AGENDA
CITY OF SHERIDAN
SEPTEMBER 9, 2024
STUDY SESSION COUNCIL MEETING START 5:30 P.M.

1. Discussion of Resolution 32-24 Adopting the 2024 Wyoming Region1 Hazard Mitigation Plan - Sheridan County Emergency Management Coordinator Jesse Ludikhuize

2. Discussion of Bid Award to Wyoming Machinery Company for Two (2) Wheel Loaders in the Amount of $287,418.00 - Utilities Director Dan Roberts

3. Discussion of Award to Prospect Construction for the Clarifier Replacement Project in the Amount of $2,651,753 - Project Manager David Ford

4. Discussion of PL-24-24, Resolution 34-24, Subdivide 25.99 Acres into 5 Lots Located at 60 Industrial Lane as a County Subdivision - City Planner Kelly Schroeder

5. General Discussion and Potential Future Agenda Items - City Administrator Stuart J. McRae
   A. CM Brantz - Main Street Bridge.
   B. Mayor Bridger - Permit Process for Road Closures.
   C. Status of Mill Park Project with the Army Corps. of Engineers.
   D. CM Linden - Assessment on 5th Street Alleways (Lewis to Dunnuck).
   E. Council Request for Future Agenda Items.

CITY OF SHERIDAN, WYOMING

55 Grinnell Street, P.O. Box 848, Sheridan Wyoming 82801
Ph (307) 674-6483 Fax (307) 674-2195

Clerk

MEMORANDUM

RE: Discussion of Resolution 32-24 Adopting the 2024 Wyoming Region1 Hazard Mitigation Plan - Sheridan County Emergency Management Coordinator Jesse Ludikhuize

From: Cecilia Good, City Clerk

To: City Council

CC:

Date: 09/09/2024

Recommendation:

See the attached draft Resolution 32-24 and Wyoming Region 1 Regional Hazard Mitigation Plan

Attachments

Resolution

Mitigation Plan

CITY OF SHERIDAN
RESOLUTION 32-24

A RESOLUTION ADOPTING THE 2024 WYOMING REGION 1 HAZARD MITIGATION PLAN

WHEREAS, the City of Sheridan recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, an adopted Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

WHEREAS, the City of Sheridan resides within the Planning Area, and fully participated in the mitigation planning process to prepare this Hazard Mitigation Plan; and

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SHERIDAN:

That the City of Sheridan hereby adopts the Wyoming Region 1 Hazard Mitigation Plan as an official plan; and

Be it further resolved, the City of Sheridan will submit this Resolution to the Wyoming Office of Homeland Security and Federal Emergency Management Agency, Region VIII officials to enable the Plan's final approval. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions at or before the end of the next five-year update cycle.

PASSED, APPROVED AND ADOPTED this 19th day of August, 2024.

City of Sheridan

_____
Richard Bridger, Mayor

ATTEST:

_____
Cecilia Good, City Clerk

Wyoming Region 1
Regional Hazard Mitigation Plan

Campbell, Crook, Johnson, Sheridan and Weston Counties

2024-2029

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Annexes

Campbell County
Crook County
Johnson County
Sheridan County
Weston County

Appendices

Appendix A - Planning Process Documentation
Appendix B - Records of Adoption (Electronic)

1 Introduction

1.1 Purpose

Wyoming Region 1 (Region), encompassing the participating jurisdictions of Campbell, Crook, Johnson, Sheridan, and Weston Counties and their municipalities, has prepared this Hazard Mitigation Plan (HMP) to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. The purpose of this HMP is to identify policies, actions, and strategies that will help to reduce risk and prevent future losses. Hazard mitigation is best realized when community leaders, businesses, citizens, and other stakeholders join together to undertake a process of learning about hazards that can affect their area and use this knowledge to prioritize needs and develop a strategy for reducing damage. Hazard mitigation is most effective when it is based on a comprehensive long-term plan developed prior to a disaster occurring.

This plan demonstrates the region's commitment to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources. This plan was also developed to make Wyoming Region 1 and the participating jurisdictions eligible for certain federal disaster assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grants including the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) and Building Resilient Infrastructure and Communities (BRIC) program, as well as to make the counties and jurisdictions more disaster resistant. This plan demonstrates the Region's commitment to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources.

1.2 Background and Scope

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

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $6 in avoided future losses in addition to saving lives and preventing injuries (Natural Hazard Mitigation Saves, 2019 Report).

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

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR §201.6) and finalized on October 31, 2007 and updated in 2012 (hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA). On April 19, 2022 FEMA updated

the State and Local Mitigation Policy Guides (policies). On April 19, 2023 they went into effect. This means that all state and local plans must meet the updated requirements. While the DMA emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Because the planning area is subject to many kinds of hazards, access to these programs is vital.

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

1.3 Plan Organization

The Wyoming Region 1 Regional Hazard Mitigation Plan is organized in alignment with the DMA planning requirements and the FEMA plan review crosswalk:

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

1.4 County Annexes

Each of the five counties has its own annex, providing a more detailed assessment of that jurisdiction's unique risks as well as their mitigation strategies to reduce long-term losses. Each annex contains the following:

- Community profile summarizing geography and climate, history, economy, and population
- More detailed hazard vulnerability information and unique risks by jurisdiction, where applicable, for geographically specific hazards
- Hazard map(s) at an appropriate scale for the jurisdiction, if available
- Number and value of buildings, critical facilities, and other community assets located in hazard areas, if available
- A capability assessment describing existing regulatory, administrative, and technical resources
- Mitigation actions specific to the county and municipalities

1.5 Multi-Jurisdictional Planning

This plan was prepared as a regional, multi-jurisdictional plan. The planning region is comprised of five counties in Wyoming Region 1 (region), as established by the Wyoming Office of Homeland Security (WOHS); the region includes Campbell, Crook, Johnson, Sheridan, and Weston Counties. All local units of government in each county were invited to participate in the planning process; the decision whether or not to participate in this process was a local decision, based on local community needs. Communities have the option to not prepare a plan, to prepare a stand-alone plan for their jurisdiction, or to participate in a multi-jurisdiction or county-wide plan. Four of the five counties in the region had previous county-wide hazard mitigation plans prior to the development of this Regional Plan; Weston County was the only one that did not have a previous hazard mitigation plan. The following table lists counties and their local governments that have opted to participate in this effort and are seeking FEMA approval of the 2023 version of this plan. Changes in participation since the original planning updates are noted. Additional details about participation can be referenced in Chapter 3 and the county annexes.

Table 1-1 Multi-Jurisdictional Participation 2023

Jurisdiction	Participation Status
Campbell County	**Continuing from 2018 update**
City of Gillette	Continuing from 2018 update
Town of Wright	Continuing from 2018 update
Campbell County Conservation District	Continuing from 2018 update
Crook County	**Continuing from 2018 update**
City of Sundance	Continuing from 2018 update
Town of Hulett	Continuing from 2018 update
Town of Moorcroft	Continuing from 2018 update
Town of Pine Haven	Continuing from 2018 update
Johnson County	**Continuing from 2018 update**
City of Buffalo	Continuing from 2018 update
Town of Kaycee	Continuing from 2018 update
Clear Creek Conservation District	New jurisdiction added in 2023
Powder River Conservation District	New jurisdiction added in 2023
Sheridan County	**Continuing from 2018 update**
City of Sheridan	Continuing from 2018 update
Town of Clearmont	Continuing from 2018 update
Town of Dayton	Continuing from 2018 update
Town of Ranchester	Continuing from 2018 update
Sheridan School District #3	New jurisdiction added in 2023
Weston County	**Continuing from 2018 update**
City of Newcastle	Continuing from 2018 update
Town of Upton	Continuing from 2018 update

2 Community Profile

This section provides a brief overview of the geography of the planning area. Additional geographic profiles of the participating jurisdictions are provided in the county annexes.

2.1 Geography and Climate

Wyoming Region 1 is comprised of five counties in the northeast corner of the state; the five counties are Campbell, Crook, Johnson, Sheridan and Weston. The region stretches from the Big Horn Mountains eastward to the Black Hills along the South Dakota border. It is bordered in the north by the State of Montana; in the east by the State of South Dakota; in the south by Wyoming's Converse, Natrona, and Niobrara counties (Region 2), and in the west by Wyoming's Big Horn and Washakie Counties (Region 6).

The region covers 16,773 square miles (10,734,556 acres). The highest point in the region is Cloud Peak in the Big Horn Mountains on the western edge of Johnson County, at 13,171 feet; the region's lowest point is 3,099 feet in the northeast corner of Crook County where the Belle Fourche River flows into South Dakota, which is also the lowest point in the state. Most of the area between those two extremes consists of rolling grasslands between 3,000 and 4,500 feet.

The major rivers in the region include the Tongue River, Powder River, Belle Fourche River, and Little Missouri River. Major highways include Interstates 25 and 90; US Highways 14, 16, 85 and 212; and state highways 50, 51, 59, 24, 112, 116, 387, 450, and 585. Multiple rail lines cross the region as well.

Overall the region averages 31 days per year with temperatures above 90˚F; during summer months, the average maximum temperature is 83.4˚F, with a record high of 108˚F. Growing season typically lasts 120-140 days a year. By contrast, the region averages 188 days a year with temperatures below 32˚F; during winter months, the average minimum temperature is 10.4˚F, with a record low of -46˚F. The region averages 17.14 inches of precipitation per year, 71% of which falls in April through September. The average seasonal snowfall is 65 inches.

A base map of the planning region is illustrated in Figure 2-1. Details of land type and ownership can be found in Table 2-1 and Table 2-2.

Figure 2-1 Wyoming Region 1 Planning Area Map

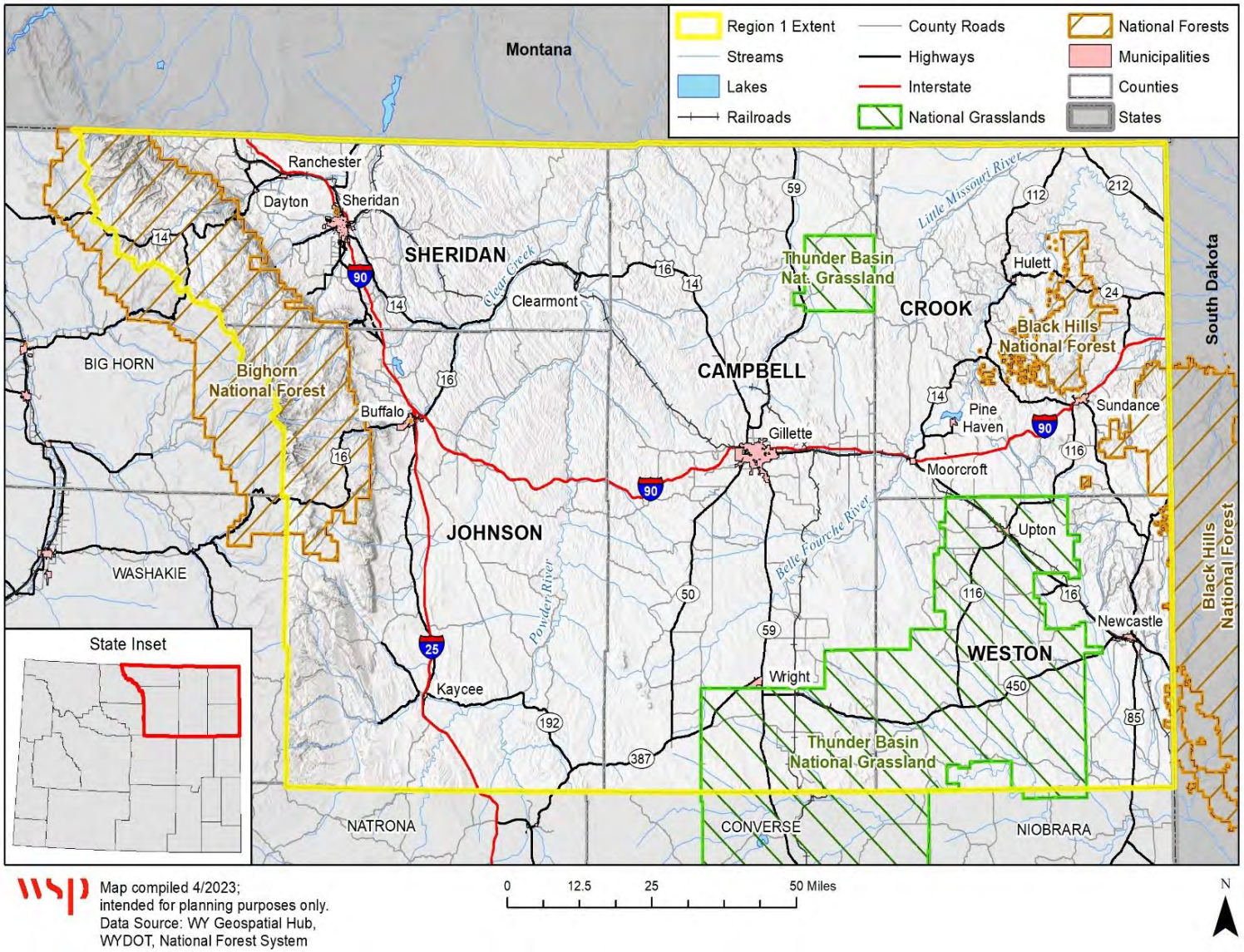


Table 2-1 Region 1 Land Types

Land Type	Acreage	Percentage
Total Acres (2006)	10,734,556	
Grassland	8,592,028	80.0%
Forest	804,323	7.5%
Shrubland	721,173	6.7%
Mixed Cropland	360,123	3.4%
Other	41,808	0.4%
Water	9,868	0.1%
Urban	3,705	0.0%

Source: NASA MODIS Land Cover Type Yearly L3 Global 1km MOD12Q1, 2006.

Table 2-2 Region 1 Land Ownership

Land Ownership	Acreage	Percentage
Total Acres	10,734,556	---
Private Lands	7,695,711	71.7%
Conservation Easement	93,351	0.9%
Federal Lands	2,257,290	21.0%
Forest Service	1,300,082	12.1%
BLM	940,016	8.8%
National Park Service	1,348	0.0%
Military	0	0.0%
Other Federal	15,844	0.1%
State Lands	778,548	7.3%
State Trust Lands	750,196	7.0%
Other State	28,352	0.3%
Tribal Lands	53	0.0%
City, County, Other	2,954	0.0%

Source: U.S. Geological Survey, Gap Analysis Program. 2016. Protected Areas Database of the United States (PADUS)

2.2 Population

Table 2-3 describes the population distribution and change for the region and its individual counties. 47% of the region's population lives in Campbell County, 31% in Sheridan County, and the remaining 22% distributed between the other three counties. Table 2-4 shows how the region's population has changed since the 2010 Census. As a whole, the Region increased in population by 2%, slightly below the state's overall growth of 3%. However, this rate varies widely across the region, with Crook County experiencing 1.4% growth, while Weston County lost an estimated 4.4% of their population.

Table 2-3 Region 1 Population Distribution

Jurisdiction	2020 Census Population	2021 American Community Survey Estimated Population	% of Region Total
Campbell County	47, 026	46,758	47%
Crook County	7,181	7,185	7%
Johnson County	8,451	8,457	8%

Jurisdiction	2020 Census Population	2021 American Community Survey Estimated Population	% of Region Total
Sheridan County	30,925	30,812	31%
Weston County	6,860	6,891	7%
Region 1 Total	100,443	100,103	---

Source: US Census Bureau

Table 2-4 Region 1 Population Change 2010-2021

Jurisdiction	2010 Census	2015	2021	% change
Campbell County	46,133	49,293	46,758	1.3%
Crook County	7,083	7,432	7,185	1.4%
Johnson County	8,569	8,616	8,457	1.3%
Sheridan County	29,116	29,940	30,812	5.8%
Weston County	7,208	7,181	6,891	-4.4%
Region 1 Total	98,109	102,462	100,103	2%

Source: US Census Bureau

Table 2-5 Region 1 Demographic Profile

Population	
Population estimate, 2021	100,103
Age and Sex	
Median Age (US median age is 37.7)	42
Percent of population under 18	23.2.0%
Percent of population 18-24	7.32%
Percent of population 15-44	34.32%
Percent of population 65 and over	15.04%
Percent of population male	51%
Percent of population female	49%
Race and Ethnicity	
White alone	94.5%
Black or African American alone	0.7%
American Indian alone	1.4%
Asian alone	0.9%
Native Hawaiian & Other Pacific Islander alone	0.0%
Some other race alone	0.8%
Two or more races	1.8%
White alone, not Hispanic or Latino	90.2%
Hispanic or Latino (of any race)	5.6%
Education	
High school graduate or higher, age 25 years+	93.86%
Bachelor's degree or higher, age 25 years+	26.08%
Vulnerable Populations	
Percent of population under 5 years old	5.72%
Percent of population 80 years and older	3.9%

Population	
Percent of population that speak English "not well"	0.8%
Percent of population with disabilities	11.8%
Percent of population without health insurance	11.32%
Percent of population in poverty	11.62%
Percent of population in deep-poverty (<1/2 federal poverty level)	6%
Percent of population over 65 and in poverty	13.16%

Source: U.S. Census Bureau, American Community Survery

*Hispanic or Latino is considered an ethnicity, not a race. People who identify as Hispanic or Latino can belong to one or more races. Therefore, the total percentage can be greater than 100%.

2.3 Economy

According to the U.S. Census American Community Survey, Region 1 has a dynamic economic profile. Approximately 36% of its workforce is involved in management, business, science, and arts occupations, followed by 15% in natural resources, construction, and maintenance roles, and 14% in production, transportation, and material moving positions. Additionally, 15% are engaged in sales and office occupations, while 16% play pivotal roles in the service sector.

- In Crook County, major industries include Agriculture, Education, and Mining.
- Sheridan County's economy is centered around Health Care, Education, and Construction, Utilities and Transportation
- Campbell County is driven by Mining, Education, and Construction, Wholesale Trade and Utilities
- Johnson County sees prominent industries in Health Care, Retail, and Public Administration, Wholesale Trade and Mining
- In Weston County, Mining, Health Care, and Manufacturing are the key sectors

Over the years, the region has seen impressive job growth, surging by 138% between 1970 and 2000, followed by an additional 32% from 2000 to 2016. From 2020 to 2021, there was a modest uptick of 0.5%. Noteworthy spikes occurred in agriculture, finance, insurance, real estate, and mining sectors.

In terms of job expansion, Region 1 has closely paralleled its population growth. Starting from a 4.9% unemployment rate in 1990, the region experienced a gradual decrease to 2.5% in 2008. The impact of the Great Recession briefly pushed the rate to 6.3%. Since then, it has stabilized at 4.4%, aligning with the national average.

The region's median household income stands at $68,300, slightly below the national average of $74,580. Approximately 11.62% of the population falls below the poverty line, just above the national average of 11.5%.

Table 2-6 Region 1 Economic Profile

Characteristic	Region 1	Campbell County	Crook County	Johnson County	Sheridan County	Weston County
EMPLOYMENT						
Total Employment, 2021	49,676	24,024	3,466	3,949	15,193	3,044
Unemployment Rate, as of 2021	4.4%	3.3%	0.3%	2.6%	2.5%	4.0%
Per capita income, 2021	$34,336	$36,568	$31,895	$34,737	$37,291	$31,190
Population % change, 2010-2020	2.3%	1.9%	1.4%	-1.4%	6.2%	-5.1%
Persons in poverty	8.3%	8.1%	6.1%	5.9%	8.2%	14.7%
Families in poverty	8.2%	9.2%	5%	9.4%	4.4%	13.4%
EMPLOYERS						
Total employer establishments, 2021	3,570	1,464	264	526	1,941	205
Total annual payroll, 2021 ($1000)	$1,743,057	$1,159,296	$70,676	$81,647	$372,283	$59,155
Total employment, 2021	7,151	17,705	1,606	2,560	12,450	1,435
Employment Growth, 2020-2021	0.5%	1.93%	-2.7%	-3.21%	2.07%	4.6%
EMPLOYMENT BY SECTOR/INDUSTRY						
Agriculture, forestry, fishing and hunting, and mining	19.46%	24.1%	25.5%	14.9%	8.1%	24.7%
Construction	9.64%	10.6%	11.1%	9.7%	10.7%	6.1%
Manufacturing	4.66%	4.0%	4.3%	2.5%	4.5%	8.0%
Wholesale trade	1.72%	1.7%	2.9%	1.4%	1.6%	1.0%
Retail trade	7.92%	9.7%	3.7%	11.2%	7.7%	7.3%
Transportation and warehousing, and utilities	6.10%	5.5%	7.7%	2.1%	5.3%	9.9%
Information	1.60%	0.7%	3.3%	1.4%	1.9%	0.7%
Finance and insurance, and real estate and rental and leasing	3.74%	3.5%	1.8%	2.6%	4.5%	6.3%
Professional, scientific, and management, and administrative and waste management services	6.08%	4.0%	2.9%	10.6%	8.6%	4.3%
Educational services, and health care and social assistance	21.06%	18.6%	19.4%	21.1%	29.1%	17.1%
Arts, entertainment, and recreation, and accommodation and food services	6.74%	8.0%	4.6%	6.6%	10.3%	4.2%
Other services, except public administration	5.40%	4.0%	8.6%	5.4%	4.3%	4.7%
Public administration	5.90%	5.6%	4.1%	10.5%	3.4%	5.9%
Management, business, science, and arts occupations	36.42%	31.1%	31.2%	46.3%	41.1%	32.4%
Service occupations	16.42%	14.1%	16.8%	15.8%	20.6%	14.8%
Sales and office occupations	15.34%	16.1%	13.1%	19.3%	15.9%	12.3%
Natural resources, construction, and maintenance occupations	17.72%	22.1%	27.8%	8.6%	12.7%	17.4%
Production, transportation, and material moving occupations	14.14%	16.6%	11.1%	10.0%	9.8%	23.2%

Characteristic	Region 1	Campbell County	Crook County	Johnson County	Sheridan County	Weston County
CLASS OF WORKER						
Private wage and salary workers	68.88%	74.7%	64.8%	58.9%	73.7%	72.3%
Government workers	19.98%	18.5%	23.8%	23.2%	19.5%	14.9%
Self-employed in own not incorporated business workers	10.44%	6.0%	10.0%	17.0%	6.6%	12.6%
Unpaid family workers	0.72%	0.8%	1.5%	0.9%	0.2%	0.2%
HOUSEHOLD INCOME						
Total Households	40,009	17,190	2,822	3,835	13,003	2,754
Less than $10,000	7.12%	4.0%	6.5%	11.6%	5.7%	7.8%
$10,000 to $14,999	4.56%	3.9%	3.9%	2.0%	5.1%	7.9%
$15,000 to $24,999	6.30%	5.9%	5.0%	7.2%	7.1%	6.3%
$25,000 to $34,999	8.74%	6.7%	9.8%	10.3%	9.6%	7.3%
$35,000 to $49,999	10.76%	6.6%	11.2%	11.3%	13.0%	11.7%
$50,000 to $74,999	16.16%	13.0%	18.4%	20.3%	15.3%	13.8%
$75,000 to $99,999	13.66%	19.9%	11.5%	7.2%	11.6%	18.1%
$100,000 to $149,999	20.90%	21.8%	25.1%	17.3%	19.9%	20.4%
$150,000 to $199,999	6.44%	12.3%	4.3%	6.3%	6.3%	3.0%
$200,000 or more	5.30%	5.7%	4.3%	6.4%	6.5%	3.6%
Median household income	$68,300	$87,547	$67,835	$58,020	$62,531	$65,566
Median monthly mortgage cost	$1,583	$1,648	$1,691	$1,575	$1,620	$1,382
Median monthly rent, 2017-2021	$838.00	$867	$749	$944	$868	$762
Mean Annual Household Earnings by Source, 2021						
Labor earnings	75.1%	84.5%	78.5%	65.4%	74.5%	72.8%
Social Security	33.1%	23.6%	32.0%	41.4%	36.8%	31.9%
Retirement income	19.%	16.8%	11.6%	23.9%	22.3%	20.5%
Supplemental Security Income	1.6%	2.6%	0.2%	2%	2.2%	1.2%
Cash public assistance income	1.1%	0.7%	0.1%	1.9%	1.2%	1.6%
Food Stamp/SNAP	2.5%	4.5%	0.3%	1.6%	3.5%	2.6%

Source: U.S. Census Bureau, American Community Survey

3 Planning Process

Requirements §201.6(b) and §201.6(c)(1):

An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and

3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

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

3.1 Background on Mitigation Planning in Region 1

Wyoming Region 1 previously participated in the 2018 Regional Hazard Mitigation Plan (Regional Plan) prior to 2023. Prior to 2018, four counties in the region had adopted county-specific hazard mitigation plans over the years. Campbell, Crook, Johnson and Sheridan Counties each had approved county-specific plans; the 2018 Regional Plan builds upon those, and this 2024-2029 version reflects an update of that efforts. The timeframe for the plan update process occurred in 2023, with final approval and adoption in early 2024. This plan represents the first official hazard mitigation plan update for Weston County, including the incorporated municipalities within the County, who first developed a mitigation plan during the 2108 Regional Plan effort.

Regional Planning. 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 1 comprises of Campbell, Crook, Johnson, Sheridan and Weston 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. WSP USA Environment and Infrastructure Inc. (WSP – formerly known as Wood Environment & Infrastructure Solutions, Inc.) was selected in 2019 to provide assistance to the State and planning regions under a five-year contract; the Region 1 planning effort began in late 2022 and spanned all of 2023.

Prior to initiating the development of this regional multi-jurisdictional hazard mitigation plan update in 2023, a substantial coordination effort took place to ensure the participation of all counties within Region 1. Each county has an Emergency Management Coordinator, who was designated as the primary point of contact. Each Coordinator assumed a coordination role within their respective counties to help fulfill Disaster Mitigation Act of 2000 (DMA) planning requirements. The county Emergency Management Coordinators then contacted each of the incorporated communities, offering them the opportunity to participate in the development of the Region 1 Hazard Mitigation Plan. All of the incorporated communities within the counties chose to participate in the development of this Regional Plan. One special district, the

Campbell County Conservation District, also participated as a jurisdiction during the 2017-18 regional planning process and participated again in 2023. Two Conservation Districts (Clear Creek and Powder River) elected to participate in Johnson County, and a Sheridan School District #3 in Sheridan County joined the effort in 2023.

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

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

3.2 Government Participation

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

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

For the Region 1 Multi-Hazard Mitigation Plan's HMPC, "participation" meant:

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

This Regional Plan includes the participation of all counties, every municipality, and certain special districts in Region 1 as noted in Chapter 1 and detailed further in Section 3.3.1. Documentation of participation is included in Appendix A in the form of meeting sign in sheets, meeting summaries, and more.

3.3 The 10-Step Planning Process

WSP established the planning process for the Region 1 plan using the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1. Organize Resources

2. Assess Risks
3. Develop the Mitigation Plan
4. Implement the Plan and Monitor Progress

Into this four-phase process, WSP integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance (FMA) programs. Thus, the modified 10-step process used for this plan meets the requirements of FEMA's Hazard Mitigation Assistance (HMA) grant programs, the CRS program, and flood control projects authorized by the U.S. Army Corps of Engineers. FEMA's Local Mitigation Planning Handbook (updated in May 2023) recommends a nine-task process within the four-phase process. Table 3.1 summarizes the four-phase DMA process, the detailed CRS planning steps and work plan used to develop the plan, the nine handbook planning tasks from FEMA's 2013 Local Mitigation Planning Handbook, and where the results are captured in the Plan. The sections that follow describe each planning step in more detail.

Table 3-1 Mitigation Planning Process Used to Develop the Regional Hazard Mitigation Plan

FEMA 4 Phase Guidance	Community Rating System (CRS) Planning Steps (Activity 510) and WSP Work Plan Steps	FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)	Location in Plan
Phase I: Organize Resources	Step 1. Organize Resources	1: Determine the Planning Area and Resources	Chapters 1, 2 and 3
		2: Build the Planning Team 44 CFR 201.6(c)(1)	Chapter 3, Section 3.3.1
	Step 2. Involve the Public	3: Create an Outreach Strategy 44 CFR 201.6(b)(1)	Chapter 3, Section 3.3.1
	Step 3. Coordinate with Other Agencies	4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)	Chapter 3, Section 3.3.1 and Annexes
Phase II: Assess Risks	Step 4. Assess the Hazard	5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)	Chapter 4 and Annexes
	Step 5. Assess the Problem		Chapter 4 and Annexes
Phase III: Develop the Mitigation Strategy	Step 6. Set Goals	6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(ii); and 44 CFR 201.6(c)(3)(iii)	Chapter 5, Section 5.2
	Step 7. Review Possible Activities		Chapter 5, Section 5.3
	Step 8. Draft an Action Plan		Chapter 5, Section 5.4 and Annexes
Phase IV: Adopt and Implement the Plan	Step 9. Adopt the Plan	8: Review and Adopt the Plan	Chapter 6
		7: Keep the Plan Current	Chapter 6

FEMA 4 Phase Guidance	Community Rating System (CRS) Planning Steps (Activity 510) and WSP Work Plan Steps	FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)	Location in Plan
	Step 10. Implement, Evaluate, Revise	9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)	Chapter 6

3.3.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

With each jurisdiction's commitment to develop a Regional Plan, WSP worked with WOHS and each county coordinator to establish the framework and organization for the process. Organizational efforts were initiated with each county to inform and educate the plan participants of the purpose of and need for a regional hazard mitigation plan. During the development of this Regional Plan, the planning process was directed through a regional planning committee led by Campbell County Emergency Management, Crook County Emergency Management, Johnson County Emergency Management, Sheridan County Emergency Management, and Weston County Emergency Management Coordinators, as well as representatives from each participating jurisdiction in these five counties. Additional stakeholders, including local, state, and federal agencies, private sector, non-governmental organizations (NGOs), academic institutions, health and human services agencies, religious institutions, and utility lifelines throughout Region 1 were also invited and participated to varying degrees in the planning process. The planning consultant (WSP) held an initial webinar to discuss the organizational aspects of the planning process with the county Emergency Management Coordinators, FEMA Region VIII, and the Wyoming Office of Homeland Security. Using FEMA's planning guidance, representative participants for each county's HMPC base membership was established, with additional invitations extended as appropriate to other federal, state, and local stakeholders and the public throughout the planning process.

Table 3-2 below lists the agencies and titles of individuals invited to participate in the planning process. Participation was achieved in a variety of methods, such as attending planning meetings, providing data or information used to update the plan, providing information on the progress of past mitigation actions, developing new mitigation actions for inclusion in the plan, conducting public outreach, and/or advertising the draft plan for review to the public. Every entity who had representatives invited to participate is listed in the table, organized by county, with the method of participation (if applicable) listed in the righthand columns. All entities were provided an opportunity to comment on the draft plan. When the draft plan was ready for public review the participating jurisdictions assisted with outreach by noticing it and sharing a link through social and other media. More details with documentation of participation included are in Appendix A.

Early in the planning process, a coordination conference call occurred in December 2022 prior to the planning process kick-off to ensure planning requirements were understood. Participants on this call included the county Emergency Management Coordinators, FEMA Region VIII, WSP and the Wyoming Office of Homeland Security.

Table 3-2 HMPC Members and Stakeholders by County

Campbell County				
Jurisdictions and Stakeholders	**Representatives**	**Attended Planning Meetings**	**Provided Input on Plan Guide (Hazards, Capabilities, and Changes in Development and Priorities)**	**Provided Progress Update on Previous Mitigation Actions and/or New Mitigation Actions**
Campbell County	Emergency Management Coordinator	X	X	X
	Deputy Emergency Management Coordinator	X		
	Senior Engineer/Floodplain Administrator			
	Planning and Zoning Administrator	X		
	Community and Government Relations	X		
	Director of Public Works			
	Building Code Official			
	Executive Director – County Parks and Recreation			
	Public Health Response Coordinator – Campbell County Public Health	X		
	Director of Urgent & Emergency Services* - Campbell County Public Health	X		
	Campbell County Health – Paramedic	X		
	Operations Lieutenant – Campbell County Sheriff's Office			
	GIS Analyst – Campbell County Surveying/GIS Department	X		
	Executive Director – Campbell County Road and Bridge			
	Deputy Chief – Campbell County Fire	X		
	Administrative Director – Campbell County Commissioners	X		
City of Gillette	City Administrator		X	X
	Lieutenant – Gillette Police Department			
	Community & Government Relations Coordinator			
	GIS Analyst			
	Director – Public Works Department			
	Events and Programming – Gillette Chambers of Commerce			
	Water Manager	X		
	Chief Building Official			
	Electrical Services Superintendent	X		

Campbell County				
	Streets Manager – City Streets Department	X		
	Director – Public Affairs	X		
	Deputy Police Chief – Gillette PD	X		
	Captain – Gillette PD	X		
	Parks Manager			
	Wastewater Manager	X		
	Solid Waste Manager	X		
	Regulatory Technical Specialist	X		
	Distribution Supervisor	X		
Town of Wright	Town Clerk		X	X
	Emergency Management Coordinator	X		
	Superintendent, Public Works			
Campbell County Conservation District	Chair*	X	X	X
	District Manager	X		
	Education Coordinator			
Other Local Agencies	Deputy Chief – Campbell County Fire Department	X		
Lifelines/Critical Infrastructure	Powder River Energy Corporation	X		
	Basin Electric Power Corp – Dry Fork Station Environmental Coordinator	X		
	Rocky Mountain Power – Emergency Management Program Manager	X		
	Wyoming Amateur Radio Emergency Service (ARES)	X		
Housing, Health, and Vulnerable populations and Non-Profits	Disaster Preparedness Manager – American Red Cross	X		
	Council of Community Services – 4 representatives			
	Administrator, Habitat for Humanity			
	Administrator, Salvation Army			
	Voluntary Organizations Active in Disasters (VOAD) – 7 volunteers			
Academia	Associate Superintendent for Instructional Support – Campbell County School District	X		
	Administrative Assistant – Campbell County/University of Wyoming Extension Office			
	Facilities Director – Gillette College	X		
Crook County				

Campbell County				
Jurisdictions and Stakeholders	**Representatives**	**Attended Planning Meetings**	**Provided Data Collection Guide**	**Provided Update on Previous Mitigation Actions and/or New Mitigation Actions**
Crook County	County Emergency Management Coordinator	X	X	X
	Undersheriff – Crook County Sheriff Office/Search and Rescue	X		
	Public Health Response Coordinator			
	Fire Warden – Crook County Fire			
	Commissioner	X		
	EMS Coordinator – Crook County EMS/Hospital	X		
Town of Hulett	Volunteer Fire District		X	X
	Chief of Police – Hulett PD	X		
	Emergency Manager			
Town of Moorcroft	Chief – Moorcroft Fire Department	X	X	X
Town of Pine Haven	Chief – Pine Haven Volunteer Fire District	X	X	X
	Pine Haven Fire – Fireman	X		
	Mayor*	X		
	Planning & Zoning Commission – Chairman	X		
Town of Sundance	Paramedic – Sundance EMS, Chief of Police		X	X
State/Local Agencies	Assistant Superintendent - Keyhole State Park	X		
	Battalion Chief – Crook County Fire RERT #1			
	Communications Specialist – K.A.R.E. EMS	X		
Private Industry/ Stakeholders	Manager HSE/RSO – Strata Energy			
	Environmental Manager – Neiman Enterprises	X		
	Chairman – LEPC	X		
Johnson County				
Jurisdictions and Stakeholders	**Representatives**	**Attended Planning Meetings**	**Provided Data Collection Guide**	**Provided Update on Previous Mitigation Actions and/or New Mitigation Actions**
Johnson County	County Commissioner		X	X
	County Emergency Management Coordinator	X		
	Operations Manager	X		
	County GIS Analyst			

Campbell County				
	County Planner	X		
	County Assessor			
	Sheriff			
	Supervisor – Road and Bridge Department			
	Public Health Response Coordinator	X		
	Lake DeSmet Manager (dam operator)	X		
Town of Kaycee	Mayor of Kaycee		X	X
	Assistant			
	Director of Public Works Department			
	Clerk	X		
	Town Council	X		
City of Buffalo	Mayor of Buffalo		X	X
	Director of Public Works Department	X		
	Building Inspector/Planner	X		
	Planner	X		
	City Clerk			
	Volunteer Fire Dept. Chief			
	City Councilwoman	X		
Clear Creek Conservation District	District Manager	X		X
Powder River Conservation District	District Manager	X	X	X
Housing, Health and Vulnerable populations	Compass Center for Families/Family Crisis Center	X		
Local Agencies	Chief – Johnson County Fire District			
	Fire Chief/ Road Deputy – Powder River Fire District			
Sheridan County				
Jurisdictions and Stakeholders	**Representatives**	**Attended Planning Meetings**	**Provided Data Collection Guide**	**Provided Update on Previous Mitigation Actions and/or New Mitigation Actions**
Sheridan County	County Emergency Management Coordinator	X	X	X
	County Sheriff	X		
	County Planner	X		

Campbell County				
	County Engineer	X		
	GIS Coordinator	X		
	County Commissioner	X		
	Public Health Response Coordinator	X		
	Chief – Sheridan Fire Rescue	X		
	Fire Warden – Sheridan Fire Rescue	X		
	Fuels Mitigation Coordinator	X		
City of Sheridan	Utilities Director	X	X	X
	Public Works Director			
	Chief – Fire/Rescue	X		
	Chief of Police	X		
Town of Clearmont	Mayor	X	X	X
Town of Ranchester	Mayor	X	X	X
	Town Marshall	X		
Town of Dayton	Mayor		X	X
Sheridan County School District #3	Superintendent	X	X	X
Local Agencies/ Stakeholders	Public Health Response Coordinator – Sheridan County Public Health			
	Community Emergency Response Team (CERT) member			
	District Manager – Sheridan County Conservation District	X		
	Program Specialist – Sheridan County Conservation District	X		
	Sheridan Area Water Supply Administrator	X		
	Facilities Director – Sheridan College	X		
	Facilities Director – Sheridan County School District #2			
Private Industry and other Stakeholders	Chairman – LEPC	X		
	Director of Facility Support – Sheridan Memorial Hospital	X		
	Emergency Manager - VA Hospital Sheridan	X		
	CFO, Farmers CO-OP Oil Company			
	Field Operations Supervisor – Montana – Dakota Utilities	X		
	Emergency Response Specialist, Phillips 66			
	General Manager, Basin Electric Power Cooperative			
	VP of Systems Operations – Powder River Electric Cooperative	X		
	General Manager – Big Horn Rural Electric Association			
	Consultant – Sustainable Forestry Consulting			
	Area Manager – AmeriGas Propane	X		

Campbell County				
	Manager of Hazardous Materials Field Operations and Emergency Response BNSF Railway			
Weston County				
Jurisdictions and Stakeholders	**Representatives**	**Attended Planning Meetings**	**Provided Data Collection Guide**	**Provided Update on Previous Mitigation Actions and/or New Mitigation Actions**
Weston County	Emergency Management Coordinator, Department of Homeland Security	X	X	X
	Public Health Response Coordinator	X		
	Weston County Public Health Officer			
	Secretary/Treasurer	X		
	County Coroner	X		
	County Sheriff			
	Patrol Sergeant – County Sheriff's Office	X		
	Commissioner	X		
	Clerk	X		
City of Newcastle	Dispatcher/Dispatch Supervisor		X	X
	City Councilman/ LEPC Chair			
	Chief, Assistant Chief, BLM fuels Coordinator – Newcastle Volunteer Fire Department			
	Patrol Sergeant – Newcastle PD	X		
Town of Upton	Upton Volunteer Fire Department		X	X
	Chief of Police	X		
Local Agencies/ Stakeholders	County Executive Director – USDA Farm Services Agency	X		
Private Industry/ Stakeholders	District Manager, Weston County Natural Resource District	X		
	LEPC Chair			
Regional Agencies/Stakeholders				
State Agencies	Wyoming Office of Homeland Security – State Hazard Mitigation Officer	X		
	Regional Hydrographer/Commissioner – Wyoming State Engineer's Office			
	Consumer Health Specialist – Wyoming Dept. of Agriculture			
	Wyoming Department of Health			

Campbell County				
	District Forester – Wyoming State Forestry Division - District 5 (Johnson, Sheridan, Campbell Counties)	X		
	District Fire Management Officer – USFS, Bighorn National Forest	X		
Federal Agencies	Hydrologist – National Weather Service			
	Warning Coordination Meteorologist – National Weather Service, Riverton	X		
	Warning Coordination Meteorologist – National Weather Service, Billings	X		
	District Conservationist – Nation Resources Conservation Service (NRCS)	X		
	Rangeland Management Specialist – NRCS	X		
	County Executive Director – USDA Farm Services Agency	X		

Each Emergency Management Coordinator (EMC), with assistance from WSP, identified key county, municipal and other local government and stakeholder representatives. Letters of invitation were emailed to invite them to participate as members of the HMPC, and to attend a series of planning meetings. During the plan development process, communication amongst the County Planning Teams occurred through a combination of face-to-face meetings, monthly conference calls, web-based meetings, phone calls, and email correspondence. Targeted input for each participating jurisdiction was collected with a Plan Update Guide (PUG) and Mitigation Action Tracker that was developed by WSP but distributed through the county EMC's. Following the initial kickoff webinar on January 11, 2023, two series of planning workshops with each County Planning Team were held during the plan's development during May and July 2023. In addition, monthly conference calls were held with the Emergency Management Coordinators, Wyoming OHS, and WSP to discuss the process including upcoming milestones and information needs. The sign-in sheets and agendas for each of the meetings are included in Appendix A. Due to scheduling conflicts in limited cases some municipalities were not able to attend the planning workshops. Emergency Management Coordinators worked with the jurisdictions individually in these cases to obtain necessary information and input into the planning process.

Kickoff Meeting

A mix of individuals representing counties, municipalities, and the state were present at the kickoff webinar. During the meeting, WSP presented information on the scope and purpose of the plan update, participation requirements of HMPC members, and the proposed project work plan and schedule. Plans for public involvement (Step 2) and coordination with other agencies and departments (Step 3) were discussed. The HMPC reviewed the hazard identification information for each county and the Region and refined the list of identified hazards to mirror that of the Wyoming Hazard Mitigation Plan. In follow-up to the meeting, participants were provided a Geographic Information Systems (GIS) data needs worksheet, a Plan Update Guide facilitate the collection of information needed to support the plan update, and a summary of the conference call/webinar.

A second set of meetings, Planning Meeting Series #2: Hazard Identification and Risk Assessment and Goals update, was organized as a series of virtual meetings to discuss the highlights of the HIRA update. The purpose of these meetings was to review the results of the risk assessment and review and update or develop goals. The following are the dates of the meeting with attendance records in Appendix A.

May 15, 2023 Johnson County

May 16, 2023 Weston County

May 24, 2023 Sheridan County

May 25, 2023 Crook County

May 25, 2023 Campbell County

Planning Meeting Series #3: Mitigation Strategy Update Workshops. These workshops focused on the update of the mitigation strategy and brainstorming of new mitigation actions to include in the HMP. The following are the dates of the meeting with attendance records in Appendix A.

July 25, 2023 Johnson County

July 25, 2023 Sheridan County

July 26, 2023 Campbell County

July 27, 2023 Crook County

July 27, 2023 Weston County

In some cases, HMPC meetings were supplemented with additional meetings, emails, and telephone discussions to further engage the municipalities in the process. During the planning process each County Emergency Management Coordinator engaged their incorporated municipalities satff for additional discussions on the planning effort.

Planning Step 2: Involve the Public

The 2023 planning process informed and involved the public early in the process. In some cases, the HMPC meetings included members of the public, such as Community Emergency Response Team members. Public outreach was conducted through several different channels, including press releases, radio announcements, social media notices, a survey, and newspaper articles. Social media was commonly used to share information related to hazards, and to inform the public on ways to share input on the plan update process. The county EMCs emailed the link to the public survey to local businesses, asking them to share it with the public, or post it to their social media page. Sheridan County sent a press release to local news organizations, including Big Horn Mountain Radio, Sheridan Press, and Sheridan Media, to help spread information on how the public could participate in the planning process. The Johnson County Emergency Management Coordinator was interviewed by local radio station KBBS as part of their "Community Speaks" program; during the interview she shared how the public can become informed on hazards they are at risk of, and how they can participate in the HMP planning process. Campbell County also conducted public outreach through social media and public information channels.

Nonprofits and community-organizations that represent and regualary connect with socially vulnerable populations were invited to particpate as members of the HMPC. It is important to ensure that attention is being given to underserved and vulnerable populations and that organizations that work with these populations are invited to the table. Wyoming is a rural state, and many communities across the state and Region 1 lack the staffing and capacity to conduct their own outreach and engagement activities with vulnerable populations. While private and non-profit entities which provide services and outreach efforts with underserved populations do exist, they may be limited in capacity and the working relationships between these entities and local governments are sometimes lacking. Additionally, local governments may not have thorough data at hand on who in their community may be vulnerable or underserved. Despite these capability challenges, representatives from the following organizations were invited to participate in the planning process as HMPC participants:

- Habitat for Humanity
- Salvation Army
- Council of Community Services
- Saint Jon Paul II Catholic Church
- Veterans of Foreign Wars (VFW)
- American Legion
- Greenhouse Living
- Public School Districts throughout Region 1
- Red Cross
- Various public health agencies (see Table 3.2.)
- The Hub on Smith

These organizations work directly with a broad range of populations that are underserved or traditionally more vulnerable to hazards, such as the elderly, young children, veterans, houseless individuals, low-income families, and non-native English speakers. Additionally, Sheridan County School District #3 and the Town of Clearmont are considered underserved

and low income areas of Sheridan County. Their involvement as participating (adopting) jurisdictions in the plan update process documents participation by vulnerable and underserved communities.

2023 Public Survey

During the regional planning process and drafting stage, a public survey was developed as a tool to gather public input. The survey was for the public to provide feedback to the county planning teams on topics related to hazard concerns and reducing hazard impacts. The survey provided an opportunity for public input during the planning process prior to finalization of the plan update. The survey gathered public feedback on concerns about wildfires, floods, winter storms and other hazards, and solicited input on strategies to reduce their impacts. The highest rated hazards in Region 1 were wildfire, severe winter weather, drought, and hail. The survey was released as an online tool in March 2023 and closed on April 30, 2023. The counties provided links to the public survey by distributing it using social media, email, and posting the link on websites. 462 public responses were received across the entire region and shared with the county planning committees to inform the process.

Figure 3-1 displays the results from Question 4, which reads: *The following types of mitigation actions may be considered in this plan. Please indicate all the types of mitigation actions that you think should have the highest priority in the Regional Multi-Hazard Mitigation Plan. These results will be considered during the planning process*. The results indicated indoor/outdoor warning systems is the most important mitigation action the public thinks should be included in this plan. Other high rated actions included improved communications capabilities, generators for critical facilities, public education/awareness initiatives, and wildfire fuels treatment projects. Excerpts of responses to two open ended questions were provided to the CPTs during the mitigation strategy workshops: Q8 “Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? “ and “Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters”. Additional results of the survey are included in Appendix A, Planning Process Documentation.

Figure 3-1 Public Survey Results – Mitigation Action Category Preferences

Prior to finalizing, a draft of the regional plan was made available to the public for review and comment. The plan was placed on the Wyoming OHS's web page, and the counties used social media, a press release and email blasts to announce the public comment period. An online feedback form was provided to collect specific comments. Despite extensive advertising by the pariticipating counties, as shown in Appendix A, during the public review period, no comments were received via the online comment form.

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting state and federal agencies and organizations to participate in the process. Neighboring communities and regional agencies involved in hazard mitigation activities (conservation districts), agencies that have the authority to regulate development (local governments), as well as other interests, businesses, academia and other private and non-profit interests, were also invited to provide feedback. Other interests included community lifeline/infrastructure such as rural electric cooperatives and industry representatives. Based on their involvement in hazard mitigation activities or their role in land stewardship in the Region, representatives from several state and federal agencies and local businesses were included in the HMPC in 2023 and are noted in Table 3.2. Academia including engaging school districts, particularly in Sheridan County where the County School District #3 became a participation jurisdiction.

Many of these stakeholders participated in planning meetings or were provided an opportunity to review the draft plan before it was finalized. Some of the State and Federal agencies which were invited to participate in the process attended meetings, provided data and information for the plan update, or provided feedback. This included the State Engineer's Office, who also leads the State's Safety of Dams Program, who attended some of the planning meetings as indicated in Table 3-2. Specific to the State Engineer's Office a GIS layer of inundation mapping for privately owned High Hazard dams was used for vulnerability analysis in Chapter 4.

Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is an important aspect of mitigation planning. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability from natural hazards. Each county and most municipalities in the Region use a variety of comprehensive planning mechanisms, such as master plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into these plans establishes a credible and comprehensive HMP that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- County comprehensive plans – informed capabilities in county annexes
- Community Wildfire Protection Plans – informed risk assessment, capabilities, mitigation strategies
- Wyoming Hazard Mitigation Plan (2020)-informed risk assessment, goals update.

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

3.3.2 Phase 2: Assess Risks

Planning Steps 4 and 5: Identify the Hazards and Assess the Risks

WSP led the HMPCs in the effort to identify and document all the hazards that have impacted or could impact the planning area. The existing hazard mitigation plans, and Wyoming Hazard Mitigation Plan provided a basis for many of the hazard profiles. Where data permitted, Geographic Information Systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. Sophisticated analyses for flood, landslide and wildfire hazards were performed by WSP that included an analysis of flood risk based on the Digital Flood Insurance Rate Maps

(DFIRMs), where available. A more detailed description of the risk assessment process and the results are included in Chapter 4 Risk Assessment.

Also included in the 2023 plan is an updated capability assessment to review and document the planning area's current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. The results of this assessment are captured in each annex.

3.3.3 Phase 3: Develop the Mitigation Plan

Planning Steps 6 and 7: Set Goals and Review Possible Activities

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

Planning Step 8: Draft an Action Plan

Based on input from the HMPC's regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, WSP produced a complete first draft of the Regional Plan. This complete draft was shared for HMPC review and comment; HMPC comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. Other agencies, including Wyoming Safety of Dams Program in the State Engineer's Office, and neighboring county emergency managers were invited to comment on this draft as well through a direct email. No final comments were provided by stakeholders or the public. The final plan for the Wyoming Office of Homeland Security and FEMA Region VIII review and approval, contingent upon final adoption by the governing boards of each participating jurisdiction, was provided in January 2024.

3.3.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the plan was adopted by the governing boards of each participating jurisdiction. As the adoption process takes place after FEMA's review and approval of the plan, copies of the adoption resolution will be included electronically in Appendix B Records of Adoption.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Each recommended action includes key descriptors, such as a lead manager and possible funding sources, to help initiate implementation. Progress on the implementation of specific actions identified in the plan is captured in the mitigation action plan summary table in Chapter 5 Mitigation Strategy. An overall implementation strategy is described in Chapter 6 Plan Adoption, Implementation and Maintenance.

Finally, there are numerous organizations within the Region 1 planning area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is important to the ongoing success of this plan and mitigation in Region 1 and is addressed further in Chapter 6. A plan update and maintenance schedule

and a strategy for continued public involvement are also included in Chapter 6. Annexes for each of the five counties include additional local information.

4 Hazard Analysis and Risk Assessment

44 CFR Requirement 201.6(c)(2):

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

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

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

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

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

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

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

Section 4.2 Hazard Profiles discusses the threat to the planning area and describes previous occurrences of hazard events, the likelihood of future occurrences, and the Region's vulnerability to particular hazard events.

County Annexes include summaries of community assets including population, building stock, critical facilities, and historic, cultural and natural resources. Additional details on vulnerability to specific hazards where they vary from those of the Region are noted in the annexes, with more details including maps, where appropriate.

4.1 Hazard Identification

Requirement §201.6(c)(2)(i):

[The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.

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

4.1.1 Results and Methodology

Using existing hazards data, plans from participating jurisdictions, and input gained through planning and public meetings, the HMPCs of Campbell, Crook, Johnson, Sheridan, and Weston Counties agreed upon a list of hazards that could affect the Region. Hazards data from FEMA, the Wyoming Office of Homeland Security (including the 2020 State of Wyoming Multi-Hazard Mitigation Plan), the National Oceanic and Atmospheric Administration, county hazard mitigation plans, and many other sources were examined to assess the significance of these hazards to the planning area. The hazards evaluated in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

There was one new hazard, coal seam fire, which was added to the risk assessment since 2018. Coal seam fires are prevalent mostly in Campbell County and have the potential to create grass and wildfires. The final list of hazards identified and investigated for the 2023 Region 1 Multi-Hazard Mitigation Plan includes:

- Dam Failure
- Drought
- Earthquake
- Expansive Soils
- Flood
- Hail
- Hazardous Materials
- High Winds and Downbursts
- Landslide/Rockfall/Debris Flow
- Lightning
- Mine and Land Subsidence
- Severe Winter Weather
- Tornado
- Wildfire
- Coal Seam Fire

Members of each HMPC used a hazards worksheet to rate the significance of hazards that could potentially affect the region. Significance was measured in general terms, focusing on key criteria such as the likelihood of the event, past occurrences, spatial extent, and damage and casualty potential. Table 4-1 represents the worksheet used to identify and rate the hazards and is a composite that includes input from all the participating jurisdictions. Note that the significance of the hazard may vary from jurisdiction to jurisdiction. In some cases, the priorities changed during the 2023 update based on input from the HMPC (notably hail went from Medium to High in Campbell, Sheridan and Weston due to more recent events). The county annexes include further details on hazard significance by county and municipality. Other changes in the hazard identification list are noted with an asterisk in the table below.

Table 4-1 Region 1 Overall Hazard Significance Summary Table

	Campbell	Crook	Johnson	Sheridan	Weston
Dam Failure	L	M	H	M	L
Drought	M	H	M	H	M
Earthquake	M	L	M	L	L
Expansive Soils	M	L	L	L	L
Flood	M	M	H	H	H
Hail	H	M	M	H	H
Hazardous Materials	H	H	M	M	M
High Winds	M	M	M	M	M
Landslide	M	L	M	M	L
Lightning	M	H	M	M	M
Mine and Land Subsidence	L	L	L	L	M
Severe Winter Weather	H	H	H	H	H
Tornado	H	M	M	M	M
Wildfire	H	H	H	H	H
Coal Seam Fire	M*	L*	N/A*	L*	N/A*

Significance based on a combination of Geographic Extent, Potential Magnitude/Severity and Probability as defined below.
*An asterisk indicates that hazard was not identified prior to 2023 in the county.

Geographic Extent

Negligible: Less than 10% of planning area or isolated single-point occurrences

Limited: 10 to 25% of the planning area or limited single-point occurrences

Significant: 25 to 75% of planning area or frequent single-point occurrences

Extensive: 75 to 100% of planning area or consistent single-point occurrences

Potential Magnitude/Severity

Negligible: Less than 10% of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.

Probability of Future Occurrences

Unlikely: Less than 1% probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.

Occasional: Between a 1 and 10% probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.

Likely: Between 10 and 90% probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years

Highly Likely: Between 90 and 100% probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Overall Significance

Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on

Limited: 10 to 25% of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.

Critical: 25 to 50% of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.

Catastrophic: More than 50% of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.

Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.

High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

Hazards considered but not profiled further include avalanche, volcanism and windblown deposits. Avalanches can occur in the Bighorn Mountains of Johnson and Sheridan counties, but are limited to back-country areas in national forest. While they sometimes do cause death and injury and affect first responders, they are not considered further in this plan due to isolated impacts. The region could be vulnerable to an eruption of the Yellowstone Caldera due to its location to the east of Yellowstone National Park. A large-scale eruption would have catastrophic global impacts. Because of the overly long expected occurrence of frequency (greater than 10,000 years) for explosive volcanism at Yellowstone, and the fact that a mitigation plan is not possible for an event of this magnitude, it was not analyzed in this document. Windblown deposits include sands that can be mobilized by wind during extended drought. This was not considered to be a significant hazard in the region and thus not profiled further.

Other hazards considered during plan update discussions included human-caused ones such as cyber-attacks, malevolent acts/sabotage, attacks on public utilities through drinking water, overloading electrical grids, etc. Human-caused hazards are not required to be addressed per the FEMA planning requirements thus the focus of the plan remains primarily on natural hazards, but these and other hazards may be revisited in future updates.

4.1.2 Disaster Declaration History

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

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

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

Fire Management Assistance Grant funding is available to state, local and tribal governments, for the mitigation, management, and control of fires on publicly or privately-owned forests or grasslands, which threaten such destruction as would constitute a major disaster. The Fire Management Assistance declaration process is initiated when a State submits a request for assistance to the Federal Emergency Management Agency (FEMA) Regional Director at the time a "threat of major disaster" exists. The entire process is accomplished on an expedited basis and a FEMA decision is rendered in a matter of hours. The Fire Management Assistance Grant Program (FMAGP) provides a 75 percent Federal cost share and the State pays the remaining 25 percent for actual costs.

Table 4-2 provides information on federal emergencies and disasters declared in Wyoming between 1963 and 2017. There have not been any state-declared disasters beyond these that rose to the level of a federal declaration.

Table 4-2 Major Disaster Declarations in Wyoming: 1963 –2023

Event/ Hazard	Year	Declaration Type	Remarks/Description
Heavy rains, flooding	1963	Presidential – Major Disaster Declaration	
Drought	1977	Presidential - Emergency Declaration	
Severe storms, flooding, mudslides	1978	Presidential – Major Disaster Declaration	All Reg. 1 Counties included in Designated Areas
Severe storms, tornadoes	1979	Presidential – Major Disaster Declaration	
Severe storms, hail, flooding	1985	Presidential – Major Disaster Declaration	
Methane gas seepage	1987	Presidential - Emergency Declaration	Campbell County
Severe winter storm	1999	Presidential – Major Disaster Declaration	
Dead Horse Fire	2000	Fire Mgmt. Assistance Declaration	
Winter storm	2000	Presidential – Major Disaster Declaration	Crook & Weston Counties included in Designated Areas
McFarland Divide Fire	2001	Fire Mgmt. Assistance Declaration	Crook County included in Designated Areas
Elk Mountain #2 Fire	2001	Fire Mgmt. Assistance Declaration	Weston County included in Designated Areas
Hensel Fire	2002	Fire Mgmt. Assistance Declaration	
Reese Mountain Fire	2002	Fire Mgmt. Assistance Declaration	

Event/ Hazard	Year	Declaration Type	Remarks/Description
Commissary Ridge Fire	2002	Fire Mgmt. Assistance Declaration	
Tongue River Fire	2003	Fire Mgmt. Assistance Declaration	Sheridan County included in Designated Areas
Tornado	2005	Presidential – Major Disaster Declaration	Campbell County included in Designated Areas
Drought	2006	USDA Declaration	Statewide drought affecting Region 1
Thorn Divide Fire Complex	2006	Fire Mgmt. Assistance Declaration	Crook County included in Designated Areas
Jackson Canyon Fire	2006	Fire Mgmt. Assistance Declaration	
Drought	2007	USDA Declaration	Statewide drought affecting Region 1
Little Goose Fire	2007	Fire Mgmt. Assistance Declaration	Sheridan County included in Designated Areas
Drought	2009	USDA Declaration	
Severe freeze	2009	USDA Declaration	Severe freezes affecting Big Horn, Park, Fremont, Hot Springs, Johnson, Sheridan, Teton, and Washakie Counties
Flooding	2010	Presidential – Major Disaster Declaration	
Severe Storms, Flooding, and Landslides	2011	Presidential-Major Disaster Declaration	Crook, Johnson, Sheridan & Weston Counties included in Designated Areas
Arapahoe Fire	2012	Fire Mgmt. Assistance Declaration	
Squirrel Creek Fire	2012	Fire Mgmt. Assistance Declaration	
Oil Creek Fire	2012	Fire Mgmt. Assistance Declaration	Weston County included in Designated Areas
Sheep Herder Hill Fire	2012	Fire Mgmt. Assistance Declaration	
Severe Storms and Flooding	2015	Presidential-Major Disaster Declaration	Johnson County included in Designated Areas
Station Fire	2015	Fire Mgmt. Assistance Declaration	
Lava Mountain Fire	2016	Fire Mgmt. Assistance Declaration	
Tokawana Fire	2016	Fire Mgmt. Assistance Declaration	
Severe Winter Storm & Winds	2017	Presidential – Major Disaster Declaration	
Heavy Rains, Flooding	2017	Presidential – Major Disaster Declaration	
Covid-19 Pandemic	2020	Emergency Declaration	Statewide
Covid-19 Pandemic	2020	Presidential – Major Disaster Declaration	Statewide

Source: FEMA, https://www.fema.gov/disasters

4.1.3 Assets Summary

Assets inventoried for the purpose of determining vulnerability include people, structures, critical facilities, and natural, historic, or cultural resources. For the regional planning process available GIS databases were utilized. Parcel and assessor data for all

counties were obtained from the Wyoming Department of Revenue's Property Tax Division in April of 2023; this information provided the basis for building exposure and property types. A critical facilities layer was created through the combination of 2022 Homeland Infrastructure Foundation-Level Data (HIFLD) databases and the 2023 National Bridge Inventory. HIFLD is national geospatial data that is open public domain data that can be used to support community preparedness, resiliency, research, and other capacities. A critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Where applicable, this information was used in an overlay analysis for hazards such as dam inundation, expansive soil, flood, landslide, and wildfire. More detail on total assets potentially exposed to hazards can be found in the county annexes, including totals by jurisdiction.

FEMA organizes critical facilities in seven (FEMA has subsequently revised the Community Lifelines to include an eighth lifeline specific to water systems after this risk assessment was completed) lifeline categories as shown in Figure 4-1.

Figure 4-1 FEMA Lifeline Categories

Source: FEMA

These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

Table 4-3 Region 1 Total Lifeline Facilities by County

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	321	160	6	8	20	65	152	**732**
Crook	50	15	4	4	9	21	172	**275**
Johnson	75	11	4	-	10	21	204	**325**
Sheridan	98	15	8	2	12	62	170	**367**
Weston	37	26	2	2	11	18	44	**140**
Total	**581**	**227**	**24**	**16**	**62**	**187**	**742**	**1,839**

Source: HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 4-4 below contains a summary of improved property exposure across the five counties and incorporated areas in the Region. More detailed tables that detail the types of properties by jurisdiction can be referenced in the county annexes.

Table 4-4 Region 1 Total Property Exposure by County and Jurisdiction

County	Jurisdiction	Improved Parcels	Improved Value	Estimated Content Value	Total Exposure
Campbell County	Gillette	10,395	$2,449,524,757	$1,613,590,338	$4,063,115,095
	Wright	445	$75,655,429	$47,865,944	$123,521,373
	Campbell Unincorporated	3,918	$855,914,775	$473,643,071	$1,329,557,846
	Total	**14,758**	**$3,381,094,961**	**$2,135,099,352**	**$5,516,194,313**
Crook County	Hulett	162	$31,587,573	$19,878,154	$51,465,727
	Moorcroft	317	$49,932,405	$31,110,732	$81,043,137
	Pine Haven	253	$52,194,690	$28,213,092	$80,407,782
	Sundance	529	$105,150,220	$72,524,953	$177,675,173
	Crook Unincorporated	1,944	$301,849,117	$176,926,762	$478,775,879
	Total	**3,205**	**$540,714,005**	**$328,653,691**	**$869,367,696**
	Buffalo	1,991	$444,007,310	$281,740,895	$725,749,925

County	Jurisdiction	Improved Parcels	Improved Value	Estimated Content Value	Total Exposure
Johnson County	Kaycee	117	$12,531,450	$7,672,691	$20,204,141
	Johnson Unincorporated	1,945	$466,494,117	$254,054,092	$720,548,209
	Total	**4,053**	**$923,032,877**	**$543,467,678**	**$1,466,502,275**
Sheridan County	Clearmont	50	$5,218,353	$2,935,160	$8,153,513
	Dayton	357	$77,984,273	$41,260,614	$119,244,887
	Ranchester	363	$81,890,969	$45,382,994	$127,273,963
	Sheridan	7,296	$2,023,459,860	$1,290,771,933	$3,314,231,793
	Sheridan Unincorporated	4,583	$1,542,800,460	$804,682,744	$2,347,483,204
	Total	**12,649**	**$3,731,353,915**	**$2,185,033,444**	**$5,916,387,359**
Weston County	Newcastle	1,236	$180,211,591	$116,416,968	$296,628,559
	Upton	359	$46,379,788	$27,461,567	$73,841,355
	Weston Unincorporated	1,058	$219,879,516	$118,709,288	$338,588,804
	Total	**2,653**	**$446,470,895**	**$262,587,823**	**$709,058,718**
	Grand Total	**37,318**	**$9,022,666,653**	**$5,454,841,987**	**$14,477,510,360**

Source: Wyoming CAMA 2022, WSP GIS Analysis

4.1.4 Social Vulnerability and Community Resilience

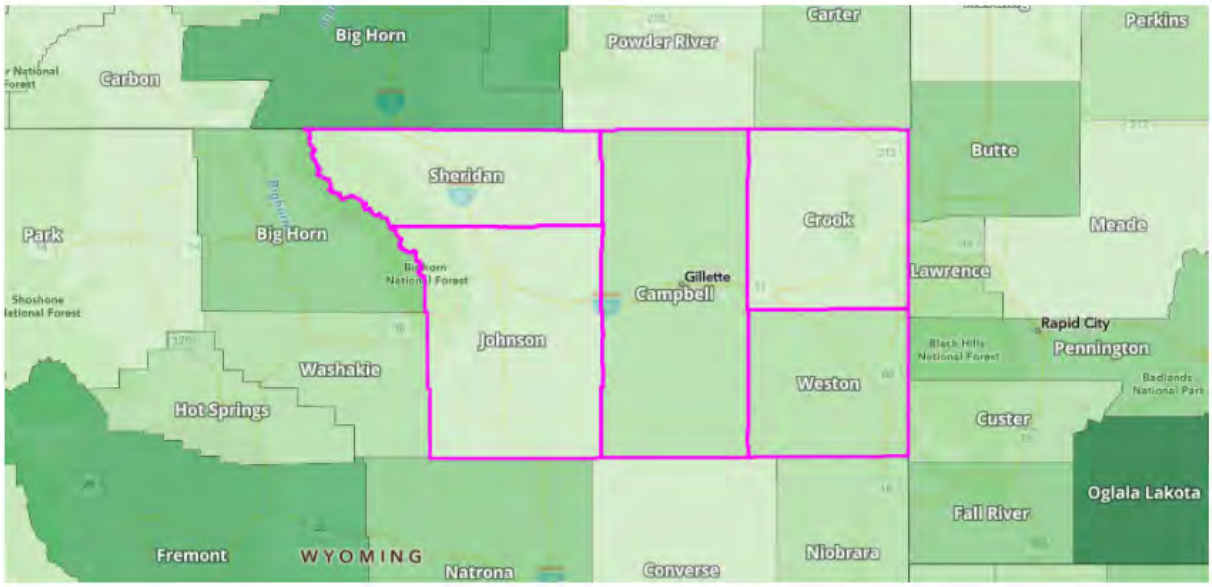
Social vulnerability refers to a community's capacity to prepare for and respond to hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human caused threats, such as toxic chemical spills. Social vulnerability considerations were included in this plan update to identify areas across the planning area that might be more vulnerable to hazard impacts based on a variety of factors.

The term vulnerability should be used to describe the communities more vulnerable to a risk or hazard, such as high vulnerability due to wildfires or floods based upon geography, topography, hydrology, or weather. Referencing people themselves directly with the term vulnerability causes individual community members to be seen with a deficit lens, leaving the impression that the vulnerability is a result of a lack of responsibility and/or adequate planning of the individual. Instead, vulnerability only occurs when the system that the individual is part of fails to provide equitable accessibility to resources or services, known as access and functional needs, for the individual to survive, respond to, and recover from an event. Barriers that may be exacerbated by certain social and economic factors – including race, age, income, renter status, or institutionalized living – directly affect a community's ability to prepare for, respond to, and recover from hazards and disasters. The concept of social vulnerability helps explain why communities often experience a hazard event differently, even when they experience the same physical impacts or property loss.

The Centers for Disease Control and Prevention (CDC) has developed a social vulnerability index (SVI) to measure the resiliency of communities when confronted by external stresses such as natural or human-caused disasters. The SVI is broken down by county to the census tract level and provides insight into particularly vulnerable populations. The National Risk Index (NRI) uses the CDC SVI data that can be used as a side-by-side comparison of social vulnerability across the region, Figure 4-2 below displays the overall social vulnerability for Region 1. Crook County has the lowest overall social vulnerability in the region, while Campbell County has the highest, but all

counties are in the relatively low to very low category overall. Further detail on specific factors of social vulnerability is provided for each county in their respective annex.

Figure 4-2 Region 1 Overall Social Vulnerability



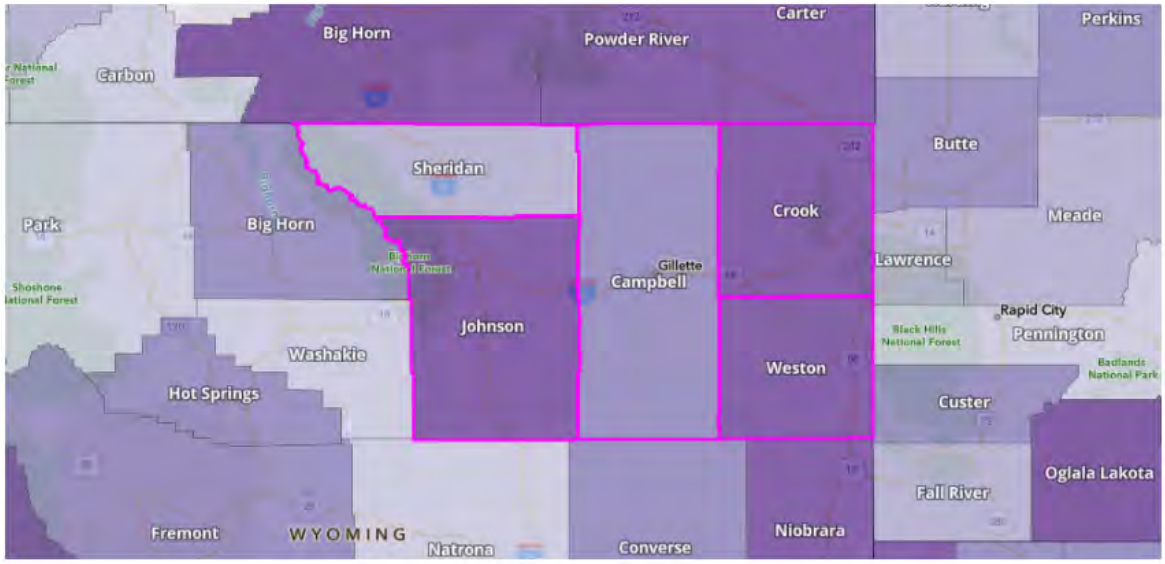
Rank	Community	State	Rating	Score
1	Campbell County	WY	Relatively Low	32.3
2	Weston County	WY	Relatively Low	23.2
3	Sheridan County	WY	Very Low	19.8
4	Johnson County	WY	Very Low	12.7
5	Crook County	WY	Very Low	4.7

Source: National Risk Index

Related to social vulnerability, the NRI utilizes community resilience as a “consequence reduction component". Community Resilience can essentially be thought of as an inverse to social vulnerability. The NRI defines community resilience as the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. There are multiple, well-established ways to define community resilience at the local level, and key drivers of resilience vary between locations. Because there are no nationally available, bottom-up community resilience indices available, the Social Vulnerability and Community Resilience Working Group chose to utilize a top-down approach. The NRI relies on using broad factors to define resilience at a national level and create a comparative metric to use as a risk factor.

The Community Resilience score is a consequence reduction risk factor and represents the relative level of community resilience in comparison to all other communities at the same level. A higher Community Resilience score results in a lower Risk Index score. Because Community Resilience is unique to a geographic location—specifically, a county—it is a geographic risk factor. Community resilience data are supported by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI) Baseline Resilience Indicators for Communities (BRIC). HVRI BRIC provides a sound methodology for quantifying community resilience by identifying the ability of a community to prepare and plan for, absorb, recover from, and more successfully adapt to the impacts of natural hazards. The HVRI BRIC dataset includes a set of 49 indicators that represent six types of resilience: social, economic, community capital, institutional capacity, housing/infrastructure, and environmental. It uses a local scale within a nationwide scope, and the national dataset serves as a baseline for measuring relative resilience. The data can be used to compare one place to another and determine specific drivers of resilience, and a higher HVRI BRIC score indicates a stronger and more resilient community. Figure 4-3 below shows the community resilience rating for each county in Region 1.

Figure 4-3 Region 1 Community Resilience Rating



Rank	Community	State	Rating	Score
1	Sheridan County	WY	Relatively Moderate	55.5
2	Campbell County	WY	Relatively Low	21.8
3	Johnson County	WY	Very Low	13.6
4	Weston County	WY	Very Low	9.7
5	Crook County	WY	Very Low	6.9

Source: National Risk Index

4.2 Hazard Profiles

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

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

4.2.1 Profile Methodology

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

Hazard/Problem Description

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

Geographical Area Affected

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

Limited: Less than 10% of the planning area

Significant: 10 to 50% of the planning area

Extensive: 50 to 100% of the planning area

Past Occurrences

This subsection contains information on historic incidents, including impacts where known. Information provided by the HMPC is included here along with information from other data sources, including the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI – formerly the National Climatic Data Center (NCDC)). and SHELDUS (where information is referenced from the State Hazard Mitigation Plan).

SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities. In 2014 this formerly free database transitioned into a fee-based service. Due to this and the availability of similar data in NCEI databases it was not used as a resource during the 2023 regional plan update except for when the data was already available.

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

Frequency/Likelihood of Occurrence

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

- **Highly Likely**—Near 100% chance of occurrence in next year, or happens every year.
- **Likely**—Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.

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

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

$$\frac{\textbf{\# of known events}}{\text{years of historic record}} \text{ x100}$$

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

Changing Future Conditions

This subsection to the Frequency/Likelihood of Occurrence section discusses the potential impacts of future changing conditions in the climate and how those changes may increase or decrease natural hazards frequency and intensity.

Potential Magnitude (Extent)

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

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

Vulnerability Assessment

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

Development Trends

This section describes how vulnerability may be changing due to development trends. Specific trends can be found in each County annex.

Risk Summary and Overall Significance by Jurisdiction

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

4.2.2 Dam Failure

Hazard/Problem Description

Dams are barriers constructed across a watercourse that stores, controls, or diverts water. They're designed for a variety of uses, including flood protection, power, agriculture and irrigation, water supply, and recreation. They're typically composed of earth, rock, concrete, or mine tailings. The water impounded behind a dam is referred to as the reservoir and is usually measured in acre-feet, with one acre-foot being the volume of water that covers one acre of land to a depth of one foot. Dams and reservoirs serve a very important role for Wyoming residents and industry. However, there is the risk that dams can fail, either completely or partially, and become a significant hazard for those downstream.

Dam failure refers to the uncontrolled release of impounded water, resulting in downstream flooding that can affect life and property. Several factors that influence the potential severity of a full or partial dam failure, including the volume of water impounded, the type of dam, and amount of development and infrastructure located downstream.

Dam failure occurs when the dam's capacity to retain water is compromised, in part or in its entirety. These failures can be triggered by various factors or sources, including:

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

It's important to note that dam emergencies are not solely restricted to complete dam failure. Large spillway discharges that can cause downstream flooding or flooding upstream due to backwater effects or high water levels are also considered dam emergencies, potentially resulting in substantial property damage and loss of life.

Dam failures can be categorized into four classifications:

- **Overtopping**: when water uncontrollably flows over the crest or the sides of a dam. These failures are typically caused by excessive water inflow or high upstream water levels, often due to heavy rainfall or rapid snowmelt. Overtopping can erode the dam's surface, weaken its structure, and lead to its breach, resulting in downstream flooding.
- **Foundation failure:** also known as seepage failures, involve the leakage of water through the foundation or base of the dam. This seepage can undermine the dam's stability and erode the foundation.

- **Structural failure:** characterized by damage or collapse of the primary components of the dam, such as the spillway, embankment, or other integral parts. These failures can be the result of design flaws, material weaknesses, or inadequate maintenance.

Other unforeseen failures can be the result from unusual events like seismic activity (earthquakes), deliberate acts of sabotage or vandalism, or complex, multifaceted causes. These failures can be challenging to predict and prevent due to their diverse and often unexpected nature.

Geographical Area Affected

In 1981, the U.S. Army Corps of Engineers completed an inspection program for nonfederal dams under the National Dam Inspection Act (P.L. 92-367). This was a four-year work effort and included compiling an inventory of about 50,000 dams and conducting a review of each state's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of dams. Part of the inspection included evaluating the selected dams and assigning a hazard potential based on the effects downstream, should one of the dams fail. The dams were rated (1) High, (2) Significant, and (3) Low hazard, just like the classification adopted by FEMA. 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**.**

The Wyoming State Engineers Office (WSEO) inspects dams over 20 feet high or with a storage capacity of 50 acre-feet or more, although smaller dams are also inspected in highly populated areas. As a part of the regulatory process, the WSEO inspects these dams once every five years.

Figure 4-4 shows the dams affecting Region 1 from the National Inventory of Dams (NID) database. Of the total 46 hazard dams, 27 are classified as High Hazard (Class I) and 19 are classified as Significant Hazard (Class II). Table 4-5 provides details of the High and Significant Hazard Dams sorted by the county where they are located. Figure 4-5 displays inundation zones below privately owned High Hazard dams. This information was obtained from the Wyoming State Engineer's Office Safety of Dams Program. A limitation to this information is that it does not have federally-owned dam inundation due to homeland security concerns, but the majority of the High Hazard dams in the Region are privately owned, with only two exceptions, thus this is not considered a significant limitation. Keyhole dam in Crook County is owned by the USBR and Sibley dam in Sheridan County is owned by the USFS. The inundation mapping deficiencies/restrictions can be overcome by referencing the hardcopy Emergency Action Plans for these dams, which are on file with the local emergency management office.

Figure 4-4 Locations of High and Significant Hazard Dams Affecting Region 1

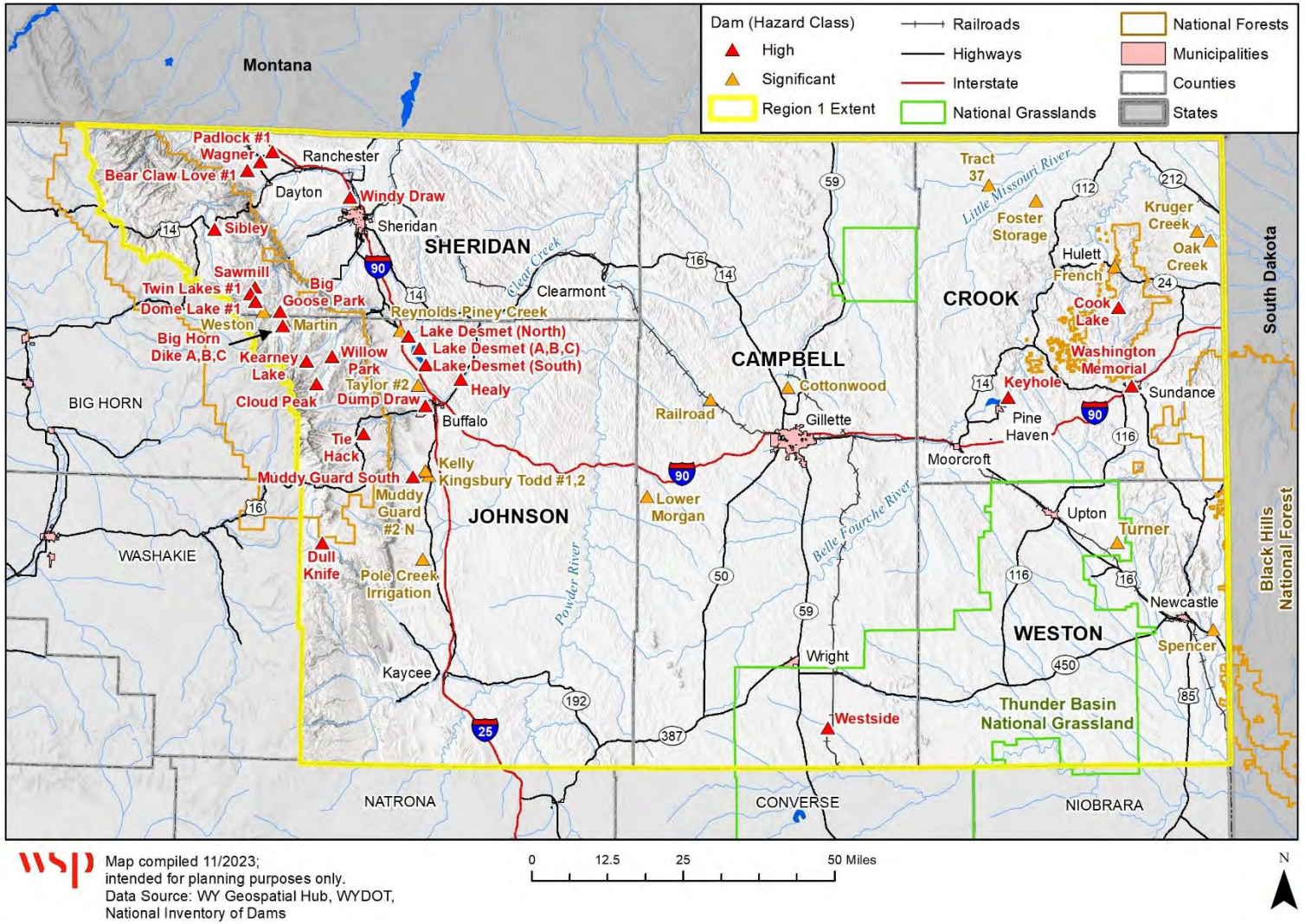


Figure 4-5 Dam Inundation Areas in Region 1

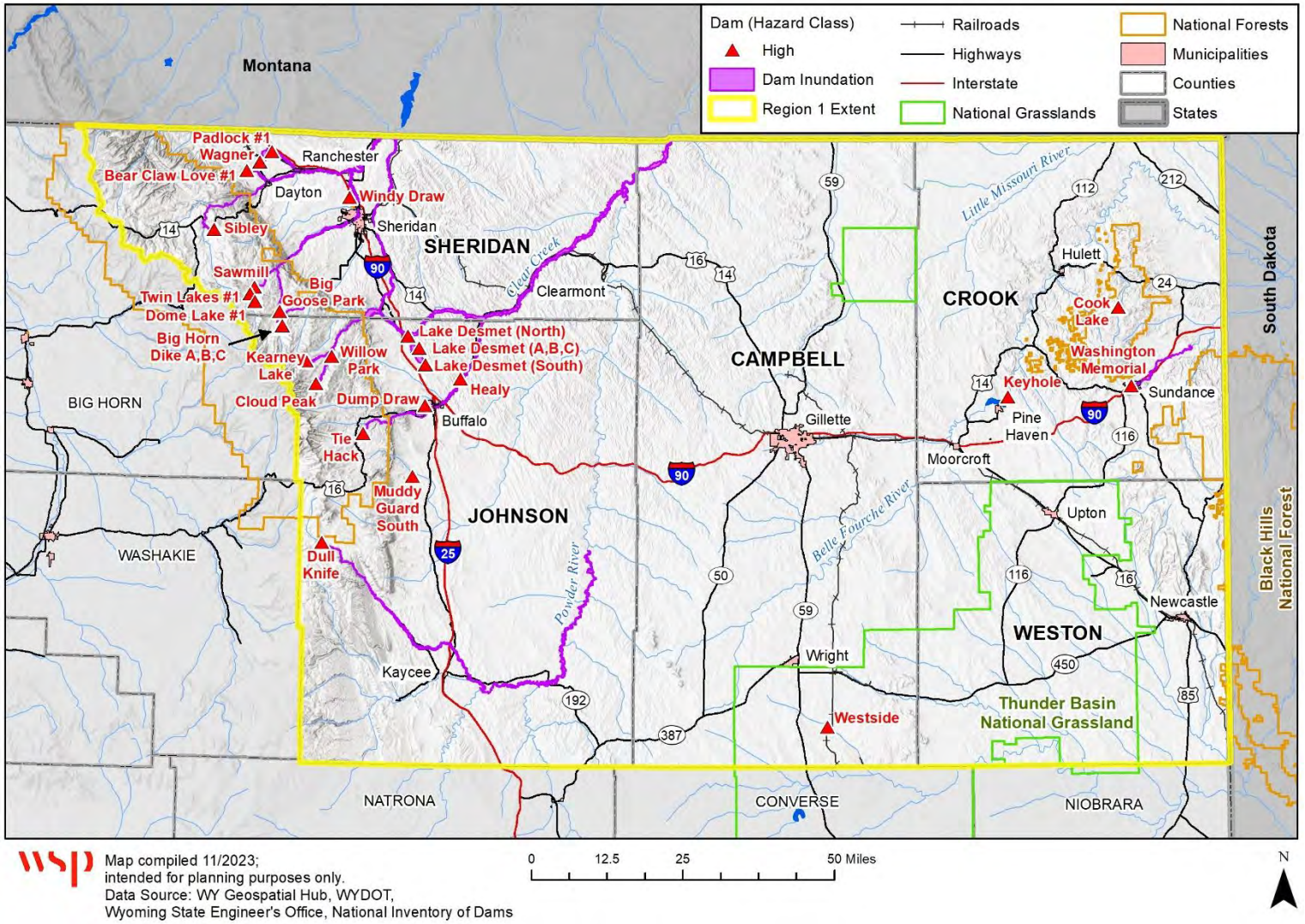


Table 4-5 High and Significant Hazard Dams in Region 1

Hazard	Dam Name	River	Normal Capacity (AF)	Nearby Jurisdiction / Populated Community
Campbell County				
H	WESTSIDE	PORCUPINE CREEK	260	BNSF RAILROAD
S	COTTONWOOD	LITTLE RAWHIDE CREEK	2,043	BROADUS, MT
S	LOWER MORGAN	MORGAN DRAW	227	1-90
S	RAILROAD	WHISKEY DRAW	28	ECHETA ROAD
Crook County				
H	KEYHOLE	BELLE FOURCHE RIVER	191,500	SPEERFISH
H	COOK LAKE	BEAVER CREAK	337	ALVA
H	WASHINGTON MEMORIAL	SUNDANCE CREEK	31	SUNDANCE
S	FOSTER STORAGE	FOSTER CREEK	103	CAMP CREEK, SD
S	FRENCH	MORRIS DRAW	37	ALVA
S	KRUGER CREEK	KRUGER CREEK	673	BELLE FOURCHE SD
S	OAK CREEK	ALUM CREEK OR OAK CREEK	915	BELLE FOURCHE, SD
S	TRACT 37	NO FK LITTLE MISSOURI RIVER	2,454	ALZADA, MT
Johnson County				
H	BIG HORN DIKE A	CROSS CREEK	4,624	BECKTON
H	BIG HORN DIKE B	CROSS CREEK	--	BECKTON
H	BIG HORN DIKE C	CROSS CREEK	--	BECKTON
H	CLOUD PEAK	SOUTH FORK SOUTH PINEY CREEK	3,570	STORY
H	DULL KNIFE	NORTH FORK POWDER RIVER	4,345	SUSSEX
H	HEALY	CLEAR CREEK	5,140	UCROSS
H	KEARNEY LAKE	NORTH FORK SOUTH PINEY CREEK	6,324	STORY
H	LAKE DESMET (A, B, C & SPILLWAY DIKES)	PINEY AND ROCK CREEK	111,827	UCROSS
H	LAKE DESMET (NORTH DAM)	PINEY AND ROCK CREEK	111,827	UCROSS
H	LAKE DESMET (SOUTH DAM)	PINEY AND ROCK CREEK	111,827	UCROSS
H	MUDDY GUARD NO. 2 SOUTH DAM	EROSION DRAW & GUARD DRAW	1,934	ARVADA
H	TIE HACK	SOUTH FORK CLEAR CREEK	2,435	BUFFALO

Hazard	Dam Name	River	Normal Capacity (AF)	Nearby Jurisdiction / Populated Community
H	WILLOW PARK	SOUTH FORK SOUTH PINEY CREEK	4,457	STORY
H	DUMP DRAW	DUMP DRAW	63	BUFFALO
S	KELLY	KELLY CREEK	102	ARVADA
S	KINGSBURY TODD NO. 1	LITTLE NORTH FORK CRAZY WOMAN	213	HWY 87
S	KINGSBURY TODD NO. 2	LITTLE NORTH FORK CRAZY WOMAN	453	HWY 87
S	MARTIN	CROSS CREEK	561	BIG HORN
S	MUDDY GUARD NO. 2 NORTH DAM	EROSION DRAW & GUARD DRAW	1,934	ARVADA
S	POLE CREEK IRRIGATION	POLE CREEK	606	HWY 87
S	REYNOLDS PINEY CREEK DIVERSION DAM	PINEY CREEK	51	KEARNY
S	TAYLOR NO. 2	SAND CREEK	36	UCROSS
Sheridan County				
H	BEAR CLAW LOVE NO. 1	NORTH FORK SMITH CREEK	248	DAYTON
H	BIG GOOSE PARK (3RD ENL.)	EAST FORK BIG GOOSE CREEK	10,362	BECKTON
H	DOME LAKE NO. 1	WEST FORK BIG GOOSE CREEK	1,506	BECKTON
H	PADLOCK NO. 1 A FIVE MILE	FIVE MILE CREEK	536	RANCHESTER
H	SAWMILL	SAWMILL CREEK	1,275	BECKTON
H	SIBLEY	PRUNE CREEK	379	DAYTON, WYO
H	TWIN LAKES NO. 1	CONEY CREEK	3,411	SHERIDAN
H	WAGNER	WAGNER DRAW	884	RANCHESTER
H	WINDY DRAW	WINDY DRAW	533	ACME
S	WESTON	BABIONE CREEK	370	BECKTON
Weston County				
S	SPENCER	STOCKADE BEAVER CREEK	2,162	EDGEMONT, SD
S	TURNER RESERVOIR	TURNER CREEK	45	OSAGE

Source: National Inventory of Dams

Past Occurrences

Region 1 has not suffered from a dam failure incident in recent years. However, there have been six recorded events of dam breach events in past years in Campbell County, Johnson County, Sheridan County, Weston County. These failures and breaches are summarized in Table 4-6 below.

Campbell County has suffered three dam breaches since 1978, but none caused loss of life or property. Smaller dam incidents have taken place as well but did not get recorded, so there are no details available.

Johnson has a record of one dam failure event in 1982, due to dam overtopping that in turn caused erosion and failure of the structure.

Sheridan also has record of one event, that took place early 1978. Overtopping and subsequent erosion occurred, but no human lives or property damages were suffered.

Weston County has recorded one storm event in 1973 that resulted in multiple dams being breached, causing damage to infrastructure, crops, and property.

Table 4-6 Documented Dam Breaches and Failures in Region 1

County	Date	Incident Narrative
Campbell	1/1/1978	Durham Dam 1 was an earthen dam with its base keyed into the foundation constructed in 1973. During the spring of 1978, this dam was overtopped and erosion resulted in a complete failure of the structure with a peak discharge of 5630 CFS. No damage was reported.
	5/19/1978	The Caballo Dam was voluntarily breached. The structure, constructed in 1948, was built of earthen material, but its base was not keyed into the foundation. The dam had saturated and started to overtop, so it was voluntarily breached to save as much of the structure as possible. The peak discharge was 2170 CFS.
	7/1/1998	Heavy rains caused a stock dam to break on the Iberlin Ranch, flooding Wyoming Highway 387
Johnson	4/9/1982	The Case Reservoir on Seventy-Six Draw was overtopped and the erosion action of the water resulted in a complete failure of the structure. It was an earthen dam, built in 1951, and its base was keyed into the foundation.
Sheridan	1/1/1978	Reynolds #1 Dam partially failed, as the earthen dam had its base keyed into the foundation. The breach resulted from overtopping and subsequent erosion. There was no property damage or loss of life incurred.
Weston	6/21/1973	Torrential rains accompanied by hail caused flash flooding in southern Weston County. Several earthen dams breached, causing damage to bridges and roads. Crop and property damage was substantial. In Gillette, heavy rain amounting to 1.5 inches in one hour resulted in flooded streets and basements and damage to new construction.

Frequency/Likelihood of Occurrence

It is estimated that Region 1 will be affected by dam failure occasionally in the future, based on the past history of events and number of dams in the Region. A number of the dam failures in Wyoming and other Rocky Mountain states occurred because of snow melt flooding that exceeded the capacity and strength of levees and dams. Wyoming's dams will continue to be tested by snow melt, heavy rains, and other types of floods every year. Thus, dam failures could possibly threaten Wyoming and Region 1 counties in the future.

Changing Future Conditions

As dam infrastructure ages, its performance and reliability may decline, posing risks to safety, functionality, and efficiency. Infrastructure materials, such as concrete, steel, and asphalt, can deteriorate over time due to exposure to environmental factors such as

moisture, temperature variations, chemicals, and UV radiation. This degradation can lead to cracks, rust, and weakening of structural elements, thus increasing the risk of dam failure.

As temperatures rise and precipitation patterns skew toward extreme ends of the spectrum (both drought and deluge), the impacts to aging infrastructure may be accelerated. Intense extreme rainfall events can lead to greater inflows of water into reservoirs, which may exceed a dam's capacity, potentially leading to dam overtopping and failure. On the other end of the spectrum, prolonged droughts can result in lower levels of water in reservoirs, exposing more infrastructure to aging elements, and increasing susceptibility to structural issues.

Potential Magnitude (Extent)

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

The existence of dams classified as High and Significant hazard within the Region (primarily Sheridan, Johnson and Crook counties) means that potential impacts could include injury and loss of life, property damage, damage to infrastructure, drinking water contamination, loss of crops and livestock, evacuations and sheltering and associated costs, interruption of commerce and transportation, search and rescue, and clean-up costs. In addition, dam failure and associated flooding can cause damage to and loss of irrigation structures such as headgates and ditches. Loss or damage to water structures negatively impacts agricultural producers of crops and livestock—and can be costly to repair.

The severity and magnitude of a given dam failure will vary on a county as well as case-by-case basis. Information on potential impacts of specific failures to particular dams is considered sensitive and is not detailed in this plan due to Homeland Security concerns. However, emergency management coordinators have access to inundation maps contained in the emergency action plans for the High and Significant Hazard dams in the state.

Vulnerability Assessment

As noted in the high and significant hazard dams table in the Geographical Area Affected section (Table 4-5), all counties except Weston contain high hazard dams that could affect downstream areas and communities, and all counties contain at least one significant hazard dam as well. Counties such as Sheridan and Johnson are at higher risk of a dam failure event due to the presence of significant and high hazard dams in relatively close proximity to towns and cities. The one High Hazard Dam in Campbell County is owned by and located on a coal mine, and the population at risk is completely within that same mine.

People

Dam failure can result in sudden and massive flooding, posing severe risk to human life. People living in dam inundation areas may have limited time to evacuate, leading to casualties and injuries. Those at greatest risk are those in affected areas who have access and functional needs, such as those with disabilities, injuries, limited access to transportation or financial resources, the elderly, and people experiencing homelessness.

The population impacted by dam failure in the Region was estimated by applying the average persons per household from each county (as determined by the US Census) to the count of improved parcels within the dam inundation area. Johnson and Sheridan Counties were the only counties with risk to residential properties within the region. Using this calculation, approximately 3,816 people are exposed to dam inundation in the Region. Sheridan County has the highest number of people who live within dam inundation areas. Refer to Table 4-7 for more details.

Property

The sudden release of water from a failed dam can cause widespread property damage. Homes, buildings, and infrastructure in the floodplain can be severely damaged or destroyed, as these properties would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable as dam waters settle and collect.

GIS analysis was used to estimate Region 1's potential property losses from dam failure events. The county parcel layers were used as the basis for the inventory of developed parcels. GIS was used to create a centroid, or point, representing the center of each parcel polygon, which was overlaid on the best available dam inundation layers. For this analysis, every parcel with an improvement value greater than zero was assumed to be developed in some way. The number of improved parcels were analyzed and aggregated by jurisdiction and property type. As mentioned above, the populations at risk are also calculated by applying the average persons per household from each County (as determined by the US Census) to the count of improved parcels within the dam inundation areas.

Table 4-7 displays the number of improved parcels by county, jurisdiction and property type in dam inundation areas within the Region. A total of 2,025 improved parcels are at risk of dam inundation events, of which 1,881 parcels are located in Sheridan County.

Table 4-7 Region 1 Parcels at Risk to Dam Inundation by County, Jurisdiction and Property Type

County	Jurisdiction	Property Type	Number of Improved Parcels	Population
Crook	Sundance	Commercial	2	-
		County Total	**2**	**0**
Johnson	Buffalo	Commercial	41	
		Residential	18	38
		Total	**59**	**38**
	Unincorporated	Commercial	18	
		Residential	65	138
		Total	**83**	**138**
		County Total	**142**	**176**
Sheridan	Clearmont	Residential	5	11
		Total	**5**	**11**

County	Jurisdiction	Property Type	Number of Improved Parcels	Population
	Dayton	Commercial	4	
		Residential	47	104
		Total	**51**	**104**
	Ranchester	Commercial	27	
		Residential	234	517
		Total	**261**	**517**
	Sheridan	Commercial	184	
		Industrial	2	
		Residential	688	1,520
		Total	**874**	**1,520**
	Unincorporated	Commercial	17	
		Residential	673	1,487
		Total	**690**	**1,487**
		County Total	**1,881**	**3,640**
		Grand Total	**2,025**	**3,816**

Source: Wyoming State Engineer's Office, Wyoming CAMA 2022, WSP GIS Analysis

Critical Facilities and Lifelines

Floodwaters resulting from a dam failure can damage or destroy roads, bridges, utility lines, and other critical infrastructure. This may disrupt transportation, communication, and access to essential services. Loss of these facilities could create additional isolation issues for the inundation areas.

Based on the critical facility inventory and dam inundation extents available, 116 critical facilities were found to be at risk. These at-risk facilities are listed in Table 4-8 below by jurisdiction and critical facility classification as based on the FEMA Lifeline categories.

Dams are critical facilities themselves and can be affected by other hazards. Within Region 1 flooding is the primary concern for a natural hazard event that can affect dam integrity. The High Hazard dams have emergency spillways to alleviate excess flow and mitigate overtopping.

Table 4-8 Region 1 Facilities within Inundation Areas by County

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	-	-	-	-	-	-	-	0
Crook	1	-	-	-	-	1	1	3
Johnson	1	1	2	-	1	2	24	31
Sheridan	3	1	2	1	1	12	62	82
Weston	-	-	-	-	-	-	-	0
Total	**5**	**2**	**4**	**1**	**2**	**15**	**87**	**116**

Source: Wyoming State Engineer's Office, HIFLD, National Bridge Inventory, WSP GIS Analysis

Economy

Dam failure could cause significant economic disruptions in the affected region. Businesses may suffer damage or destruction, leading to income losses and reduced economic activity. Long-term loss of water in a reservoir, which may be critical for potable water needs, can interrupt the water supply, affecting drinking water availability, agricultural needs, and industrial water usage.

Environmental and Cultural Resources

Reservoirs held behind dams affect many ecological aspects of a river. River topography and dynamics depend on a wide range of flows, but rivers below dams often experience long periods of very stable flow conditions or saw-tooth flow (when water volumes rapidly oscillate between higher and lower flow volumes) patterns caused by intermittent releases. Water releases from dams usually contain very little suspended sediment, which can lead to scouring of riverbeds and banks.

The environment would be vulnerable to a number of risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways, potentially causing the destruction of downstream habitats.

Development Trends

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

Risk Summary and Overall Significance by Jurisdiction

Overall, dam failure significance in the Region is **medium**, with the greatest risk assessed in Johnson County, followed by Sheridan, and Crook Counties. The probability of a damaging dam failure event is **occasional**, but impacts could become significant depending upon the dam involved and where it occurred in the region. Jurisdictions at risk include, among others, Sundance, Dayton, Newcastle, and Buffalo, though Table 4-5 contains more details on the location of dams in comparison with streams and cities/towns (including unincorporated areas within Region 1). While not noted on this table as the nearest downstream community, there is also risk to Ranchester and Sheridan in Sheridan County.

Table 4-9 Dam Failure Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Limited	Unlikely	Limited	Low
Crook	Significant	Occasional	Limited	Medium
Johnson	Significant	Occasional	Critical	High
Sheridan	Significant	Occasional	Limited	Medium
Weston	Limited	Unlikely	Limited	Low

4.2.3 Drought

Hazard/Problem Description

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

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

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

Geographical Area Affected

Since droughts are often regional events that impact multiple counties and states simultaneously, given the climate of the planning area being contiguous, it is reasonable to assume that a drought will impact the entire planning region to some extent. According to the Wyoming State Climate Office, Wyoming is the 5th driest state in the United States, and since 1999 moderate to severe droughts have been normal occurrences in much of the state due to its natural climate. Although the Region falls within two river drainage basins in the state (Powder/Tongue and the Northeast Basins), and while the Bighorn Mountains get some snow, the Bear Lodge Mountains do not collect significant snowpack during the winter months to discharge large amounts of flow through major local streams (e.g., Belle Fourche River, Cheyenne River, Little Missouri River). Furthermore, as of 2018, parts of both the Powder River and the Belle Fourche River were declared as impaired waters by the Wyoming Water Resources Data System & Wyoming State Climate Office services (WRDS-UWY, 2018); streams falling under this impairment criteria are considered threatened, significantly degraded, or too contaminated to meet the water quality standards set by the Environmental Protection Agency's Clean Water Act (EPA, 2017). Given the Region's lack

of widespread access to large amounts of fresh water locally, effects from droughts may be exacerbated and the areas affected may be quite large.

Past Occurrences

The Region 1 area has experienced several multi-year droughts over the past century. A significant statewide drought began in the spring of 2000 and endured through 2004. The region had a wetter year in 2005, technically signifying the end of the drought period. Dry conditions returned in the following years and became severe between 2006 and 2007. According to the Wyoming State Climate Office, "conditions [had] eased somewhat in mid-2008, but a near decade with warm temperatures and relatively little precipitation has left [Wyoming] very vulnerable" (http://www.wrds.uwyo.edu/sco/drought/drought.html). The driest year to date occurred in 2012, with only 10.9 inches of precipitation, or 68.38% of the normal precipitation observed in the state.

The 2000-2004 drought is considered by many to be the most severe in collective memory. However, some older residents have indicated that they remember streams drying up in the 1930s and 1950s. According to instrument records, since 1895 there have been only seven multi-year (three years or longer) statewide droughts. Based on deficit precipitation totals (negative departures from the long-term average), they are ranked statewide. Refer to Table 4-10 for a summary of the years that suffered drought, their average precipitation records, and the percent of those years' precipitation compared to the average annual records (i.e., average precipitation in the range of years / the average annual precipitation of 15.94).

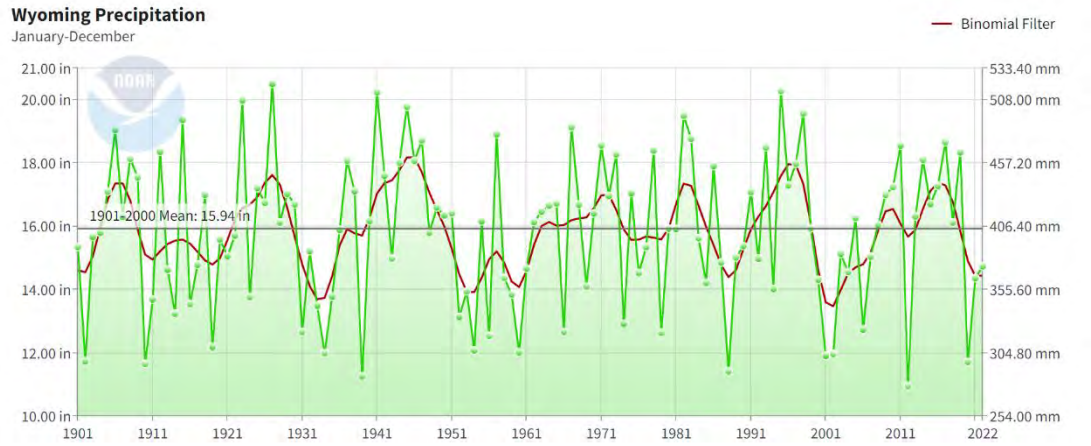
Table 4-10 Significant Multi-Year Wyoming Droughts since 1895 (Modern Instrumented Era)

Years	Average Annual Precipitation (inches)	Percent of 1895-203 Average Annual Precipitation (15.94")
1900-1903	13.53	84.88%
1931-1935	13.43	84.25%
1952-1956	12.93	81.11%
1958-1960	13.23	83.00%
1987-1990	14.17	88.90%
2000-2004	13.44	84.32%
2020-2023	13.61	85.38%

Source: NOAA – National Centers for Environmental Information

Overall, Wyoming's precipitation record from 1895-2023 reveals that, for the first half of the 20th century (except for the Dust Bowl years of the 1930s and the localized event in the mid-1950s), there was generally a surplus of moisture. During the second half of the 20th century and into the 21st century there was a trend of increased periods of drought (Figure 4-6). The dry years are denoted by the binomial filter troughs (i.e., red line dips). Note the dips in 2002-2006, 2012, and 2020-2023 which were the most recent severe droughts in Wyoming.

Figure 4-6 Wyoming Annual Precipitation: 1895-2023

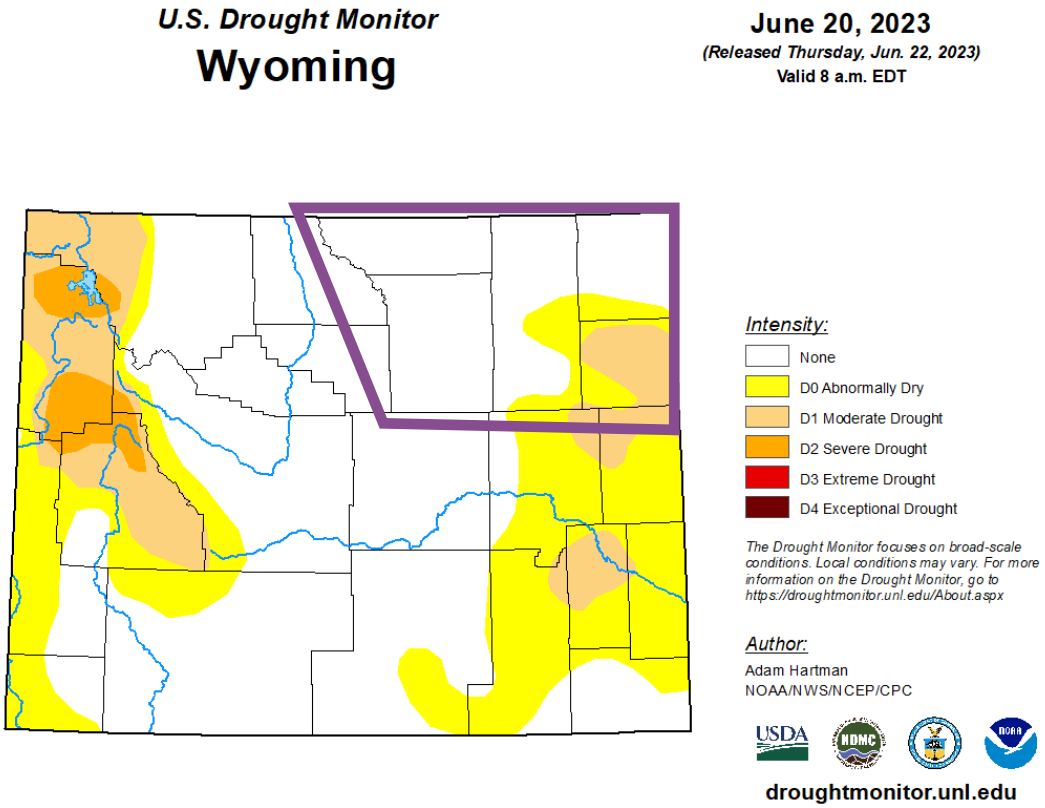


Source: NOAA – NCEI (http://www.ncdc.noaa.gov/cag/time-series/)

The U.S. Drought Monitor provides a general summary of current drought conditions. The U.S. Department of Agriculture (USDA), the National Oceanic and Atmospheric Administration (NOAA), and the National Drought Mitigation Center (University of Nebraska-Lincoln) collaborate on this weekly product, which is released each Thursday. Multiple drought indicators, including various indices, outlooks, field reports, and news accounts are reviewed and synthesized. In addition, numerous experts from other agencies and offices across the country are consulted. The result is the consensus assessment presented on the U.S. Drought Monitor map (with Wyoming's current drought conditions portrayed in Figure 4-7). The image is color-coded for six levels of drought intensity. The first drought category, "Abnormally Dry," is used to show areas that might be moving into a drought, as well as those that have recently come out of one. The last category is called "Exceptional Drought", and is reserved to classify the most severe drought events. The remaining four categories define droughts ranging from less to more severe (Source: https://www.drought.gov/drought/)

As of June 20, 2023, two drought conditions were identified in parts of the Region: "Abnormally Dry" and "Moderate Drought." Note that the majority of the Region is not currently impacted by drought, and hence displayed in white by Figure 4-7. This provides an example snapshot of the drought conditions in the region and statewide, as these conditions can change week to week.

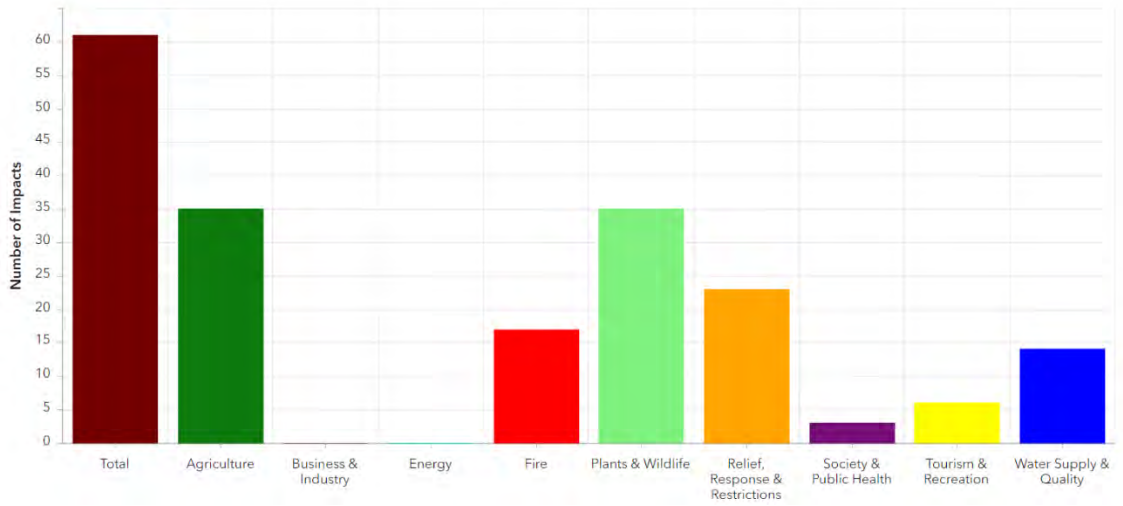
Figure 4-7 U.S. Drought Monitor



A particularly useful resource to determine the impacts of drought is the Drought Impact Reporter (DIR), launched by the National Drought Mitigation Center in July 2005 as the nation's first comprehensive database accounting for a range of drought impacts. The Drought Impact Reporter is an interactive web-based mapping tool designed to compile and display impact information across the United States in near real-time. Information within the DIR is collected from a variety of sources including the media, government agencies and reports, and citizen observers. Each of these sources provides different types of information at different spatial and temporal scales. (Source: http://drought.unl.edu/monitoringtools/droughtimpactreporter.aspx)

A search of the database for Region 1 from 1999 to 2023 (which includes the most recent severe droughts) shows a total of 61 reported impacts. Figure 4-8 below contains the breakdown of reported impacts in Region 1. The majority of reported impacts fall within the Agriculture and Plants & Wildlife Categories. Drought effects associated with agriculture include damage to crop quality; income loss for farmers due to reduced crop yields; reduced productivity of cropland; reduced productivity of rangeland; forced reduction of foundation stock; and closure/limitation of public lands to grazing, among others. Drought effects associated with plants and wildlife include loss of biodiversity of plants or wildlife; loss of trees from rural or urban landscapes, shelterbelts, or wooded conservation areas; reduction and degradation of fish and wildlife habitat; lack of feed and drinking water; greater mortality due to increased contact with agricultural producers, as animals seek food from farms and producers are less tolerant of the intrusion; and disease, among others

Figure 4-8 Number of Reported Drought Impacts from 1999 to 2023 in Region 1



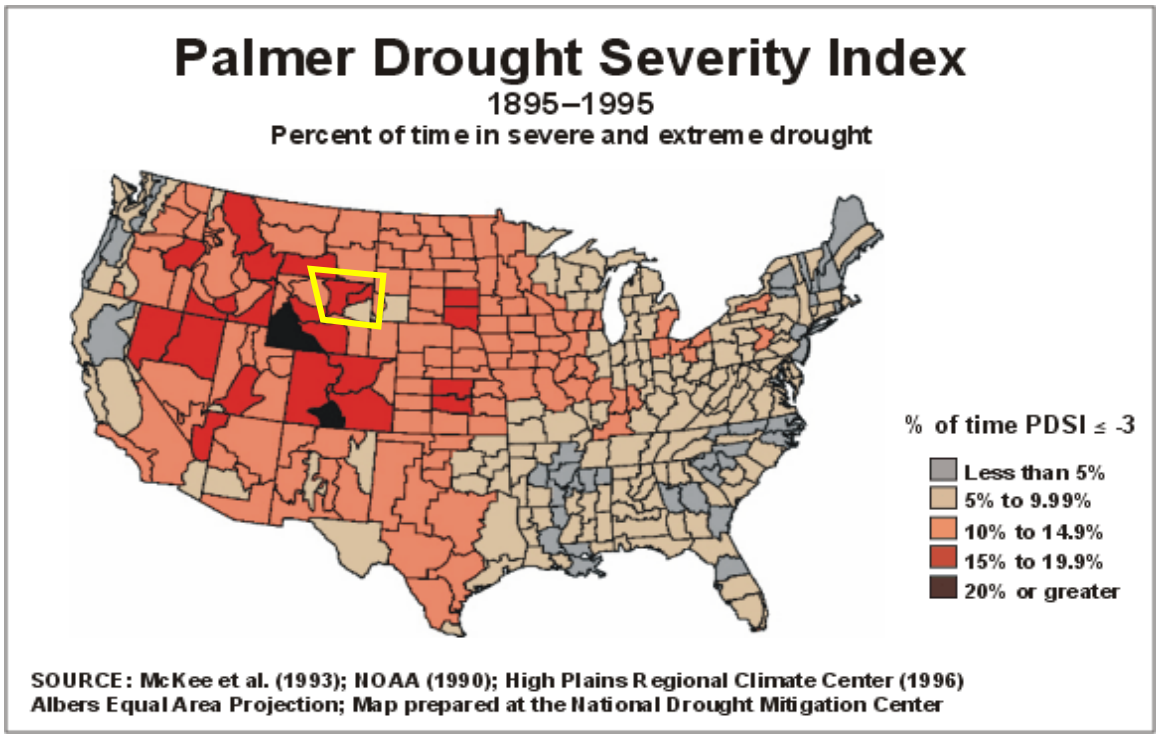
All areas in Region 1 have, at various times, been included in regional USDA disaster declarations for droughts. In 2017 specifically, both Campbell and Crook counties were included in the Secretarial Drought Designation statement as a primary disaster designated county. That same year, the USDA received reports from 8 Wyoming counties suffering from drought-induced natural disasters: Big Horn, Campbell, Converse, Crook, Johnson, Laramie, Sheridan, and Weston. Note that all five counties in Region 1 suffered from drought disasters, accounting for 11 out of the total 14 state claims in the year.

Frequency/Likelihood of Occurrence

Figure 4-9 indicates the Region 1 area spent approximately 15-20% of the 100-year span from 1895 to 1995 in severe or extreme drought. This is consistent with the data in the Past Occurrences subsection which suggests that severe multi-year droughts have occurred roughly every twenty years, since the beginning of precipitation data collection in 1895. An occurrence interval of roughly once every twenty years for the Region until 1995 may not quite correspond to a likely frequency of occurrence, but given more recent data records since then, the trend has changed. From 1995 onward, Region 1 has experienced eight additional years of drought, averaging to a drought (of at least one year) every 1.71 years, or a multi-year drought every 5 years.

Modeling from the Cooperative Institute for Satellite Earth System Studies (CISESS) and NOAA's National Centers for Environmental Information (NCEI) have shown that temperatures throughout Wyoming have increased by about 2.5˚F since the beginning of the 20th century and are expected to continue to rise. Increases in evapotranspiration due to these warmer temperatures will likely increase rates of soil moisture loss, intensifying these naturally occurring droughts in the future. Consequently, the frequency of wildfire in the state is also expected to increase.

Figure 4-9 Palmer Drought Severity Index Time Series for the Continental U.S.: 1895-1995



Changing Future Conditions

According to an analysis by FEMA Region VIII on the projected changes in natural hazards frequency and intensity, the areas in the state at risk to drought are not expected to change in the future, though drought is projected to increase in intensity and frequency. Seasonal precipitation patterns are projected to shift, leading to dryer summers and less precipitation as snow in early spring and late fall seasons. This, coupled with earlier spring runoff, is projected to result in longer duration in droughts statewide.

Potential Magnitude (Extent)

In order to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. Impacts can help understand the effects of a hazard, and potentially assist in preparing for and preventing against said hazard (e.g., drought). In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of a common occurrence. Based upon Table 4-10, the drought of 2000-2004 was more significant, in terms of losses and changes in productivity, than some of the other droughts in the last 100 years for the entire state. The droughts noted previously in Table 4-10, derived from NOAA's National Center for Environmental Information database, indicate that the most significant droughts in the last century, in terms of precipitation deficit, were in 1952-1956, 1958-1960, 1931-1935, 2000-2004, and 2020-2023.

To determine how the drought periods had significant negative impacts on Wyoming, crop production and livestock inventory data for the driest period (1952-1956) and the latest multi-year drought period for which data was available (2000-2004) were compared. 1957 and 2005 were wetter years, with annual statewide precipitation totals

above the 1895-2017 average. Those two years were used as endpoints for the droughts that started in 1952 and 2000 respectively. In both cases, the years following saw a return to drier conditions. Because of this, the most recent drought impacts were also calculated for 2005 and 2006 and are included in summary tables. Table 4-11 and Table 4-12 show percentage of peak decline in one or more production categories during drought compared to the 5-year pre-drought production averages for various commodities.

A comparison of Table 4-11 and Table 4-12 indicate that drought impacts to the Wyoming agricultural community were greater in the 2000-2004 drought than in the 1952-1956 drought. With the exception of dry beans, all commodities in the worst years of the 2000-2004 drought showed a greater percentage decline in production than in the 1952-1956 drought. As a result, the 2000-2004 drought will be used as the drought of historic record to calculate dollar impacts. (Note that the abbreviation 'Bu.' means *bushel*, and 'cwt' stands for *hundredweight*.)

Table 4-11 Peak Commodity Production Changes from Pre-Drought (1947-1951) to Drought (1952-1956)

Commodity	5-Year Pre-Drought Production Average	Units	Lowest Production During Drought (1952-1956)	Year of Lowest Production (1952-1956)	Production Losses*	Percent Change
Winter Wheat	5,072	1,000 bu.	2,346	1954	2,726	-54%
Spring Wheat	1,579	1,000 bu.	600	1954	979	-62%
Barley	4,414	1,000 bu.	2,700	1956	1,714	-39%
Oats	4,577	1,000 bu.	2,470	1954	2,107	-46%
Dry Beans	1,009	1,000 cwt.	589	1955	420	-42%
Sugar beets	413	1,000 tons	421	1955	No Losses	+2%
Corn	227	1,000 bu.	161	1953	66	-29%
Alfalfa Hay	490	1,000 tons	675	1954	No Losses	+38%
Other Hay	674	1,000 tons	442	1954	232	-34%
Cattle/ Calves Inventory	1,050	1,000 head	1,096	1954	No Losses	+4%

Source: USDA * Difference between 5-year production averages and lowest production rates, during drought

Table 4-12 Peak Commodity Production Changes from Pre-Drought (1994-1998) to Drought (2000-2004)

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	Lowest Production During Drought (1999-2006)	Year of Lowest Production (1999-2006)	Production Losses*	Percent Change
Winter Wheat	6,029	1,000 bu.	2,375	2002	3,654	-61%
Spring Wheat	648	1,000 bu.	96	2002	552	-84%
Barley	8,383	1,000 bu.	4,680	2002	3,703	-44%
Oats	1,648	1,000 bu.	600	2005	1,048	-64%
Dry Beans	691	1,000 cwt.	514	2001	177	-26%
Sugar beets	1,151	1,000 tons	659	2002	492	-43%
Corn	6,328	1,000 bu.	4,165	2002	2,163	-34%
Alfalfa Hay	1,581	1,000 tons	1,150	2002	431	-27%
Other Hay	817	1,000 tons	450	2002	367	-45%
Cattle/ Calves Inventory	1,536	1,000 head	1,300	2004	236	-16%

Source: USDA * Difference between 5-year production averages and lowest production rates, during drought

Agricultural dollar impacts can also be used to show the effects of drought. For Wyoming, historic data from the 2000-2004 drought and the two subsequent years was obtained from the U.S. Department of Agriculture (USDA) Quick Stats database (https://quickstats.nass.usda.gov).

The data below represent changes in production value for crops, and changes in inventory value for cattle and calves. As such, the data should be considered to summarize impact value versus economic loss value. For example, with cattle and calves inventory (Table 4-13 through Table 4-19), the inventory decreased during the drought. Therefore, the value of inventory on hand decreased. The inventory decreased, however, because of the reduced sales in cattle and calves, due to hardships in raising the cattle, feeding, etc. The net result, therefore, is an overall decrease in inventory value, which is a negative impact stemming from drought. Although these summaries have been obtained state-wide, they serve as a good indicator of how drought can affect a specific industry or business over time.

Table 4-13 2000 Production and Inventory Value Impact

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2000 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	4,080	$2.70/bu	- $ 5,262,300

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

Source: USDA

Table 4-14 2001 Production and Inventory Value Impact

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2001 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	2,880	$2.70/bu	- $ 8,502,300
Spring Wheat	648	1,000 bu.	168	$2.90/bu	- $ 1,393,160
Barley	8,383	1,000 bu.	6,970	$3.32/bu	- $ 4,691,160
Oats	1,648	1,000 bu.	1,344	$1.65/bu	- $ 501,600
Dry Bean	691	1,000 cwt.	514	$23.00/cwt	- $ 4,066,400
Sugar Beet	1,150	1,000 tons	794	$39.70/ton	- $ 14,133,200
Corn	6,328	1,000 bu.	6,375	$2.30/bu	+ $ 108,100
Alfalfa Hay	1,581	1,000 tons	1,276	$110.00/ton	- $ 33,550,000
Other Hay	817	1,000 tons	605	$105.00/ton	- $ 22,302,000
Cattle/Calves Inventory	1,536	1,000 head	1,470	$780.00/head	- $ 51,480,000
TOTAL					-$140,511,720

Source: USDA

Table 4-15 2002 Production and Inventory Value Impact

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

Source: USDA

Table 4-16 2003 Production and Inventory Value Impact

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

Source: USDA

Table 4-17 2004 Production and Inventory Value Impact

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2004 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	3,510	$3.20/bu	-$ 8,060,800
Spring Wheat	648	1,000 bu.	240	$3.25/bu	-$ 1,326,000
Barley	8,383	1,000 bu.	7,050	$3.41/bu	-$ 4,545,530
Oats	1,648	1,000 bu.	795	$1.55/bu	-$ 1,322,150
Dry Bean	691	1,000 cwt.	541	$25.90/cwt	-$ 3,885,000
Sugar Beet	1,150	1,000 tons	812	$41.70/ton	-$ 14,094,600
Corn	6,328	1,000 bu.	6,550	$2.48/bu	$ 550,560
Alfalfa Hay	1,581	1,000 tons	1,305	$74.50/ton	-$ 20,562,000
Other Hay	817	1,000 tons	756	$69.50/ton	-$ 4,239,500
Cattle/Calves Inventory	1,536	1,000 head	1,300	$1020.00/head	-$ 240,720,000
TOTAL					-$ 298,205,020

Source: USDA

Table 4-18 2005 Production and Inventory Value Impact

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2005 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	4,350	$3.50/bu	-$ 5,876,500
Spring Wheat	648	1,000 bu.	315	$3.19/bu	-$ 1,062,270
Barley	8,383	1,000 bu.	5,580	$3.28/bu	-$ 9,193,840
Oats	1,648	1,000 bu.	600	$1.60/bu	-$ 1,676,800
Dry Bean	691	1,000 cwt.	776	$18.70/cwt	$ 1,589,500
Sugar Beet	1,150	1,000 tons	801	$42.80/ton	-$ 14,937,200
Corn	6,328	1,000 bu.	6,860	$2.45/bu	$ 1,303,400
Alfalfa Hay	1,581	1,000 tons	1,560	$75.00/ton	-$ 1,575,000
Other Hay	817	1,000 tons	756	$72.00/ton	-$ 4,392,000
Cattle/Calves Inventory	1,536	1,000 head	1,400	$1140.00/head	-$ 155,040,000
TOTAL					-$ 190,860,710

Source: USDA

Table 4-19 2006 Production and Inventory Value Impact

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2006 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6,029	1,000 bu.	3,645	$4.58/bu	-$ 10,918,720
Spring Wheat	648	1,000 bu.	234	$3.80/bu	-$ 1,573,200
Barley	8,383	1,000 bu.	4,845	$3.32/bu	-$ 11,746,160
Oats	1,648	1,000 bu.	684	$2.15/bu	-$ 2,072,600
Dry Bean	691	1,000 cwt.	590	$22.00/cwt	-$ 2,222,000
Sugar Beet	1,150	1,000 tons	798	$46.80/ton	-$ 16,473,600
Corn	6,328	1,000 bu.	5,805	$2.64/bu	-$ 1,380,720
Alfalfa Hay	1,581	1,000 tons	1,400	$101.00/ton	-$ 18,281,000
Other Hay	817	1,000 tons	715	$103.00/ton	-$ 10,506,000
Cattle/Calves Inventory	1,536	1,000 head	1,400	$1010.00/head	-$ 137,360,000
TOTAL					-$ 212,534,000

Source: USDA

Table 4-20 Production and Inventory Value Impact for Worst Year of Drought

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

Source: USDA – National Agricultural Statistics Service

The 2000-2004 drought made historical record impacts, with significant negative ramifications particularly on the agricultural industry. The worst-case year was 2002, with a negative dollar impact of $308,171,390 statewide. Region 1 comprises 17.47% of the State of Wyoming in land area. While drought impacts are not always equally distributed across the state, the potential drought impact in Region 1 could nevertheless be estimated to be almost $168 million for the period, based on the region's size alone. The total impact statewide for the 2000-2004 drought was about $961,536,160. The 2002 year alone caused Region 1 about $53,837,542 in production losses.

Another tool provided by the USDA and used to assess commodity and crop losses is the Risk Management Agency's indemnity summaries, which highlight insurance payments to counties based on damages caused to different crops, by specific hazards (such as drought). From 2008 to 2017, the Region 1 counties experienced drought-caused damages to 168,574 acres of land, totaling $6,894,142 in indemnity payments. Table 4-21 below breaks down the drought impacts by county, acreage, and commodity type. The largest losses were associated with forage production. The HMPC also noted that there are livestock sell-offs that also result from drought.

Table 4-21 Indemnities Paid for Commodities that Suffered from Drought in Region 1, 2008-2017

Commodity	Counties Affected	Acres Damaged	Indemnity Amount
Barley	Crook, Campbell, Sheridan	473	$13,656
Forage Production	Crook, Campbell, Johnson, Sheridan, Weston	151,049	$5,876,584
Forage Seeding	Crook, Campbell	882	$61,616
Oats	Crook, Campbell, Weston	2,089	$53,023
Wheat	Crook, Campbell, Weston	10,449	$688,478
All Other Crops	Johnson, Sheridan, Weston	3,632	$200,785
TOTAL		168,574 acres	$6,894,142

Source: USDA – Risk Management Agency

In addition to affecting the agricultural industry as well as ranching businesses, drought can exacerbate the risk of wildfires, increase the cost of municipal water usage, and deplete water resources used for recreation and tourism, hence negatively affecting the economy in various ways.

Vulnerability Assessment

The geographic extent of the hazard is considered **extensive**. The probability of future drought occurrences is considered **likely**, and the potential magnitude/severity is **high**. The HMPC considers the hazard to have an overall impact rating of **high** for the Region.

Vulnerability is tempered somewhat for Johnson and Sheridan counties, due to the Bighorn mountains being a headwaters area. The snowpack in the Bighorn Range helps feed rivers and streams during normal years, but can be affected by dry, low snowpack years.

People

During times of prolonged drought, water scarcity can cause an increase in food prices and a decrease in water quality. Food shortages and water scarcity can lead to malnutrition and related health problems. Additionally, drought conditions can create an environment conducive to the spread of disease due to decreased water quality and inadequate access to clean water.

Indirectly, drought can lead to respiratory issues as dust increases due to dry soil and reduced vegetation cover. Drought can also prime environments for wildfire, which can in turn increase respiratory issues through the inhalation of smoke and other volatile organic compounds (VOCs). These issues resulting from drought can cause the displacement of individuals, families, or whole communities, leading to humanitarian issues and increased challenges for host communities.

Property

Typically, structures are not directly vulnerable to drought, although secondary, indirect, and compound impacts may increase vulnerability. Reduced soil moisture can lead to subsidence, which can cause structural damage to buildings and roadways. Impacts may include cracked foundations and walls, and sinking roads and potholes. The rehydrating of soils can further compound these issues.

Critical Facilities and Lifelines

Drought can stress water supply systems, including reservoirs, water treatment plants, and pipes. In addition to reduced water availability for domestic, industrial, and agricultural uses, reduced water levels can lead to the accumulation of sediments and debris, impacting the functionality of pipes and other water infrastructure.

Economy

Economically, the agricultural sector is the most vulnerable to drought and will benefit the most from mitigation efforts. Outdoor recreation and tourism, which are important to the region's economy, are also vulnerable to drought.

Environmental and Cultural Resources

Reduced water availability can impact plant growth and the survival rate of various animal species. Over time, this can lead to habitat degradation and fragmentation, which in turn, can result in a decline in biodiversity and the loss of plant and animal species. These losses can impact cultural practices that are dependent on native habitats.

Development Trends

Future development in the Region is not anticipated to change its vulnerability to drought in a significant way.

Risk Summary and Overall Significance by Jurisdiction

Drought is considered a high significance hazard for most of the Region due to the extensive economic and environmental impacts. Drought can be widespread and pervasive for several years, affecting more than people's way of life. Drought can also have a cascading impact on other hazards, notably wildfire, and can lead to increased soil expansion/contraction in expansive soils.

Table 4-22 Drought Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Campbell	Significant	Likely	Critical	Medium
Crook	Significant	Likely	Critical	High
Johnson	Significant	Likely	Limited	Medium
Sheridan	Significant	Likely	Critical	High
Weston	Significant	Likely	Critical	Medium

4.2.4 Earthquake

Hazard/Problem Description

An earthquake is generally defined as a sudden motion or trembling in the earth caused by the abrupt release of strain accumulated within or along the edge of the earth's tectonic plates. The most common types of earthquakes are caused by movements along faults or by volcanic forces, although they can also result from explosions, cavern collapse, and other minor causes not related to slowly accumulated strains. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds.

Earthquakes can last from a few seconds to over five minutes; they may also occur as a series of tremors over several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris, because the shocks shake, damage, or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer, and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides, or releases of hazardous material, compounding their disastrous effects.

Earthquakes tend to reoccur along faults, which are zones of weakness in the crust. Even if a fault zone has recently experienced an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake could still occur. Small, local faults produce lower magnitude quakes, but ground shaking can be strong, and damage can be significant in areas close to the fault. In contrast, large regional faults can generate earthquakes of great magnitudes but, because of their distance and depth, they may result in only moderate shaking in an area.

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

Part of what makes earthquakes so destructive is that they generally occur without warning. The main shock of an earthquake can usually be measured in seconds, and

rarely lasts for more than a minute. Aftershocks can occur within the days, weeks, and even months following a major earthquake.

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

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Liquefaction

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

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

Geographical Area Affected

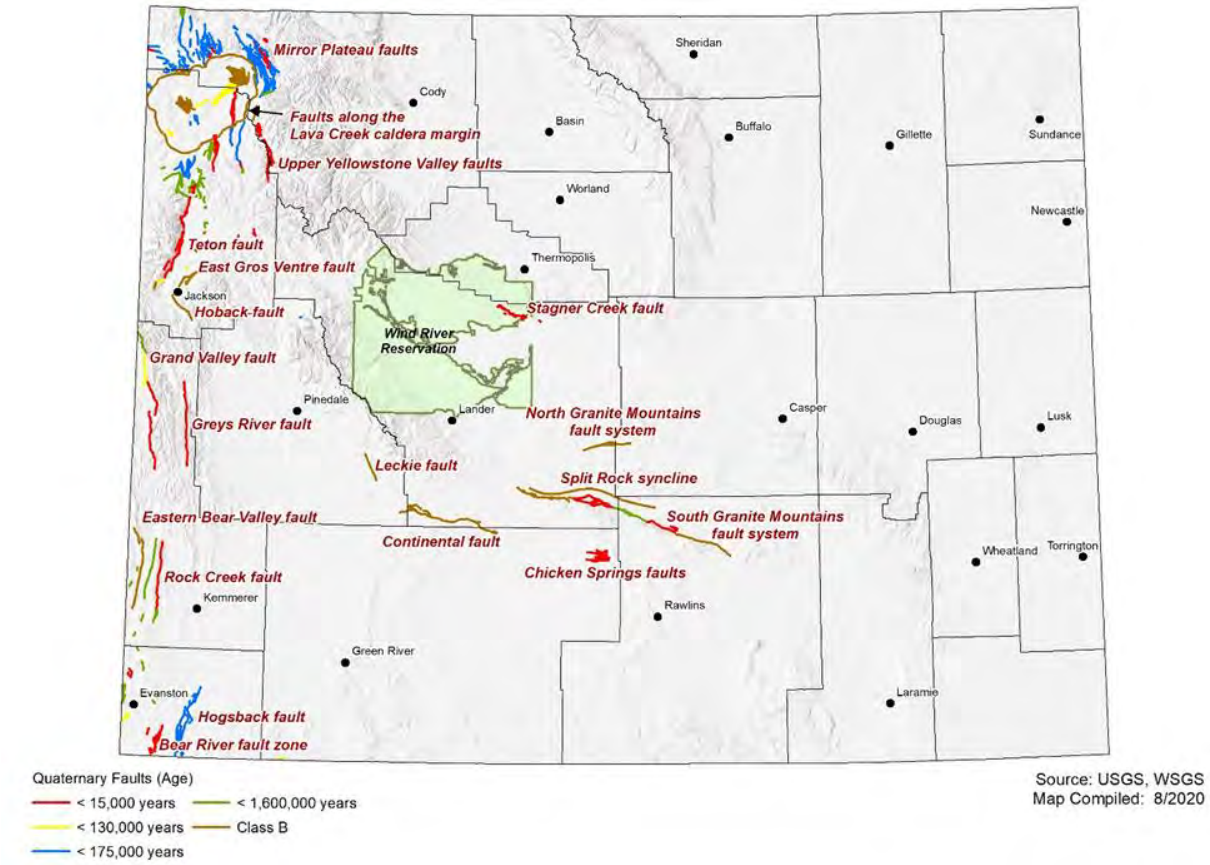
Most Wyoming earthquakes outside of Yellowstone National Park occur as a result of movement on faults. If the fault has moved within the Quaternary geological period, or last 1.6 million years, the fault is considered to be active. Active faults can be exposed at the surface or deeply buried with no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

According to the Wyoming State Geological Survey, there are approximately 80 Quaternary faults mapped in Wyoming, with 26 considered active (Source: www.wsgs.wyo.gov). All of the exposed active faults are outside of Region 1. The Cedar Ridge-Dry Fork in northern Fremont and Natrona counties is the closest fault system capable of generating a magnitude 6.5+ earthquake. Additionally, the Stagner Creek fault system near Boysen Reservoir and the South Granite Mountain fault system near Jeffrey City, are both considered potentially active and capable of generating magnitude 6.5 to 6.75 earthquakes.

A dynamic magma chamber beneath Yellowstone National Park, combined with regional tectonic forces, results in significant seismic activity. Many of the earthquakes are associated with movement of hydrothermal fluids in the subsurface. Some deeper earthquakes may be related to fluids within or around the magma chamber. Earthquakes which may be related to active faults also occur in the park. Yellowstone is a super-volcano, and it has explosively erupted 0.64 million, 1.3 million, and 2.1 million years ago. The explosive eruptions led to the formation of three giant calderas, the collapse of which led to the formation of faults. In addition, after major eruptions, resurgent domes formed within the calderas. The doming process led to the formation of other faults; as a result, many of the faults in Yellowstone are not considered major threats. There are other faults, however, that are easily capable of generating magnitude 6.5+ earthquakes (State Hazard Mitigation Plan 2016). Refer to the following figure; the box indicates Region 1.

Historically, Wyoming's earthquakes are tied to faults that are buried. Buried faults that have never broken the surface are generally considered to be capable of generating up to magnitude 6.5 earthquakes. Since the distribution of the buried faults is not well known, it is assumed that earthquakes up to magnitude 6.5 can occur anywhere in the state. (State Hazard Mitigation Plan 2021).

Figure 4-10 Exposed Known or Suspected Active Faults in Wyoming



Source: Wyoming Geological Survey, Figure by WSP

The Stagner Creek fault system is an east-west trending system located near Boysen Reservoir on the south flank of the Owl Creek uplift in Fremont County and on the Wind River Reservation. Geomatrix Corporation determined that the maximum length of the fault is 24 miles (38 km), with Quaternary-age displacement found along a 17-mile (27 km) segment of the fault between Mexican Pass and Tough Creek. The maximum credible earthquake for this fault system was determined to be a magnitude 6.75 event.

The Cedar Ridge/Dry Fork fault system is present in northeastern Fremont County and northwestern Natrona County. The 35-mile-long Cedar Ridge fault comprises the western portion of the fault system, and the 15-mile long Dry Fork fault makes up the eastern portion. After various assessments, Geomatrix concluded that it is not possible to conduct a reliable deterministic analysis on the fault system; however, general estimates can be made. Although there is no compelling reason to believe that the Dry Fork fault system is active, if it did activate as an isolated system, it could potentially generate a magnitude 6.7 earthquake.

Figure 4-11 shows areas in Wyoming that could experience liquefaction during an intense earthquake. Areas shown have sands and coarse silts that are less than 10,000 years in age and are within 30 feet of the surface. As indicated by the box on the map, Region 1 does not contain any areas susceptible to liquefaction

Figure 4-11 Wyoming Liquefaction Coverage

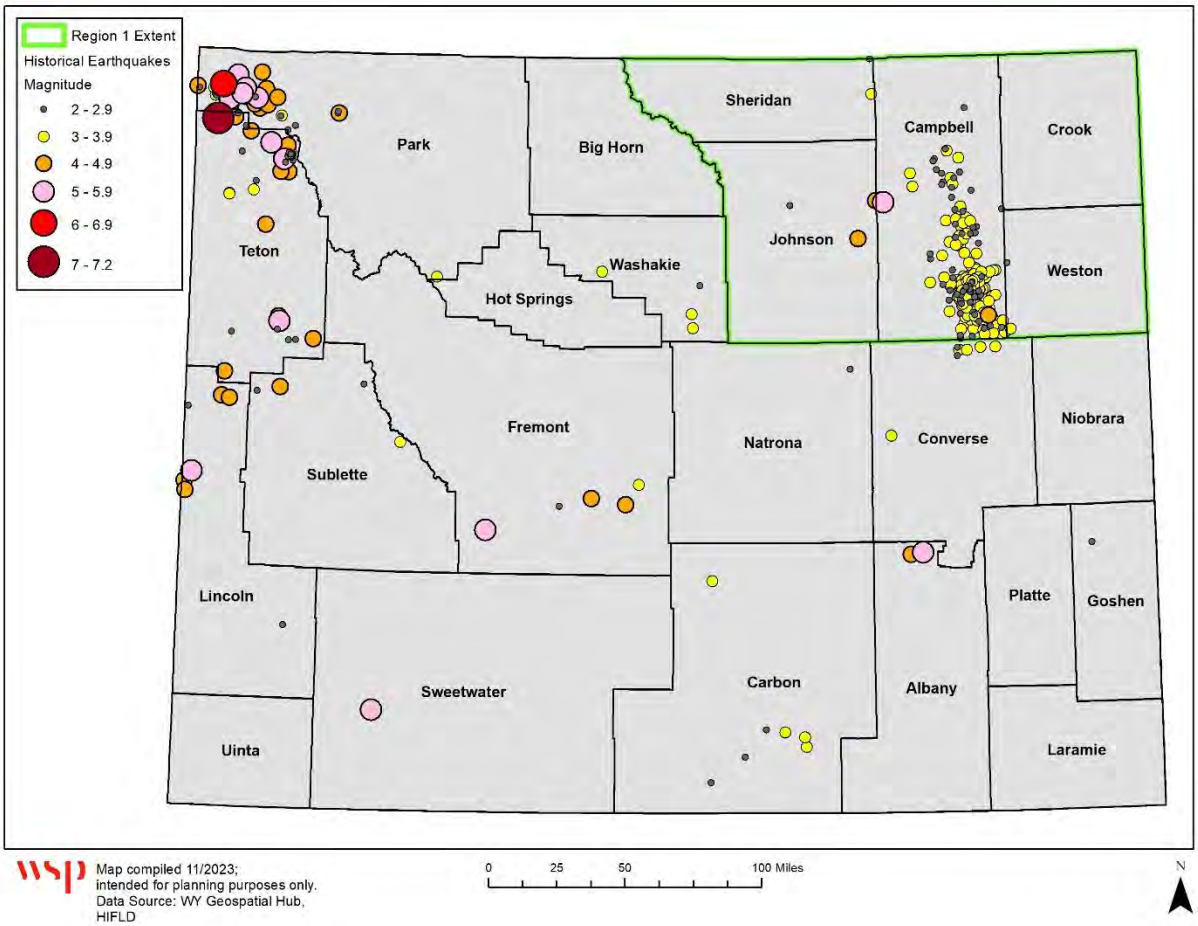
Source: Wyoming Geological Survey Blue box denotes Region 1 planning area

Past Occurrences

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

Since 1871, the state has logged some 47,000 earthquakes, with the higher magnitude of events taking place in the western third of the state (see Figure 4-12) where the majority of the potentially active, or Quaternary Period, faults are identified. This epicenter database represents events for significant earthquakes that have caused death, property damage, and geological disturbances along with its population within their extents. It is suspected that the cluster of small earthquakes shown in Campbell County may be associated with human activity such as mining and oil and gas extraction.

Figure 4-12 Wyoming Historical Significant Earthquakes Statewide 1959 - 2022



Historically, earthquakes have occurred in every county in Wyoming. The first was reported in Yellowstone National Park in 1871. Data on instrumentally recorded earthquakes is available from the USGS Earthquake Hazards Program dating back to 1973. Five magnitude 4.5 and greater earthquakes have been recorded in the Region since 1973, with two of these events taking place in Johnson County, and three in Campbell County. These earthquakes are noted in the tables below and discussed in further detail below by county.

Regional Summary of Past Events

Table 4-23 Earthquakes Greater than M 2.5 in Region 1: 1968 – 2023

County	Magnitude 2.5-2.9 Intensity I	Magnitude 3.0-3.9 Intensity II-III	Magnitude 4.0-4.9 Intensity IV-V	Magnitude 5.0-5.9 Intensity VI-VII	Total
Johnson	4	-	2	1	7
Campbell	5	2	2	2	11
Sheridan	2	-	2		4
Crook	-	-	1		1
Weston	-	-	-	-	-
Total	5	2	7	3	23

Source: Analysis of data from USGS Earthquake Hazards Program and Wyoming Geological Survey

Table 4-24 Ten Highest Magnitude* Earthquakes in Region 1: 1968 – 2023

County	Magnitude/Intensity	Date
Johnson	5.1	10/7/1984
Campbell	5.1	9/7/1984
Campbell	5.0	5/29/1984
Johnson	4.8	10/2/1976
Campbell	4.8	5/11/1976
Campbell	4.8	9/2/1976
Campbell/Crook	4.3	2/18/1972
Sheridan	3.9	2/25/1993
Campbell	3.6	2/24/1993
Sheridan	3.6	3/24/1977

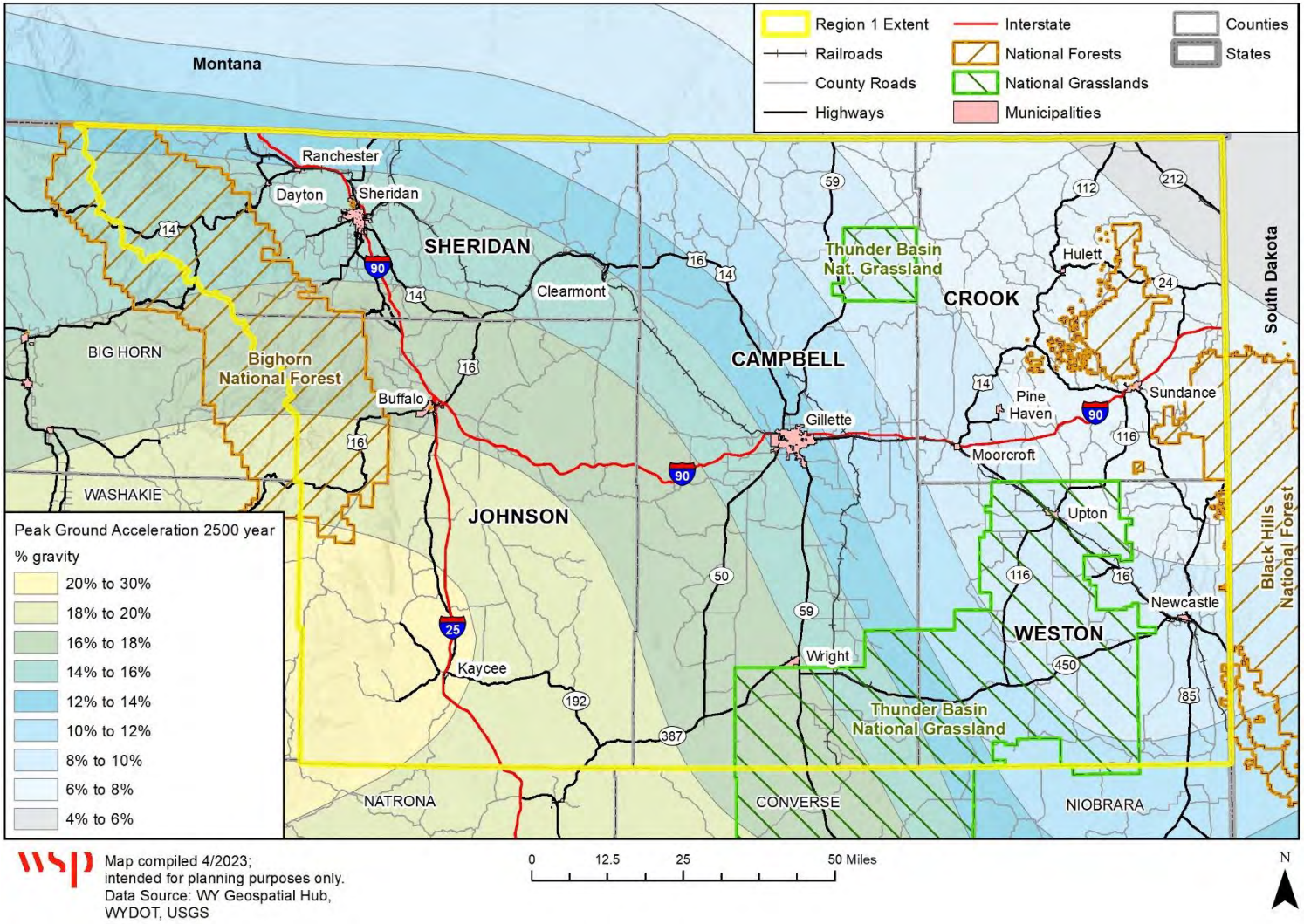
*Based on instrumentally recorded earthquakes.
Source: USGS Earthquake Hazards Program and Wyoming Geological Survey

Frequency/Likelihood of Occurrence

With a total of 23 recorded earthquakes with a magnitude greater than 2.5 in the last 55 years, the region is likely to experience an earthquake every three to four years; or a somewhat **likely** occurrence rating. However, based on past occurrences, the earthquakes are likely to cause little to no damage. To determine the likelihood of damaging earthquakes the U.S. Geological Survey (USGS) publishes probabilistic acceleration maps for 500-, 1000-, and 2,500-year time frames. The maps show what accelerations may be met or exceeded in those time frames by expressing the probability that the accelerations will be met or exceeded in a shorter time frame. For example, a 10% probability that acceleration may be met or exceeded in 50 years is roughly equivalent to a 100% probability of exceedance in 500 years. The 2,500-year (2% probability of exceedance in 50 years) map is shown in the figure below. The International Building Code uses a 2,500-year map as the basis for building design. The maps reflect current perceptions on seismicity in Wyoming based on available science. In many areas of Wyoming, ground accelerations shown on the USGS maps can be increased further due to local soil conditions. For example, if fairly soft, saturated sediments are present at the surface, and seismic waves are passed through them, surface ground accelerations will usually be greater than would be experienced if only bedrock was present. In this case, the ground accelerations shown on the USGS maps would underestimate the local hazard, as they are based upon accelerations that would be expected if firm soil or rock were present at the surface.

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

Figure 4-13 2500-year Probabilistic Acceleration Map (2% Probability of Exceedance in 50 years)



Source: Wyoming Geological Survey

Potential Magnitude (Extent)

The amount of energy released during an earthquake is usually expressed as a Richter magnitude and is measured directly from the earthquake as recorded on seismographs. The moment magnitude scale (abbreviated as MMS; denoted as MW or M) is used by seismologists to measure the size of earthquakes in terms of the energy released. The scale was developed in the 1970s to succeed the Richter magnitude scale. Even though the formulas are different, the new scale retains a similar continuum of magnitude values to that defined by the older one. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface as felt by humans or resulting damage to structures and defined in the Modified Mercalli scale (see Table 4-25). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4-25 Modified Mercalli Intensity (MMI) Scale

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

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

Table 4-26 Modified Mercalli Intensity (MMI) Scale and Peak Ground Acceleration

MMI	Acceleration (%g) (PGA)
I	<0.17
II	0.17 – 1.4
III	0.17 – 1.4

MMI	Acceleration (%g) (PGA)
IV	1.4 – 3.9
V	3.9 – 9.2
VI	9.2 – 18
VII	18 – 34
VIII	34 – 65
IX	65 – 124
X	>124
XI	>124
XII	>124

Source: Modified Mercalli Intensity and peak ground acceleration (PGA) (Wald, et al 1999).

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

Some HMPCs noted concerns about damage to hospitals from an earthquake. The presence of historic buildings that include unreinforced masonry buildings in many of the region's towns and cities was also noted as a potential vulnerability.

Changing Future Conditions

Changes in future conditions in Wyoming are not expected to directly affect earthquake frequency or intensity.

Vulnerability Assessment

During the 2020-2021 update process for the Wyoming State Hazard Mitigation Plan, earthquake vulnerability data was generated for each county in the state using a Level 1 HAZUS-MH analysis. HAZUS (Hazards U.S.) is a nationally standardized, GIS-based, risk assessment and loss estimation computer program that was originally designed in 1997 to provide the user with an estimate of the type, extent, and cost of damages and losses that may occur during and following an earthquake. It was developed for the FEMA by the National Institute of Building Sciences (NIBS). There have been a number of versions of HAZUS generated by FEMA, with HAZUS-MH (HAZUS - Multi-Hazard) being the most recent release.

Once the location and size of a hypothetical earthquake are identified, HAZUS-MH estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up. Additional information provided includes anticipated households displaced or seeking temporary shelter, electrical outages anticipated, number of households without potable water, debris generated by the scenario and economic losses resulting from three categories: buildings, transportation, and utilities.

People

The entire population of Region 1 is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the

age and construction type of the structures people live in, the soil types their homes are constructed on, their proximity to fault location, etc. Whether impacted directly or indirectly, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of functions of utilities could impact populations that suffered no direct damage from an event itself.

Three population groups are particularly vulnerable to earthquake hazards:

- **Linguistically Isolated Populations**—Problems arise when there is an urgent need to inform non-English speaking residents of an earthquake event. They are vulnerable because of difficulties in understanding hazard-related information from predominantly English-speaking media and government agencies.
- **Population below Poverty Level**—Families and individuals with incomes below the poverty level may lack the financial resources to improve their homes to prevent or mitigate earthquake damage. Poorer residents are also less likely to have insurance to compensate for losses in earthquakes.
- **Population over 65 Years Old**—This population group is vulnerable because they are more likely to need special medical attention, which may not be available due to isolation caused by earthquakes. Elderly residents also have more difficulty leaving their homes during earthquake events and could be stranded in dangerous situations.

Casualty impacts on persons in the planning area were estimated for the 2,500-Year Probabilistic Earthquake. Casualty levels as defined by Hazus-MH are described as follows:

- Level 1: Injuries will require medical attention, but hospitalization is not needed
- Level 2: Injuries will require hospitalization but are not considered life-threatening
- Level 3: Injuries will require hospitalization and can become life-threatening if not promptly treated
- Level 4: Victims are killed by the earthquake

These impacts are summarized by County in the table below.

Table 4-27 Estimated 2500-Year Probabilistic Earthquake Impact on Persons and Households

Jurisdiction	Casualty Level 1	Casualty Level 2	Casualty Level 3	Casualty Level 4
Campbell	36	4	0	1
Crook	2	0	0	0
Johnson	7	1	0	0
Sheridan	39	5	0	1
Weston	3	0	0	0

Source: Hazus-MH 4.2

Property

All structures in the planning area are susceptible to earthquake impacts to varying degrees. Hazus 4.2.3 uses building inventory based on 2018 RS Means Valuation Updates for general building stock and values.

There are two methods of ranking counties to determine where earthquake impacts may be the greatest. Either the loss ratios or total damage figures can be used (Table

4-28). The loss ratio is determined by dividing the sum of the structural and non-structural damage by the total building value for the county. The loss ratio is a better measure of impact for a county as it gives an indication of the percent of damage to buildings. The total damage figure by itself does not reflect the percentage of building damage. If a county has a number of valuable buildings, small damage to a number of valuable buildings may result in a higher total damage figure than what may be found in a county with fewer, less expensive buildings with a higher percentage of damage. The probabilistic loss estimates may significantly over-estimate actual losses sustained from an individual earthquake. The data shows aggregated loss potential, rather than potential losses for a specific event. Sheridan County could experience the highest potential loss due to building exposure and closer proximity to seismic sources, whereas Johnson County can experience a higher loss ratio.

Table 4-28 Region 1 2,500-Year Probabilistic Scenario Loss Estimates

Jurisdiction	Total Loss ($M)	Loss Ratio
Campbell	$70	1.0%
Crook	$3	0.3%
Johnson	$19	1.3%
Sheridan	$83	1.1%
Weston	$6	0.5%

Source: Hazus-MH 4.2

Critical Facilities and Lifelines

All critical facilities and infrastructure in the planning area are exposed to the earthquake hazard. Hazardous Materials (HAZMAT) releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding HAZMAT are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

Damage impacts to transportation corridors and communications lines could affect first responders' ability to effectively respond in the aftermath of an earthquake. Damage to government facilities/personnel in incident area may require temporary relocation of some operations. Regulatory waivers may be needed locally. The public may question local government's ability to respond and recover if planning, response, and recovery are not timely and effective. A significant earthquake may require disaster declarations and aid programs. These needs may impact funding or administrative resources for other regular operations or may necessitate changes to existing operating procedures.

HAZUS-MH classifies the vulnerability of critical facilities to earthquake damage in two categories: at least moderate damage or complete damage. The analysis did not indicate any damages in these categories to specific facilities. Damage to the transportation system and utility lifelines is possible; specific loss numbers were not available at county levels from the Hazus analysis done for the Wyoming State Hazard Mitigation Plan.

Economy

Impacts to the economy from an earthquake can be direct, in the form of direct damages and losses to buildings and infrastructure, and indirect, often in the form of lost wages and business income, relocation costs, and other costs of recovery. Capital stock and income losses by County in Region 1 are shown below in Table 4-29.

Table 4-29 Region 1 Economic Impacts, 2500-Year Probabilistic Earthquake Scenario

	Capital Stock Losses (Thousands of Dollars)					Income Losses (Thousands of Dollars)				
County	**Structural**	**Non-Structural**	**Contents**	**Inventory**	**Loss Ratio (%)**	**Relocation**	**Capital-Related**	**Wages**	**Rental**	**Total Loss**
Campbell	$7,807	$36,237	$17,782	$256	2.18	$5,317	$2,131	$2,564	$2,444	**$74,538**
Crook	$468	$1,481	$563	$14	0.27	$309	$88	$115	$106	**$3,144**
Johnson	$1,845	$9,116	$4,513	$100	1.27	$1,293	$535	$604	$634	**$18,639**
Sheridan	$11,136	$37,176	$20,025	$1,067	1.14	$5,248	$2,151	$3,084	$3,084	**$82,972**
Weston	$770	$2,778	$1,185	$30	0.47	$517	$164	$226	$201	**$5,871**

Source: Hazus-MH 4.2

Environment and Cultural Resources

Secondary hazards associated with earthquakes will likely have some of the most damaging effects on the environment. Earthquake-induced landslides can significantly impact surrounding habitat. Streams can be rerouted or blocked entirely as occurred in the Hebgen Lake event in Montana, after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology. Historic building stock is commonly made of unreinforced masonry which is vulnerable to damage from earthquakes.

Liquefaction Vulnerability

There have been little, if any, reported damages from liquefaction in Wyoming. Given that ground motions associated with Intensity VIII or larger are usually needed to trigger liquefaction, and that only small areas of the Region would experience that level of shaking during the 2% event (2% probability of exceedance in 50 years), liquefaction would be a rare occurrence in the Region

Development Trends

Future development in the Region is not anticipated to extensively change vulnerability to earthquake significantly.

Risk Summary and Overall Significance by Jurisdiction

There are not any active faults within the region, but previous occurrence data indicates potential for damaging seismic activity, most likely in Campbell and Johnson counties. In summary, within Region 1, these two counties have the highest level of susceptibility and structural exposure. Though the probability is low, WSGS studies indicate the possibility of a 6.5 magnitude could occur anywhere in the state.

Table 4-30 Earthquake Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Limited	Occasional	Limited	Medium
Crook	Limited	Occasional	Negligible	Low
Johnson	Limited	Occasional	Limited	Medium
Sheridan	Limited	Occasional	Negligible	Low
Weston	Limited	Occasional	Negligible	Low

4.2.5 Expansive Soils

Hazard/Problem Description

Expansive soils contain clay which causes the material to increase in volume when exposed to moisture and shrink as it dries. They are also commonly known as expansive, shrinking and swelling, bentonitic, heaving, or unstable soils.

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

the restraining pressure exerted by materials on top of the swelling soil. Each of these factors impacts how much swelling a particular area will experience, but may be modified, for better or worse, by development actions in the area.

Low—this soil class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential if the clay is kaolinite. Kaolinite is a common clay mineral.

Moderate—this class includes silty clay and clay textured soils, if the clay is kaolinite, and also includes heavy silts, light sandy clays, and silty clays with mixed clay minerals.

High—this class includes clays and clay with mixed montmorillonite, a clay mineral that expands and contracts more than kaolinite.

Geographical Area Affected

Expansive soils occur throughout the Region. Figure 4-14 illustrate possible expansive soil locations in Wyoming. Figure 4-14 shows the areas that are locally susceptible to expansive soil, which can also be interpreted as low hazard areas, as well as areas that are regionally susceptible to expansive soil, which are the moderate hazard areas. As shown in Figure 4-14, most of these hazard areas are in Crook, Weston Counties, as well as Sheridan and Johnson Counties. Campbell County does not really have any susceptible areas. Moreover, Table 4-31 shows the percentage of land area that is susceptible to expansive soils based on GIS spatial calculations.

The HMPC provided the following inputs during the 2018 and 2023 plan update:

The Campbell County HMPC has concerns regarding expansive soil in the conservation districts, especially in terms of its potential to cause damage to septic systems, which can subsequently contaminate groundwater. In the previous HMP, it was mentioned that Campbell County made significant investments in soil remediation for the City of Gillette and the Town of Wright. These investments have alleviated some concerns about the future impact on the structural integrity of these areas. However, there is a need for mapping in this County to fully understand the risk of expansive soil.

Johnson County noted that Kaycee has regular sinkhole problems west of town, including one incident where shifting soils led to broken saddles on a water main. Weston County reported broken foundations in some residences and has had problems with Highway 85 south of Newcastle. A proposed middle school site was denied due to potential impacts of expansive soils.

The HMPCs reported that the U.S. Bureau of Land Management in coordination with Wyoming DOT is working on updating their expansive soils mapping. Additionally, the Natural Resources Conservation Service (NCRS) is conducting research to identify expansive soils in Campbell County.

Figure 4-14 Region 1 Expansive Soil Susceptibility

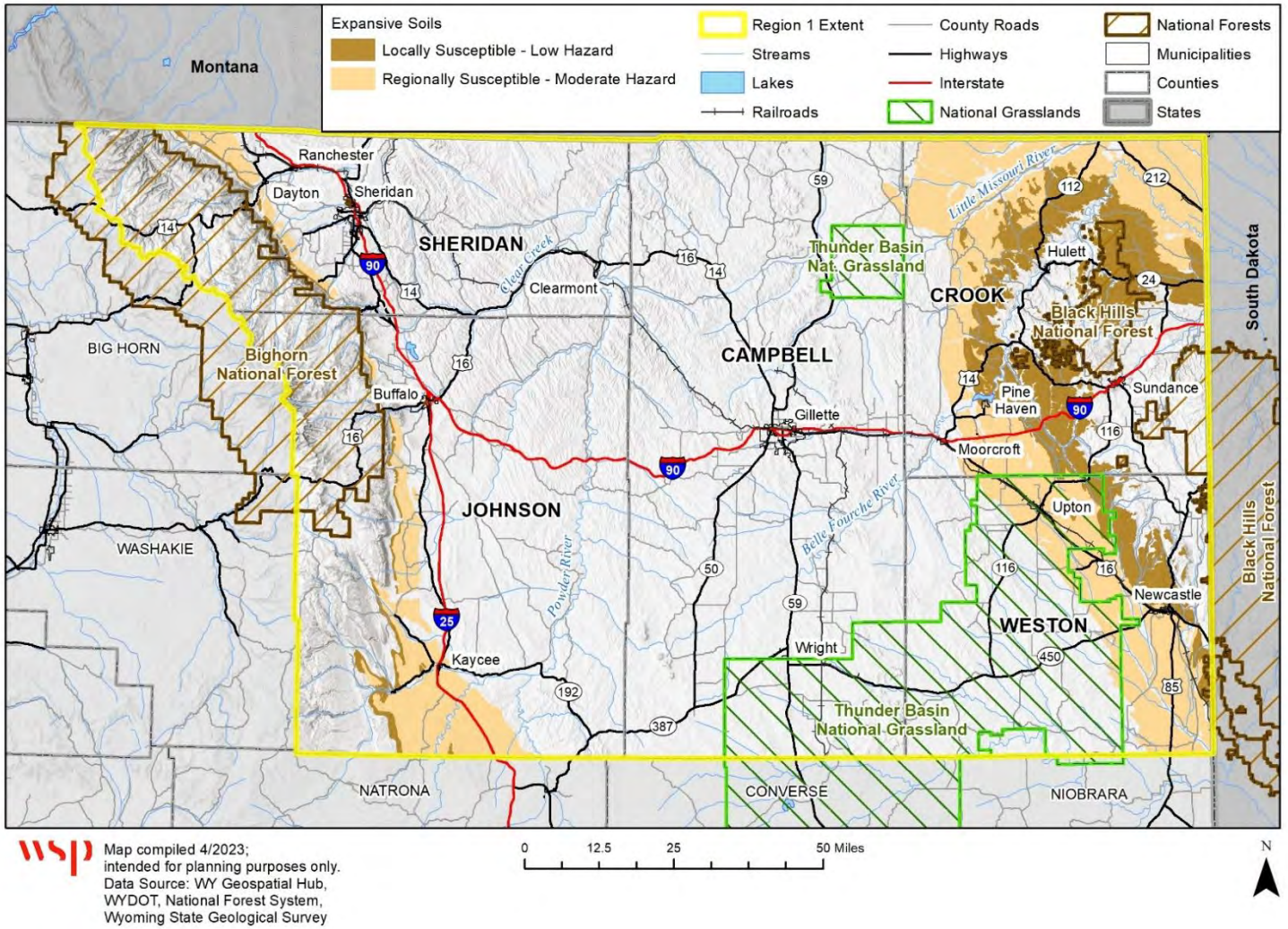


Table 4-31 Percentage of Land Area Susceptible to Moderate Expansive Soils Risk

County	% Expansive Soils
Campbell	0.24%
Crook	50.67%
Johnson	9.85%
Sheridan	3.09%
Weston	30.03%
Regional Average	16%

Source: State of Wyoming Geospatial Hub

Moreover, although the mapping data shows nearly no identified expansive soil area within Campbell County, the County has experienced expansive soil problems.

Based on the figures above, expansive soils have the potential to affect a **Significant** portion of the planning area, although the geographic extent of any individual expansive soil incident is likely to be extremely localized.

Past Occurrences

Very little data exists on expansive soil problems and damages in Wyoming. Studies on the issue have not been performed and no database exists to catalog occurrences. The 2020 State of Wyoming Multi-Hazard Mitigation Plan lists no known events in Region 1. Damages due to expansive soils such as foundation cracks, parking lot/sidewalk cracks, etc. do occur but are generally handled by individual property owners. Other damages to supply lines, roads, railways, bridges and power lines typically occur over time and are not attributed to or reported as an event.

Frequency/Likelihood of Occurrence

Historical data on expansive soil issues was not readily available, making frequency difficult to extrapolate. Based on HMPC discussions, expansive soils are Likely to continue to be an occasional problem for the jurisdictions in Region 1.

Changing Future Conditions

Many soils and rocks have the potential to swell based on a combination of mineralogy and water content. The actual swelling will be caused by a change in the environment (e.g., water content, stress, chemistry, or temperature) in which the material exists. Since the 1950s, precipitation and duration of snowpack have both decreased while rising temperatures have increased the rate of water evaporating into the air, creating drier soil conditions in Wyoming (EPA 2016). More extremes in future conditions, such as drastic wet/dry weather patterns, could potentially exacerbate swelling soil issues in the future.

Potential Magnitude (Extent)

The potential magnitude of expansive soil events and damages is estimated to be Negligible for the counties in the Region, with limited and isolated impacts. Because damages from expansive soils are difficult to track due to limited reporting, it is difficult to estimate the potential severity of a problem. Expansive soils can create localized damage to individual structures and supply lines, such as roads, railways, bridges and power lines, but no significant impacts have been reported.

Vulnerability Assessment

People

An estimated 5,383 people are living in areas at moderate risk of expansive soils. Refer to Table 4-32 for details regarding which jurisdictions these people are located in. However, no direct impacts on people are anticipated. Should an impact occur, it is anticipated to be localized.

Property

There are 2,754 parcels in Region 1 located in areas of moderate risk of expansive soils, as shown in Figure 4-14 above, and broken down by jurisdictions in Table 4-32 below. This represents over 7% of the total improved parcels in Region 1. However, the risk to these structures is more gradual and incremental than most hazards analyzed in this plan. Moreover, as shown in Table 4-32, Weston County has the most parcels that are at moderate risk of expansive soils. On the other hand, Campbell County's risk is shown as being essentially nonexistent (because this analysis is based on the mapping shown in Figure 4-14 which only has minimal areas of risk shown in this county), although as noted above evidence suggests this is not the case.

Table 4-32 Region 1 Expansive Soil Parcel Analysis by Jurisdiction

County	Jurisdiction	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Population
Crook County	Pine Haven	180	$37,563,429	$20,327,793	$57,891,222	442
	Crook Unincorporated	336	$57,536,783	$37,365,312	$94,902,095	537
	Total	516	$95,100,212	$57,693,105	$152,793,317	978
Johnson County	Kaycee	25	$2,672,508	$1,561,830	$4,234,338	42
	Johnson Unincorporated	63	$17,719,609	$9,131,282	$26,850,891	121
	Total	88	$20,392,117	$10,693,112	$31,085,229	163
Sheridan County	Sheridan Unincorporated	59	$31,486,276	$16,463,987	$47,950,263	126
	Total	59	$31,486,276	$16,463,987	$47,950,263	126
Weston County	Newcastle	1,234	$179,649,722	$116,136,033	$295,785,755	2,416
	Upton	359	$46,379,788	$27,461,567	$73,841,355	678
	Weston Unincorporated	498	$92,161,340	$53,860,387	$146,021,727	1,021
	Total	2,091	$318,190,850	$197,457,987	$515,648,837	4,115
	Grand Total	**2,754**	**$465,169,455**	**$282,308,191**	**$747,477,646**	**5,383**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

While impacts are slow to accumulate, costly damages to roads and other infrastructure could occur. The majority of the hazard's significance is drawn from the exposure of existing development to this hazard. Older construction may not be resistant to the swelling-soil conditions and, therefore, may experience expensive and potentially extensive damages. This includes heaving sidewalks, structural damage to walls and basements, the need to replace windows and doors, or dangers and damages

caused by ruptured pipelines. Newer construction may have included mitigation techniques to avoid most damage from the hazard, but the dangers continue if mitigation actions are not supported by homeowners. For example, the maintenance of grading away from foundations and the use of appropriate landscaping near structures must be continued to prevent an overabundance of water in vulnerable soils near structures. While continued public education efforts may help increase compliance for landscaping and interior finishing mitigation actions, physical reconstruction of foundations is probably not feasible in all but the most heavily impacted of existing development. Therefore, damages may be expected in the future for existing structures.

Critical Facilities and Lifelines

162 critical infrastructure assets have been identified in areas at moderate risk of expansive soils, as shown in Table 4-33. The results are shown by the jurisdictions and FEMA Lifeline categories. While assets such as roads, pipelines, wires, and facilities can be impacted, significant damages are not anticipated for most facilities. Road damages can be expensive, however; repairs to US 36 after the 2019 sinkhole exceeded $20 million.

As shown in Table 4-33, Weston County has the most critical facilities that are exposed to moderate expansive soil risk. Among the seven lifelines, transportation and communication lifelines have the most facilities that are exposed to moderate expansive soil risk. On the other hand, damage from these soils will be individual events, damaging a small number of buildings or road segments over time.

Table 4-33 Critical Facilities Potentially Exposed to Mapped Expansive Soil Hazards

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	-	-	-	-	-	-	-	**0**
Crook	3	5	2	1	1	1	14	**27**
Johnson	8	-	-	-	1	-	21	**30**
Sheridan	2	-	-	1	-	-	1	**4**
Weston	26	22	2	1	11	18	21	**101**
Total	**39**	**27**	**4**	**3**	**13**	**19**	**57**	**162**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

Economy

The economic cost of this hazard is typically minor in the short term, although over time they can add up to significant impacts. Road closures or detours during expansive soil repairs can result in temporary economic impacts.

Environmental and Cultural Resources

Collapsible and expansive soils are a natural environmental process. Nonetheless, they have the potential to alter the landscape and can cause damages to historic and cultural resources which may have less engineered resistance to these geologic processes.

Development Trends

Typically, the process of erosion does not limit land use, especially if efforts are made to minimize it. Erosion impacts can be reduced and controlled by surface drainage management, re-vegetation, or disturbed lands, controlling stream-carried eroded materials in sediment catchment basins, and riprapping of erosion-prone stream banks (especially adjacent to structures). Ground modification and structural solutions can help mitigate the threats of localized erosion and deposition. Proper drainage and water management are also important to prevent increasing vulnerability to erosion and deposition hazards. Also, modern building practices incorporate mitigation techniques, which provide proper geotechnical testing that is employed to identify expansive soils. If areas prone to expansive soils are identified, future areas for development will need to take this hazard into account.

Risk Summary and Overall Significance by Jurisdiction

Overall, expansive soils are a low significance hazard for the counties in the region. While the impacts of individual expansive soil incidents are fairly limited, the HMPCs indicated that it is a more significant risk for them than the data indicates. Additional research and mapping are needed, particularly in Campbell County, to better understand the extent of the hazard.

Table 4-34 Expansive Soil Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Limited	Likely	Negligible	Medium
Crook	Limited	Likely	Negligible	Low
Johnson	Limited	Likely	Negligible	Low
Sheridan	Negligible	Likely	Negligible	Low
Weston	Limited	Likely	Negligible	Low

4.2.6 Flood

Hazard/Problem Description

Floods can and have caused significant damage in Region 1, and are one of the more significant natural hazards in the Region. They have caused millions of dollars in damage in just a few hours or days. A flood, as defined by the National Flood Insurance Program, is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area, or of two or more properties from: overflow of waters; unusual and rapid accumulation or runoff of surface waters from any source; or a mudflow. Floods can be slow or fast rising, but generally develop over a period of hours or days. Causes of flooding relevant to the Region include:

- Rain in a general storm system
- Rain in a localized intense thunderstorm
- Melting snow
- Rain on melting snow
- Urban stormwater drainage
- Hail drifts clogging stormwater drainage
- Ice Jams
- Dam failure

- Levee Failure
- Rain on fire damaged watersheds

The area adjacent to a river channel is its floodplain. In its common usage, “floodplain” most often refers to that area that is inundated by the 100-year flood, the flood that has a 1% chance in any given year of being equaled or exceeded. The 100-year flood is the national standard to which communities regulate their floodplains through the National Flood Insurance Program. This is also called the Special Flood Hazard Area (SFHA) on flood insurance maps and in floodplain management ordinances.

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

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

Floods can occur for reasons other than precipitation or rapidly melting snow. They can also occur because of ice jams. An ice jam is a stationary accumulation of ice that restricts flow. Ice jams can cause considerable increases in upstream water levels, while at the same time downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. Floods arising from these types of ice jams can be slow or fast rising, but generally develop over a period of many hours or days.

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

associated with levees and the increased water velocity that is created. It is also important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

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

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

Geographical Area Affected

All counties within the planning region have the potential for flooding. The extent of the flooding varies based on the location of the county, and on what part of the county is being examined. Detailed geographic flood assessments are provided later in this section for each county and flood-prone community.

The counties of Region 1 are predominantly located in the Northeast Wyoming River Basin and the Powder/Tongue River Basin. In addition, the northwest corner of Sheridan county crosses slightly onto the Big Horn Basin. The Northeast Wyoming River Basin encompasses the basins of the Little Missouri River, Cheyenne River, and Belle Fourche River, among other smaller ones.

The Little Missouri River originates near Devils Tower, close to the Crook and Campbell county boundaries, and flows northeast into North Dakota, draining into the Missouri River. Some tributaries to the Little Missouri River within the Region 1 boundaries include the Prairie Creek River (falling between Campbell and Crook counties), the North Fork Little Missouri River (also between the two counties), and Thompson Creek, touching on the north/northwest edge of Crook County.

The Cheyenne River originates south of the Region, touching on the edges of Campbell and Weston counties. The river flows east to South Dakota, and north onto the Missouri River. The Cheyenne River is approximately 295 miles long and drains over 24 thousand square miles into the basin named after it. The river has some major tributaries including Dry Fork Creek and Antelope Creek.

The Belle Fourche River originates near south Campbell County and is a tributary to the Cheyenne River. It flows north towards the northeast corner of Crook County, then southeast into South Dakota to meet the Cheyenne River. The Belle Fourche is about 290 miles long, and many of its contributing tributary streams originate in the Black Hills mountains, crossing the Wyoming/South Dakota boundaries.

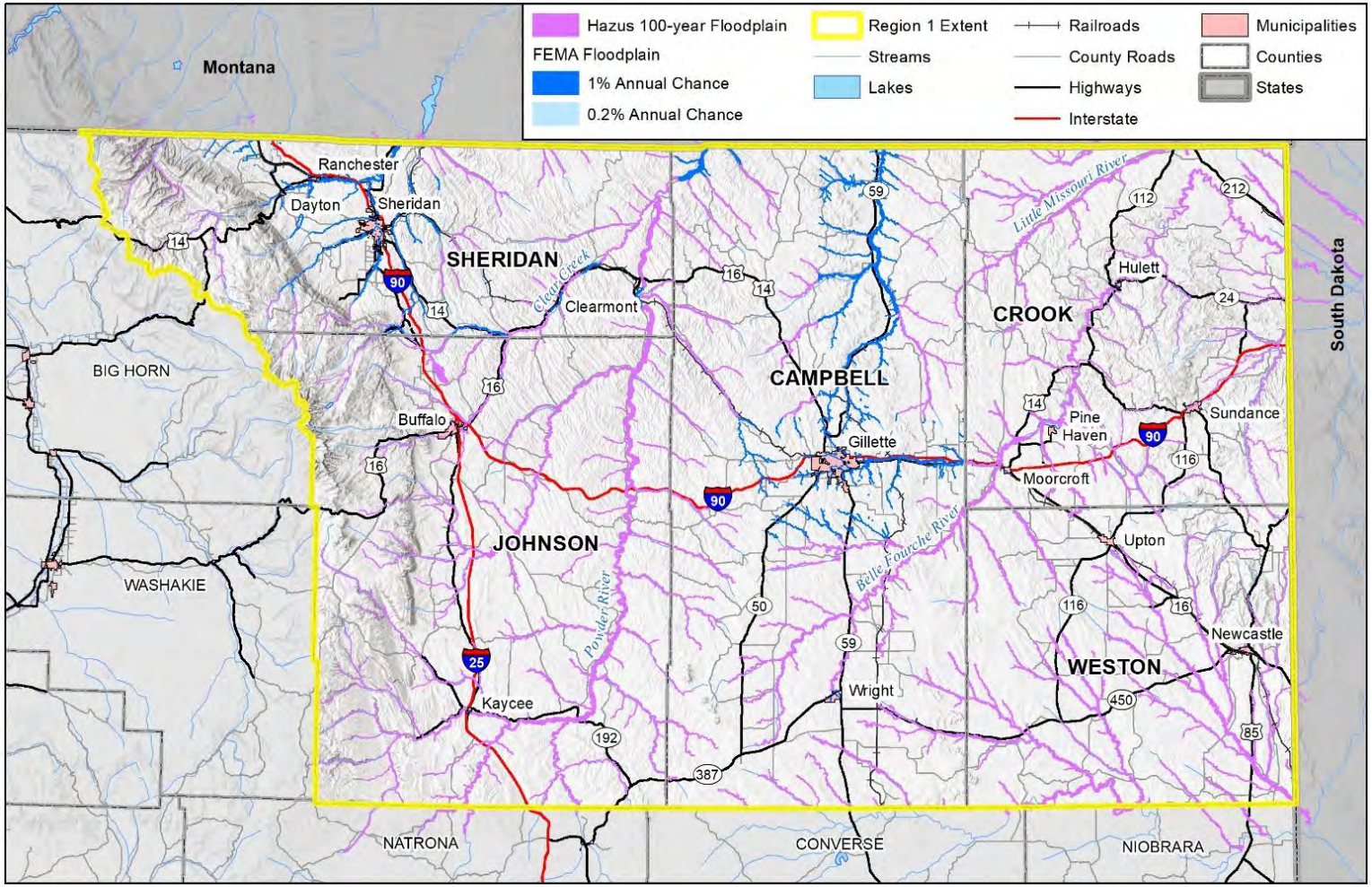
The Tongue River is approximately 265 miles long and originates in the Big Horn Mountains west of Sheridan County. It flows northeast into Montana, finally merging into the Yellowstone River. Some major rivers within the Region that drain into the Tongue River include Wolf Creek, Big and Little Goose Creeks, and Prairie Dog Creek.

Another major tributary of the Yellowstone River, the Powder River, encompasses three main forks originating on the Big Horn Mountains, all of which meet near Kaycee, Johnson County. The Powder River is around 375 miles long, flowing north and east of Johnson and into Sheridan and then Campbell County (from where it connects to Montana). Major tributaries flowing into the Powder River include Crazy Woman Creek, Ninemile Creek, Salt Creek, Clear Creek, and Buffalo Creek.

The only major river within the Big Horn River Basin and the Region 1 area is the Little Big Horn River, which originates northwest of Sheridan County (in the Big Horn Mountains), then flows north to join the Big Horn River on the Montana side. The Little Big Horn River is approximately 138 miles long.

The geographic extent rating for Region 1 is **significant**, meaning that a flood event could impact 10-50% of the planning area. The following sections detail the extent and history of flood hazards in the Region. The figure below shows the Region 1 Flood Hazards, highlighting both the available Digital Flood Insurance Rate Maps (DFIRM) layers from FEMA, for parts of Sheridan and Campbell, as well as Hazus-derived flooding area estimates (portrayed in purple) to supplement those provided by the federal agency. Both DFIRM and Hazus derived datasets are utilized in the maps to follow, as only limited parts of the region contain updated flooding study information.

Figure 4-15 Wyoming Region 1 FEMA and Hazus Flood Hazards



Map compiled 4/2023;
intended for planning purposes only.
Data Source: WY Geospatial Hub,
WYDOT, National Forest System,
FEMA NFHL, Hazus- MH MR2

0 12.5 25 50 Miles

Campbell County Effective Date 1/2/2008
Latest LOMR Effective Date 2/27/2012
Sheridan County Effective Date 1/16/2014
Latest LOMR Effective Date 12/20/2018

N

Past Occurrences

A brief history of the federally declared disasters due to flooding is summarized in Table 4-35 below. Floods and flash floods documented by the NCEI Storm Database which caused property or crop damage are summarized in Table 4-36 below. There were no recorded deaths or injuries associated with these events. The complete history of floods and flash floods captured by the NCEI Storm Database between 1950 and 2022 is presented in each county's annex. Based upon the historical data presented below, a damaging flood occurs in the area every year or two on average. The data indicates that Johnson County has had the largest number and most damaging floods in the Region.

Table 4-35 Federally Declared Disasters Wyoming Region 1978 - mid 2023

County	Declaration	Year Declared	Declaration Title
Johnson	DR-4227-WY	2015	Severe storms and flooding
Crook, Johnson, Sheridan, Weston	DR-4007-WY	2011	Severe storms, flooding, and landslides
Campbell, Crook, Johnson, Sheridan, Weston	DR-557-WY	1978	Severe storms, flooding & mudslides

Source: Fema.gov

Table 4-36 NCEI Flood Events in Region 1 1955-2022

County	Type	Location	Date	Property Damage	Crop Damage
Campbell County	Flash Flood	Gillette	5/28/2001	$400,000	$0
	Flood	Gillette	5/5/2007	$58,000	$0
	Flash Flood	Echeta	5/26/2013	$25,000	$0
	Flash Flood	Wright	8/1/2013	$150,000	$0
	Flash Flood	Gillette Airport	5/24/2014	$10,000	$0
	Flash Flood	Savageton	6/3/2015	$1,000	$0
	Flood	Savageton	6/3/2015	$1,000	$0
Total				**$645,000**	**$0**
Crook County	Flood	Colony	6/5/2008	$100,000	$0
	Flood	New Haven	5/31/2013	$60,000	$0
	Flood	New Haven	6/1/2013	$100,000	$0
	Flash Flood	Moorcroft	6/17/2015	$5,000	$0
	Flood	Moorcroft	7/27/2017	$1,000	$0
Total				**$266,000**	**$0**
Johnson County	Flood		1/29/1996	$2,000	$0
	Flash Flood	Kaycee	7/10/2001	$18,000	$0
	Flash Flood	Kaycee	8/26/2002	$459,000	$0
	Flash Flood	Buffalo	6/19/2003	$60,000	$0
	Flash Flood	Buffalo	8/7/2006	$1,400	$0

County	Type	Location	Date	Property Damage	Crop Damage
	Flash Flood	Kaycee	7/19/2007	$50,000	$2,000
	Flood	Buffalo Airport	5/22/2008	$50,000	$0
	Flash Flood	Mayoworth	7/12/2009	$5,000	$0
	Flash Flood	Barnum	7/4/2013	$0	$10,000
	Flash Flood	Kaycee	7/5/2013	$50,000	$0
	Flood	Kaycee	5/24/2015	$50,000	$250,000
	Flood	Sussex	5/25/2015	$5,000	$0
	Flash Flood	Buffalo	6/3/2015	$10,000	$0
	Flash Flood	Buffalo Airport	6/3/2015	$1,500,000	$0
Total				**$2,260,400**	**$262,000**
Sheridan County	Flood	Sheridan	8/19/1998	$20,000	$0
	Flood	Parkman	5/20/2011	$520,000	$0
	Flood	Ranchester	5/28/2019	$125,000	$0
Total				**$665,000**	**$0**
Weston County	Flash Flood	Newcastle	8/12/2005	$100,000	$0
	Flash Flood	Osage	5/9/2011	$163,000	$0
	Flash Flood	Upton	5/24/2011	$50,000	$0
	Flash Flood	Osage	7/17/2012	$5,000	$0
	Flash Flood	Four corners	6/21/2013	$25,000	$0
	Flash Flood	Rochelle	7/28/2013	$100,000	$0
	Flash Flood	Osage	8/7/2013	$10,000	$0
	Flash Flood	Rochelle	6/25/2015	$30,000	$0
	Flood	Newcastle	7/3/2019	$10,000	$0
	Flash Flood	Newcastle Airport	8/10/2019	$25,000	$0
Total				**$518,000**	**$0**
Grand Total				**$4,254,400**	**$262,000**

Source: NCEI

Figure 4-16 and Figure 4-17 were created by Western Water Assessment based on their analysis of NCEI data; they show the number of flood and flash flood events in Wyoming per county from 1996-2017.

Figure 4-16 Flood Events in Wyoming, 1996-2017

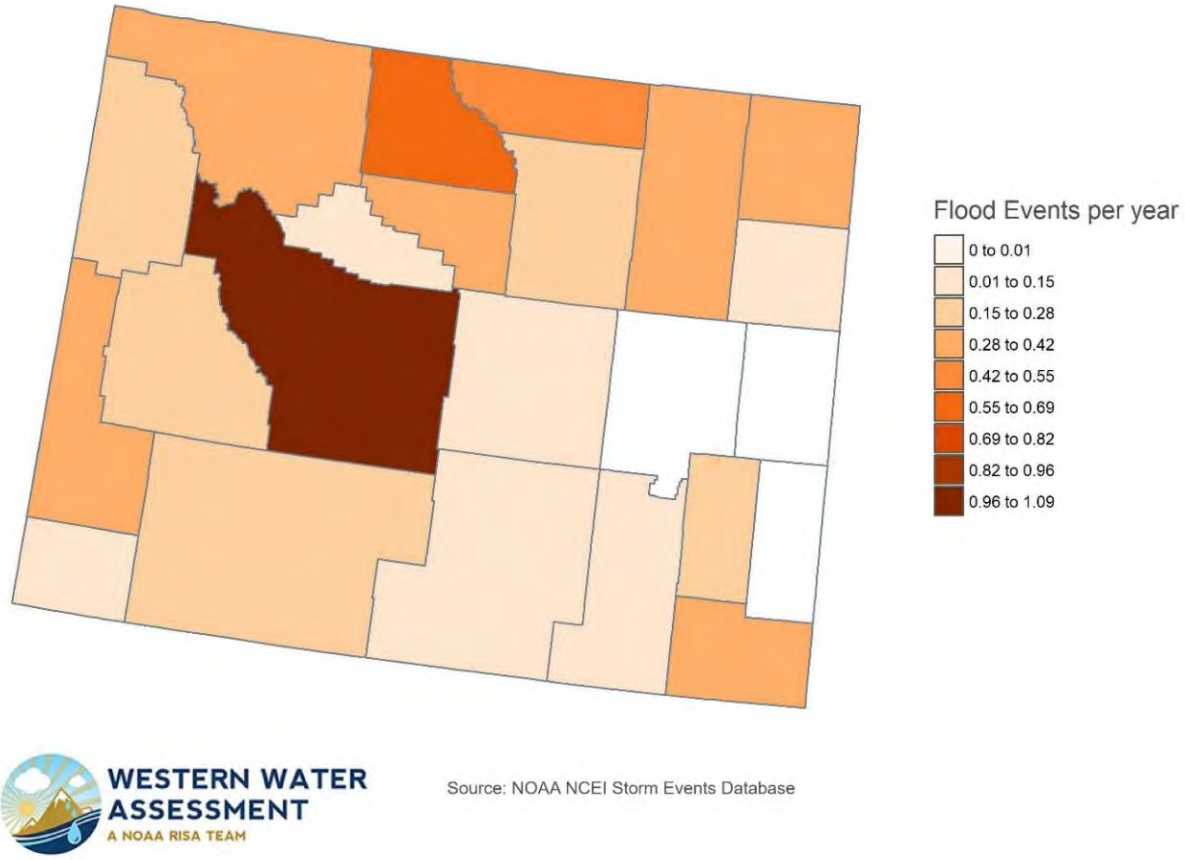
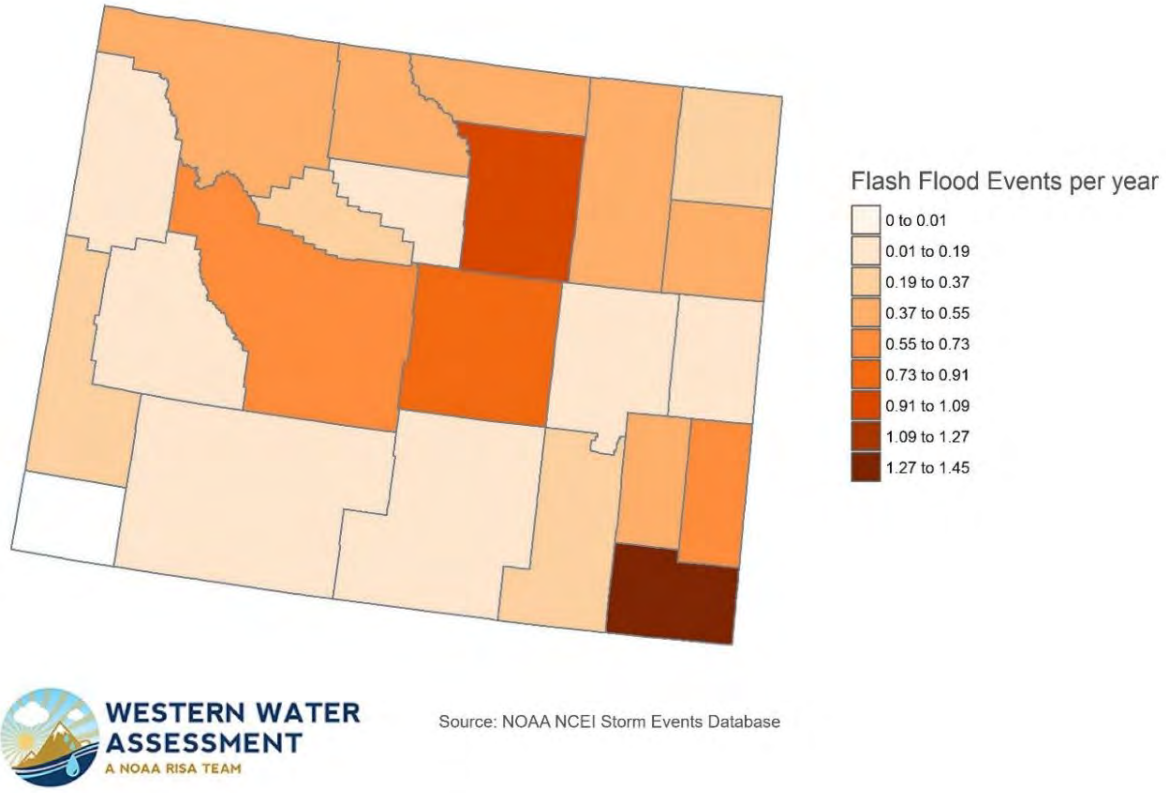


Figure 4-17 Flash Flood Events in Wyoming, 1996-2017



Frequency/Likelihood of Occurrence

Judging by the historical flood record for the Region, a flood of at least minimal magnitude occurs once or twice a year, on average, within the planning area. Most of these floods' extents were less than the 100-year flood; the chance of a 100-year flood occurring in any given year in the Region is 1%. Using the guidelines outlined in Section 4.2.1 a damaging flood has a **Likely** occurrence rating, meaning that a flood has a 10-100% chance of occurrence in the next year somewhere in the Region.

Table 4-37 Flood Occurrences per County

County	Events	Period of Record	Annualized Frequency
Campbell	26	1996-2022	1.0/year
Crook	21	2001—2022	1.0/year
Johnson	37	1996-2022	1.4/year
Sheridan	25	1996-2022	1.0/year
Weston	20	1998-2022	.08/year

Source: NCEI

Changing Future Conditions

With increasingly variable precipitation patterns, Wyoming Region 1 may experience more intense rainfall events, increasing the risk of flooding. Changes in the timing of snowmelt can lead to rapid run-off in the spring, causing sudden and significant increases in water flow downstream. As heat evaporates water from soil, creating a dry and hard surface, the soil's reduced ability to hold water can result in more water entering rivers and streams, raising flood risk.

Erosion caused by intense rainfall and runoff can lead to sedimentation in water bodies, obstructing flow paths and exacerbating flood potential during subsequent rain events. Additionally, increased wildfires prompted in part by climate change can further decrease the ability of soil to absorb water, making Wyoming Region 1 more susceptible to flash flood events.

Potential Magnitude (Extent)

Magnitude and severity can be described or evaluated in terms of a combination of the different levels of impact that a community sustains from a hazard event. Specific examples of negative impacts from flooding on Region 1 span a comprehensive range and are summarized as follows:

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

Flood recurrence intervals describe the statistical expectation of inundation frequency. Typical recurrence intervals include the list below, all of which can be experienced in South Dakota:

- 10 years (10% probability of occurring in any given year)
- 25 years (4% probability of occurring in any given year)
- 50 years (2% probability of occurring in any given year)
- 100 years (1% probability of occurring in any given year)
- 500 years (0.2% probability of occurring in any given year)

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

The magnitude and severity of the flood hazard is usually determined by both the extent of impact it has on the overall geographic area, and by identifying the most catastrophic event in the previous flood history (as an example of the losses that could be incurred during such an event). Sometimes this “example” of a catastrophic event is referred to as the “event of record.” The flood of record is almost always correlated to a peak discharge at a gage, because it usually also comes with the worst impacts in terms of property damage, loss of life, etc. The two most damaging events in the Region are used to set the “events of record”, in terms of injuries/deaths and property/agricultural damages. A flood in July of 2008 cost Campbell County one

human life and three injuries, when heavy rains resulted in flash flooding that washed out a culvert, leading to a pickup truck driving into a culvert and crashing. With regards to property damages, Johnson County has the highest losses. A flood in early June of 2015 caused $1,500,000 in property damages in Buffalo, due to heavy thunderstorms and rapid flooding of houses, businesses, and infrastructure. Five homes were severely damaged during this event. Two other incidents in Campbell County resulted in flood deaths in recent years; one occurred on an oil rig site north of Rozet when a flash flood surrounded the site, and the other in Gillette when a man working to clear a drain culvert near an elementary school was pulled through it and all the way under the interstate.

The potential magnitude for a flood event in the Region is overall estimated to be **Limited**. An event of limited magnitude can result in some injuries, a shutdown of critical facilities for over a week, and/or damages to more than 10% of the planning area (in terms of property and agricultural losses). This is consistent with the flood event history in the Region. The flood history indicates that damaging floods have occurred consistently in the planning area, particularly in Johnson, Campbell, and Sheridan Counties.

Vulnerability Assessment

During the Map Modernization period, Sheridan County was one of the areas that received a RiskMAP project. FEMA produced new preliminary floodplain maps for Sheridan in 2012 and then in 2013, and additionally the communities received a Flood Risk Report and Flood Risk Database. The goal of the Flood Risk Report and Flood Risk Database is to help inform and enable communities to take action to reduce flood risk. Through the RiskMAP program, FEMA provides communities with updated DFIRMs and Flood Insurance Studies (FIS) that describe the probability of floods and show flood boundaries and elevations. However, given the regional nature of this plan, an in-house vulnerability assessment that considers loss estimates and population from both FEMA NFHL and Hazus-derived flood layers was performed for all five counties in Region 1, to supplement the type of study that was performed for Sheridan a few years back.

People

Vulnerable populations in Region 1 include residents living in known flood prone areas or near areas vulnerable to flash floods. Certain populations are particularly vulnerable. This may include the elderly and very young; those living in long-term care facilities; mobile homes; hospitals; low-income housing areas; temporary shelters; people who do not speak English well; tourists and visitors; and those with developmental, physical, or sensory disabilities. These populations may be more vulnerable to flooding due to limitations in mobility and accessibility, income, challenges in receiving and understanding warnings, or unfamiliarity with surroundings.

During this Regional Plan's update, an estimate of the population exposed to flooding was created using a GIS overlay of existing Digital Flood Insurance Rate Maps (DFIRMs), or Hazus 100-year flood hazard areas where DFIRM was not available, to determine potentially flooded parcels. The flood-impacted population for each county in the region was then calculated by taking the number of residential units in the 100-year and 500-year floodplains and multiplying that number by the average household size based on the Census Bureau's estimate for the counties. The average household factor was 2.65 for Campbell County, 2.63 for Crook, 2.12 for Johnson, 2.21 for Sheridan, and 2.29 for Weston County. The results for the Region are displayed below in Table 4-38.

Table 4-38 Flood Vulnerable Population Estimate in Region 1

Type of Flood	Total # of Residential Parcels	Vulnerable Population Estimate
1% Annual Chance Flood	805	1,586
0.2% Annual Chance Flood	613	1,177
TOTAL	**1,418**	**2,763**

Source: FEMA NFHL, HAZUS, Census Bureau average household estimates, WSP GIS Analysis

Property

GIS analysis was used to estimate Region 1's potential property losses. The county parcel layers were used as the basis for the inventory of developed parcels. GIS was used to create a centroid, or point, representing the center of each parcel polygon, which was overlaid on the best available floodplain layers. For the purposes of this analysis, the flood zone that intersected the centroid was assigned as the flood zone for the entire parcel. Another assumption with this model is that every parcel with an improvement value greater than zero was assumed to be developed in some way. Only improved parcels, and the value of those improvements, were analyzed and aggregated by jurisdiction, property type and flood zone.

The table also shows loss estimate values which are calculated based upon the improved value and estimated contents value. The estimated contents value is 50% of the improved value for residential properties (150% for industrial and 100% for all other non-residential properties); the total exposure value is the sum of the improved and estimated contents values; the loss estimate is 25% of the total value based on FEMA's depth-damage loss curves. For example, a two-foot flood generally results in about 25% damage to the structure (which translates to an estimated loss of 25% of the structure's replacement value). The summarized results for the Region are shown below in Table 4-39.

Table 4-39 Region 1 Flood Parcel Loss Estimation Summaries

1% Annual Chance						
County	**Improved Parcels**	**Improved Value**	**Est. Content Value**	**Total Exposure**	**Estimated Loss**	**Population**
Campbell	82	$20,212,851	$11,536,642	$31,749,493	$7,937,373	201
Crook	128	$17,503,549	$10,548,293	$28,051,842	$7,012,960	197
Johnson	158	$36,309,543	$25,550,773	$61,860,316	$15,465,079	269
Sheridan	395	$112,197,132	$62,036,629	$174,233,761	$43,558,440	829
Weston	42	$6,854,697	$3,754,641	$10,609,338	$2,652,334	89
Total	**805**	**$193,077,772**	**$113,426,977**	**$306,504,749**	**$76,626,187**	**1,586**
0.2% Annual Chance						
Campbell	39	$18,239,245	$18,239,245	$36,478,490	$9,119,623	72
Crook	39	$7,708,811	$7,708,811	$15,417,622	$3,854,406	89
Johnson	2	$172,734	$172,734	$345,468	$86,367	4
Sheridan	533	$118,385,054	$118,385,054	$236,770,108	$59,192,527	1,012
Weston	-	-	-	-	-	-
Total	**613**	**$144,505,844**	**$144,505,844**	**$289,011,688**	**$72,252,922**	**1,177**
Grand Total	**1,418**	**$337,583,616**	**$257,932,821**	**$595,516,437**	**$148,879,109**	**2,763**

Source: FEMA NFHL, Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Weston County does not have FEMA mapped floodplains in a digital format so 0.2% annual chance floodplain losses were not calculated in this plan.

Based on this analysis, the Region 1 planning area has significant assets at risk to the 100-year and greater floods. There are 805 improved parcels within the 100-year floodplain (1% annual chance), for a total improved value of $193,077,772. There are 613 improved parcels within the 500-year floodplain (0.2% annual chance), for a total improved value of $144,505,844. Overall, Region 1 counties potentially face over $148 million in combined content and building improvement losses from flooding both the 100-year and 500-year floodplain estimations. Approximately $76.6 million of that total is based on damage estimates from the 1% annual chance flood alone, with the remaining $72.2 million in damages resulting from the 0.2% annual chance flood.

NFIP Claims Analysis

Another method of examining the magnitude and severity of flooding in the Region is to examine the damage losses and payments from the National Flood Insurance Program, or NFIP. This information is not comprehensive, because it only reflects the communities which participate in the NFIP, and properties with flood insurance, but it is another way to analyze flood damages in the region. The information below represents the composite of unincorporated and community-specific policies, claims and payments. According to statistics from the National Flood Insurance Program (http://www.fema.gov/policy-claim-statistics-flood-insurance/policy-claim-statistics-flood-insurance/policy-claim-13) there have been a total of 105 flood insurance claims filed between 1/1/1978 and 11/1/2023 in the Region. The total of the payments made on these claims is $359,392. As of 11/1/2023, there were 105 flood insurance policies in force in the Region, for a total coverage of $31,514,000. There are no repetitive loss or severe repetitive loss properties within the Region. More details on National Flood Insurance Program participation can be found within the county annexes.

Crook and Weston Counties' unincorporated areas (and some communities) are not mapped with effective FEMA Flood Insurance Rate Maps and not participating in the NFIP, and therefore have no NFIP policies; .

Table 4-40 NFIP Policy and Insurance Claim Data for Region 1

Counties	Policies	Coverage "Insurance in Force"	# of Claims "Closed Paid Losses"	Paid Losses "$ of closed paid losses"	# of Policies in A Zones
Campbell County	15	$7,078,000	23	$38,090	8
Crook County	4	$1,072,000	0	$0	1
Johnson County	22	$4,617,000	6	$21,905	11
Sheridan County	62	$18,545,000	75	$298,223	22
Weston County	2	$202,000	1	$1,174	1
Grand Total	**105**	**$31,514,000**	**105**	**$359,392**	**43**

Source: FEMA Policy and Claim Statistics http://www.fema.gov/policy-claim-statistics-flood-insurance and State of Wyoming Department of Homeland Security, NFIP Coordinator as of 5/10/2023

The only community in the Region that has participated in the National Flood Insurance Program's voluntary Community Rating System (CRS) is the City of Sheridan, in Sheridan County. The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect

the reduced flood risk resulting from the community actions. The City of Sheridan entered into the CRS on 10/1/95, but as of October 2016 it had rescinded, and remains in this designation as of 2023.

Critical Facilities and Lifelines

GIS analysis of flood hazards in Region 1 indicates that there are 311 critical facilities and/or community assets that are potentially exposed to flood hazards. There are 304 facilities in the 100-year floodplain shown in Table 4-41 and seven in the 500-year floodplain shown in Table 4-42. Counties not listed in the table do not have any identified critical facilities in the flood zone. One limitation to the HIFLD data is a lack of potable water facilities. Gaining access to this type of information would enhance the results of the critical facility risk analysis. Replacement values were not available with the data; thus, an estimate of potential monetary loss could not be performed. Impacts to any of these facilities could have wide ranging ramifications, in addition to property damage and other cascading impacts.

Table 4-41 Critical Facilities at Risk to 1% Flood Hazard (FEMA & Hazus) by County

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	3	15	-	1	1	-	52	**72**
Crook	-	-	2	-	-	1	56	**59**
Johnson	-	-	4	-	-	-	66	**70**
Sheridan	-	-	4	-	-	-	70	**74**
Weston	-	-	-	-	-	-	29	**29**
Total	**3**	**15**	**10**	**1**	**1**	**1**	**273**	**304**

Source: FEMA NFHL, Hazus-MH MR2, HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 4-42 Critical Facilities at Risk to 0.2% Flood Hazard (FEMA) by County

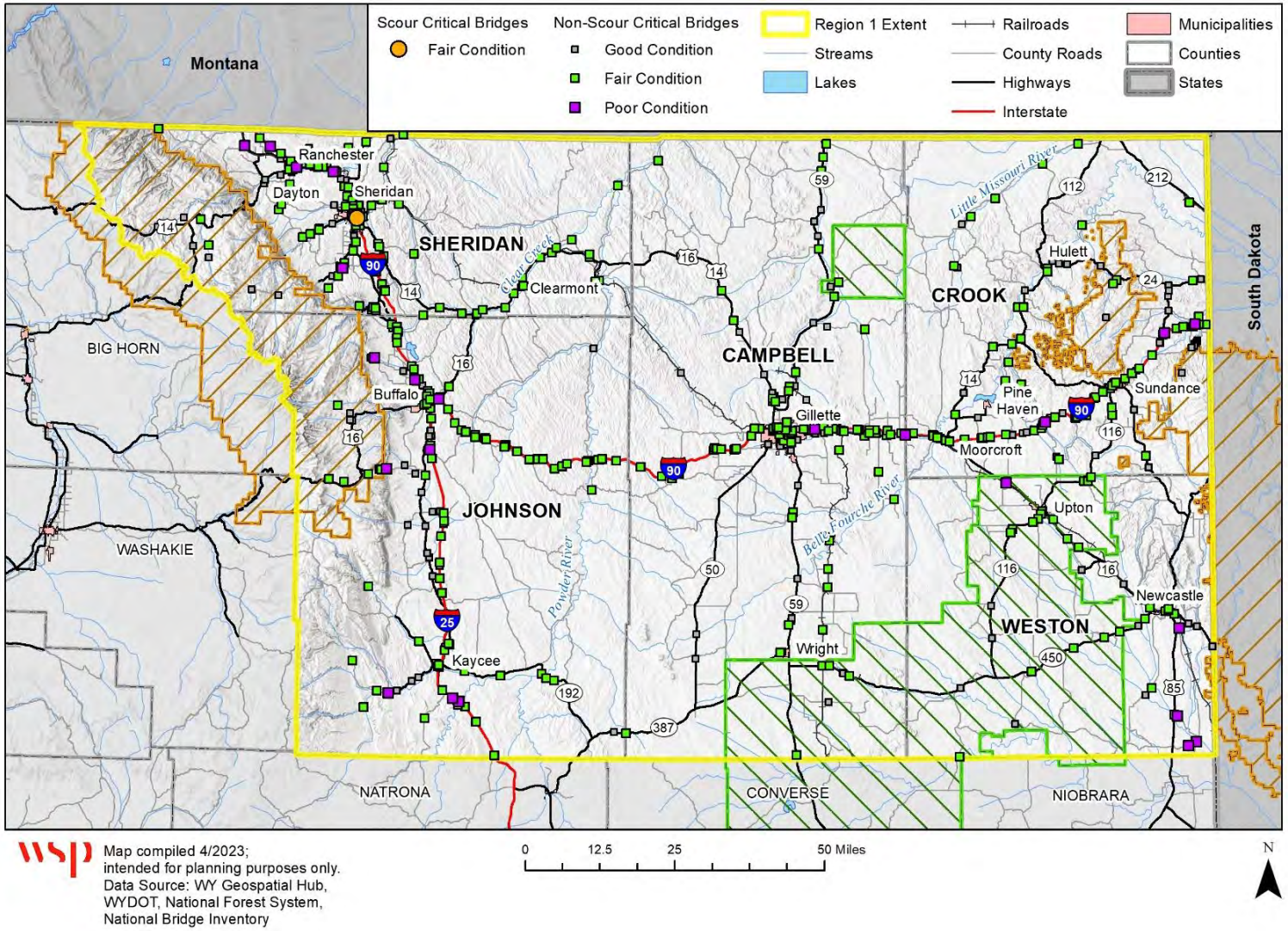
County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	1	-	-	-	-	-	-	**1**
Sheridan	-	2	-	-	-	1	3	**6**
Total	**1**	**2**	**-**	**-**	**-**	**1**	**3**	**7**

Source: FEMA NFHL, HIFLD, National Bridge Inventory, WSP GIS Analysis

Transportation routes could be cut off due to floodwaters, isolating portions of the planning area. These impacts may last after the flood water recedes as flash floods commonly cause extensive damage to roadway infrastructure. For example, Weston County lost a county road bridge due to a wash out during flooding in 2022.

Based on the 2023 National Bridge Inventory (NBI), Region 1 does have a number of bridges of concern, including one fair condition scour critical bridge in Sheridan County (a bridge with a foundation element determined to be unstable for the observed or evaluated scour condition), 28 non-scour poor condition bridges (advanced section loss, deterioration and spalling), and 501 non-scour fair condition bridges (primary structural elements are sound but may have minor section loss, cracking, or spalling). Figure 4-18 shows the locations and condition of bridges throughout Region 1.

Figure 4-18 Region 1 Bridges - Scour Critical and Condition Classification



Economy

Flooding can have a major negative impact on the economy. Based on the flood loss analysis, there are 195 commercial structures worth an estimated $120 million in total value directly at risk to flooding in the 1% and 0.2% annual chance zone, shown in Table 4-43. Based on the loss analysis this could result in approximately $30 million in direct losses. This does not account for other indirect losses such as business interruption, reduced tourism and visitation, lost wages, and other downtime costs.

These indirect losses can also have a significant economic cost. Flood events can cut off customer access to a business as well as close a business for repairs or permanently. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

Table 4-43 Commercial Parcel Analysis at Risk to 1% and 0.2% Annual Chance Flood

County	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss
1% Annual Chance Flood Hazard					
Campbell County	6	$2,860,433	$2,860,433	$5,720,866	$1,430,217
Crook County	53	$3,593,036	$3,593,036	$7,186,072	$1,796,518
Johnson County	29	$12,208,589	$12,208,589	$24,417,178	$6,104,295
Sheridan County	20	$11,876,125	$11,876,125	$23,752,250	$5,938,063
Weston County	2	$75,392	$75,392	$150,784	$37,696
Total	**110**	**$30,613,575**	**$30,613,575**	**$61,227,150**	**$15,306,788**
0.2% Annual Chance Flood Hazard					
Campbell County	6	$6,551,623	$6,551,623	$13,103,246	$3,275,812
Crook County	5	$527,049	$527,049	$1,054,098	$263,525
Sheridan County	74	$22,417,501	$22,417,501	$44,835,002	$11,208,751
Total	**85**	**$29,496,173**	**$29,496,173**	**$58,992,346**	**$14,748,087**
Commercial Total Flood Hazard Risk					
Grand Total	**195**	**$60,109,748**	**$60,109,748**	**$120,219,496**	**$30,054,874**

Source: Campbell County FEMA NFHL 1/2/2008, Sheridan County FEMA NFHL 1/16/2014, Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Environmental and Cultural Resources

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

Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development such as bridge abutments can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

Tourism and outdoor recreation is an important part of the Region's economy. If part of the planning area were significantly damaged by flooding, tourism and outdoor recreation could potentially suffer. Some downtown areas with historic buildings have a risk of flooding, notably in Buffalo and Kaycee in Johnson County.

Development Trends

For NFIP participating communities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. The lack of comprehensive flood hazard mapping in unincorporated areas of Crook, Campbell, Johnson, Weston and Sheridan counties makes floodplain management challenging. No major growth or development in the Region is expected to significantly alter the general area flood risk, but good planning, zoning, and general hazard mitigation practices are always necessary to prevent future development from being heavily impacted by flooding.

Risk Summary and Overall Significance by Jurisdiction

Overall, flooding is a **high** significance hazard in the region, particularly in Johnson, Campbell, and Sheridan Counties. The Region floods, on average, once or twice a year, having damaged homes, infrastructure (roads, railroads, bridges, culverts), and causing agricultural losses in the past. Flood risk varies by jurisdiction and this risk is detailed further in the county annexes.

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Limited	Likely	Limited	Medium
Crook	Limited	Likely	Limited	Medium
Johnson	Significant	Likely	Significant	High
Sheridan	Significant	Likely	Significant	High
Weston	Limited	Likely	Limited	High

4.2.7 Hail

Hazard/Problem Description

Hail causes more than a billion dollars of property damage nationally each year. Damaging hail events occur sporadically throughout Region 1, usually associated with severe summer storms and wind events. Hailstones form when a super-cooled droplet collects a layer of ice and continues to grow, sustained by an updraft. Once the hailstone cannot be held up any longer by the updraft, it falls to the ground. Hail up to 4.25 inches in diameter has been recorded by the NCEI in the Region. Most of this damage is to crops, but hail can also decimate structural sidings, shatter windows, peel paint, and severely damage automobiles and equipment not protected or stored inside.

Hailstones grow two ways: by wet growth or dry growth. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a supercooled drop, the water does not freeze on the ice immediately. Instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape, resulting in a layer of clear ice. Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are "frozen" in place, leaving cloudy ice. Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are "balanced" in an updraft. One can tell how many times a hailstone traveled to the top of

the storm by counting its layers. Hailstones can begin to melt and then re-freeze together, forming large and very irregularly shaped hail.

Geographic Area Affected

Hail can strike anywhere in the Region, and when they do occur hailstorms can impact a significant portion of the Region. Hailstorms occur during severe storms, which are regional in nature. However, just as the amount of precipitation in the form of snow or rain may vary significantly with a single storm, so may the amount, size, and duration of hail within a severe storm.

Past Occurrences

A comprehensive history of damaging hailstorms historically affecting the counties in Region 1 is included in Table 4-44. The data was derived from the monthly Storm Data reports generated and released by the National Oceanic and Atmospheric Administration's National Climate Center. The data is more accurate after doppler radar was introduced into the Region in the 1990s.

NCEI records any hail events with hailstones that are 0.75 inch or larger in diameter, or any hail of a smaller diameter which causes property and/or crop damage, or casualties. According to the NCEI definition, there have been 1,630 separate hail incidents in the region since 1950. Six of those hail incidents caused reported damage or injuries, with a total reported property damage of $78,520,700, and reported crop damage of $45,000. Most public and personal property damage from hail is insured under private property insurance or crop insurance policies, serviced by multiple insurance providers; it is very difficult to get a true cumulative estimate of damage costs caused by hail events. No deaths have been associated with these storms in the region during this timeframe; however, on July 8, 2001 four climbers on Devil's Tower were injured by tennis ball-sized hail. Nationwide, most hail-related injuries are suffered by people caught unsheltered when hail begins to fall. Most hail-related injuries are minor and go unreported. The figures and tables below display past occurrences of hail in the Region.

The HMPCs noted that hail is a serious problem every summer, and the reported damage figures are low. Local media estimated damages from one hailstorm in Gillette in 2010 to be as much as $46 million. The Sheridan Police Department sustained $50,000 in damage from one hailstorm.

Table 4-44 Hail History, Region 1 (1955-2023)

County	Events	Deaths	Injuries	Property Damage	Crop Damage
Campbell	553	0	2	$73,561,500	$0
Crook	461	0	4	$3,349,200	$20,000
Johnson	144	0	0	$40,000	$25,000
Sheridan	194	0	0	$50,000	$0
Weston	278	0	0	$1,520,000	$0
Total:	1630	0	6	$78,520,700	$45,000

Source: NOAA

Figure 4-19 displays the amount of hail events that each county has experienced from 1955-2023. Historically, Campbell County has had more damaging hailstorms, followed by Crook County.

Figure 4-19 Hail Events, 1955-2023

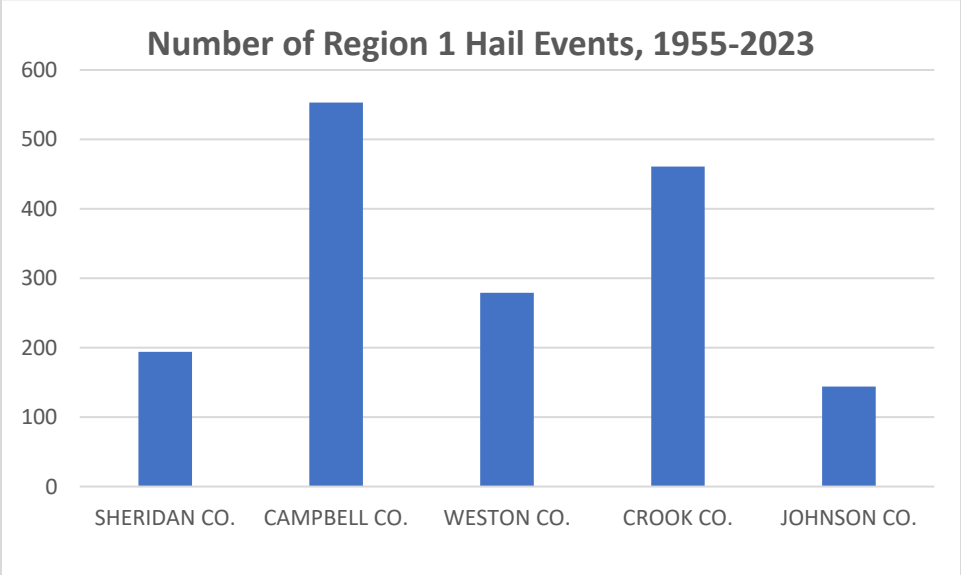


Figure 4-20 Region 1 Hail Events (1950-2021)

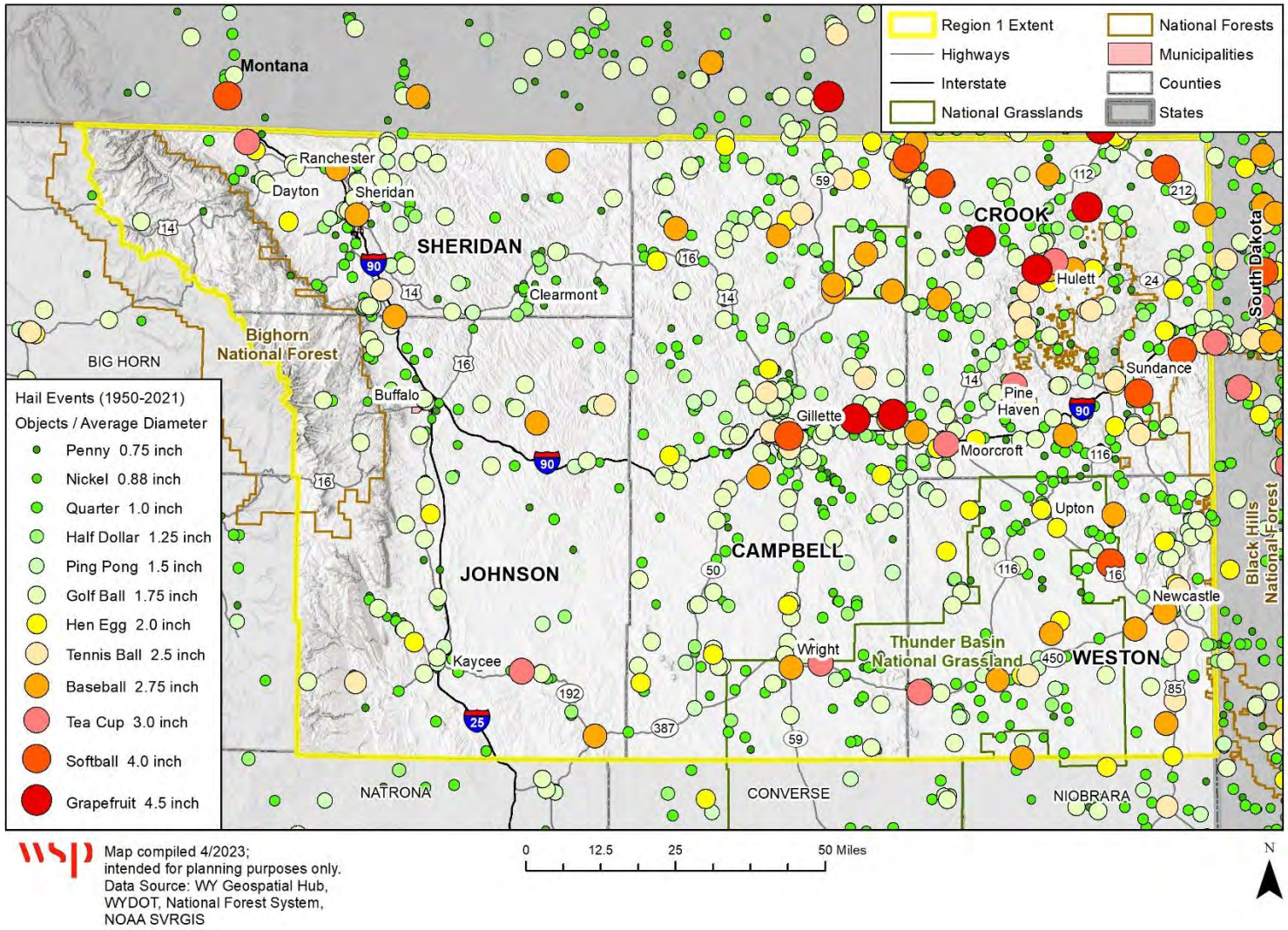


Table 4-45 Region 1 Damaging Hail Events 1987-2023

County	Date	Hail Size	Deaths	Injuries	Property Damage	Crop Damage
Campbell	1987-07-17	0.75	0	0	$500	$0
Crook	1987-08-11	2	0	0	$50,000	$0
Crook	1987-08-11	2	0	0	$50,000	$0
Campbell	1989-06-16	1.5	0	0	$5,000	$0
Johnson	1990-07-15	1.75	0	0	$50,000	$0
Campbell	1992-07-23	1.75	0	0	$50,000	$0
Sheridan	1993-05-04	1	0	0	$50,000	$0
Campbell	1995-07-15	1	0	0	$5,000	$0
Crook	1999-08-11	1.75	0	0	$20,000	$0
Campbell	2000-07-04	2.75	0	0	$10,000	$0
Crook	2001-07-08	2.5	0	4	$10,000	$0
Campbell	2003-06-21	2.75	0	0	$17,000,000	$0
Weston	2005-08-12	1.75	0	0	$10,000	$0
Campbell	2006-08-18	1.75	0	0	$10,000	$0
Crook	2007-06-25	4	0	0	$50,000	$0
Crook	2007-06-25	3.5	0	0	$10,000	$0
Crook	2007-06-25	2.75	0	0	$10,000	$0
Crook	2007-07-18	2.5	0	0	$10,000	$0
Campbell	2008-06-02	2.75	0	0	$30,000	$0
Crook	2009-05-30	1.75	0	0	$20,000	$0
Crook	2009-07-13	2.75	0	0	$400,000	$0
Crook	2009-07-13	4.25	0	0	$200,000	$0
Crook	2009-07-13	4.25	0	0	$30,000	$0
Crook	2009-07-13	2.75	0	0	$10,000	$0
Johnson	2009-07-20	0.88	0	0	$0	$20,000
Campbell	2009-08-07	1.75	0	0	$200,000	$0
Campbell	2010-05-26	1.75	0	0	$46,000,000	$0
Johnson	2010-06-20	2.75	0	0	$10,000	$0
Campbell	2010-06-30	2.5	0	0	$10,000	$0
Crook	2010-07-19	1.75	0	0	$800,000	$0
Weston	2010-07-19	2	0	0	$700,000	$0
Campbell	2010-07-19	4.25	0	0	$100,000	$0
Weston	2010-07-19	1.5	0	0	$20,000	$0
Campbell	2010-07-19	2.75	0	0	$10,000	$0
Campbell	2011-06-12	1.25	0	0	$100,000	$0
Crook	2011-06-12	1.25	0	0	$30,000	$0
Weston	2011-07-02	1.75	0	0	$250,000	$0
Crook	2011-07-02	2.5	0	0	$10,000	$0

County	Date	Hail Size	Deaths	Injuries	Property Damage	Crop Damage
Crook	2011-07-27	1.75	0	0	$100,000	$0
Campbell	2011-08-05	1	0	0	$10,000	$0
Crook	2012-06-22	2.75	0	0	$600,000	$0
Crook	2012-06-22	2.75	0	0	$20,000	$0
Weston	2012-06-22	1.5	0	0	$20,000	$0
Crook	2012-08-02	1.75	0	0	$50,000	$0
Crook	2012-08-02	1.75	0	0	$10,000	$0
Crook	2013-05-17	1.75	0	0	$200,000	$0
Weston	2013-05-27	1.75	0	0	$500,000	$0
Johnson	2013-07-03	0.88	0	0	$0	$10,000
Crook	2013-07-06	1.75	0	0	$10,000	$0
Crook	2013-07-22	1.5	0	0	$150,000	$0
Crook	2013-07-22	1.75	0	0	$50,000	$0
Crook	2013-07-22	1.25	0	0	$10,000	$0
Weston	2013-07-22	1.75	0	0	$10,000	$0
Campbell	2013-08-01	1.75	0	0	$10,000,000	$0
Campbell	2013-08-01	1.75	0	0	$10,000	$0
Campbell	2013-08-02	1.5	0	0	$50,000	$0
Campbell	2013-08-03	1.75	0	0	$10,000	$0
Crook	2013-08-03	1	0	0	$0	$20,000
Campbell	2013-08-07	1.75	0	0	$10,000	$0
Weston	2013-08-07	1.75	0	0	$10,000	$0
Campbell	2013-09-08	1.5	0	0	$10,000	$0
Campbell	2013-09-08	4.25	0	0	$10,000	$0
Crook	2014-05-22	2.5	0	0	$300,000	$0
Crook	2014-05-22	2	0	0	$200,000	$0
Johnson	2014-06-10	3	0	0	$10,000	$0
Crook	2014-06-17	1.5	0	0	$150,000	$0
Weston	2014-07-22	2.75	0	0	$10,000	$0
Crook	2015-06-24	1.75	0	0	$10,000	$0
Crook	2016-07-16	1.25	0	0	$200	$0
Johnson	2018-07-27	1.75	0	0	$10,000	$0
Crook	2019-05-26	2	0	0	$2,000	$0
Weston	2019-08-14	1.5	0	0	$5,0000	$0

Source: NOAA

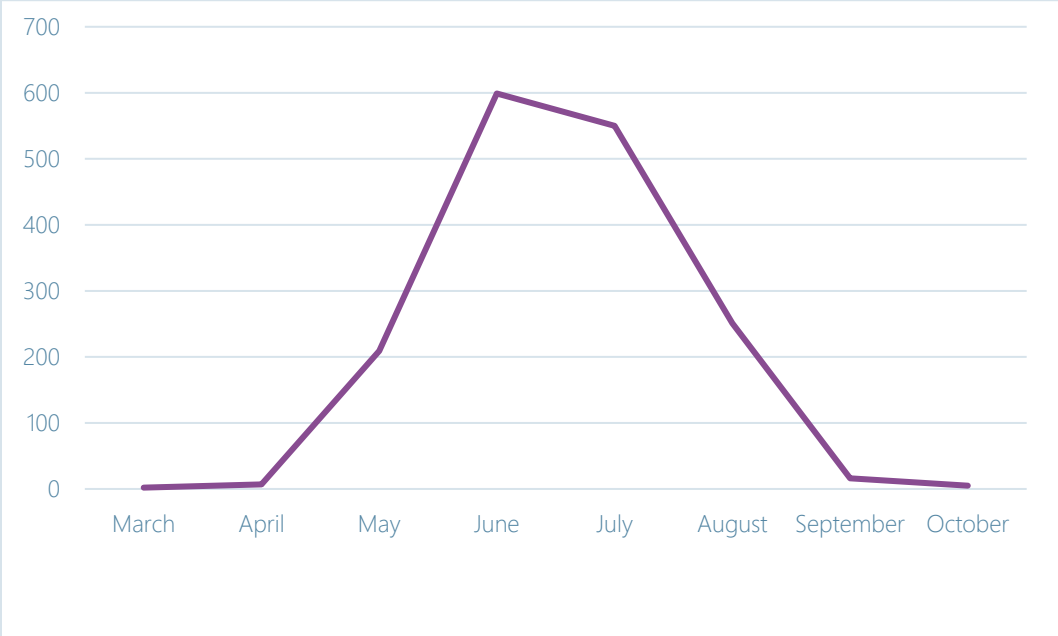
Hail events in Region 1 are most common during the months of May through August, most often between 1 pm and 11 pm. Hail with a diameter less than two inches is most common, although hail up to four inches has been recorded in the Region. While most historical hailstorms in the Region don't result in major damage, recordable damage to property and crops could be in the hundreds of thousands of dollars, while extreme events could result in millions of dollars of damage. Insured loss related to hailstorms

could be in the millions, depending on the location and parameters of the storm. Since our last updated plan in 2016, Region 1 has experienced several new hail events that caused nearly $17,000 in property damages. It was reported that these damages were due to a thunderstorm that produced large hail and a hail that broke windows in a house.

Table 4-46 Region 1 Summary of Crop Damage Due to Hail 2007-2021

Region 1 Crop Loss Events (2007-2021)			
County Impacted	Total Number of Events	Total Crop Damage	Net Acres Lost
Campbell	42	$523,039	11,100.12
Crook	49	$611,420.18	13,757.28
Johnson	1	$3,996.00	55.4
Sheridan	10	$238,126	2,511.90
Weston	26	$184,001.05	2,892.44

Figure 4-21 Number of Region 1 Hail Events by Month, 1950-2022



Source: NOAA

Frequency/Likelihood of Occurrence

Region 1 has experienced 77 separate damaging hail events between 1950 and 2023, which is roughly one incident a year. Thus, the Region is **Likely** to suffer damaging hailstorms in the future. Based on historical data, an average hail event in Region 1 occurs in the summer months, with a peak in the number of events in June and happens in the afternoons around 2:00 p.m., as shown in Figure 4-37 and Figure 4-38. The NCEI data shows that hail events in Region 1 are typically less than 1 inch diameter. There were no recorded incidents of hail larger than 1.75 inches in diameter in the NCEI dataset.

Changing Future Conditions

As the atmosphere warms further due to climate change, the increased heat provides more energy for severe storms. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s and cost 14 times as much in economic losses. Historical data shows that the probability of severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration, and frequency of storm events. All these impacts could have significant economic consequences.

Potential Magnitude (Extent)

Most public and personal property damage from hail is insured under private property insurance or crop insurance policies, serviced by multiple insurance providers; it is very difficult to get a true cumulative estimate of damage costs caused by hail events. Data collection regarding dollar damage to public and personal property holds significant gaps for this reason. There have been no FEMA disaster or state declarations for the counties in the Region related to damaging hail, and no USDA disaster declarations as a result of hail damage were found. Agricultural losses and claims met by crop insurance carriers due to hail damage are difficult to determine. Since most hail damage is insured, the overall impact for most of the Region is Negligible, but given Campbell County's history of more damaging hailstorms, the potential impact for that County is Limited.

The National Weather Service (NWS) classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4-47 indicates the hailstone measurements utilized by the NWS. There is no clear distinction between storms that do and do not produce hailstones. Nearly all severe thunderstorms produce hail aloft, though it may melt before reaching the ground. Multi-cell thunderstorms produce many hailstones, but not usually the largest hailstones. In the life cycle of the multi-cell thunderstorm, the mature stage is relatively short so there is not much time for growth of the hailstone. Supercell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud. In general, hail 2 inches (5 cm) or larger in diameter is associated with supercells (a little larger than golf ball size, which the NWS considers to be 1.75 inch.). Non-supercell storms are capable of producing golf ball sized hail.

The largest size of hail reported by the NCEI in Region 1 was 4.25 inches, or roughly grapefruit sized. The NCEI reported 4 different events with this sized hail, in Campbell and Crook Counties.

Table 4-47 National Weather Service Hail Severity

Severity	Description	Hail Diameter Size (in inches)
Non-Severe Hail Does not typically cause damage and does not warrant severe thunderstorm warning from NWS.	Pea	1/4"
	Marble/mothball	1/2"
	Penny	3/4"
	Nickel	7/8"
Severe Hail Research has shown that damage occurs after hail reaches around 1" in diameter and larger. Hail of this size will trigger a severe thunderstorm warning from NWS.	Quarter	1" (severe)
	Half Dollar	1 1/4"
	Walnut/Ping Pong Ball	1 1/2"
	Golf Ball	1 3/4"
	Hen Egg/Lime	2"

Severity	Description	Hail Diameter Size (in inches)
	Tennis Ball	2 1/2"
	Baseball	2 3/4"
	Teacup/Large Apple	3"
	Softball	4"
	Grapefruit	4 1/2"

1. Source: National Weather Service (NWS)

Vulnerability Assessment

Hail can strike anywhere in the region, and all structures are vulnerable. Hail can damage roofs, shingles, windows, siding, unsheltered vehicles and any other property unprotected from the storm. People without shelter can also be injured by exposure to hailstorms, though there is very little historical reference for this occurring in the Region. Most injuries caused by hail are minor, and go unreported. Higher levels of property damage are expected in more urban areas, and higher levels of crop damage would be expected in rural areas with more farmland. The HMPC emphasized that hail can ruin crops and have economic impacts to roofs and vehicles all throughout the region.

People

Exposure is the greatest danger to people from hail for those caught outside in the open without shelter. This includes outdoor enthusiasts, outdoor workers, and homeless populations. Large hail has the potential to cause significant bruising, concussions, the potential for broken bones, and even death. The impacts of hail on vulnerable populations can be more severe. People without shelter can also be injured by exposure to hailstorms, though there is very little historical reference for this occurring in the Region. Most injuries caused by hail are minor and go unreported.

Property

Hail can strike anywhere in the region and all structures are vulnerable. Hail can damage roofs, shingles, windows, siding, unsheltered vehicles, and any other property unprotected from the storm. Hail causes more than a billion dollars of property damage nationally each year. Most of this damage is to crops, but hail can also decimate structural sidings, shatter windows, peel paint, and severely damage automobiles and equipment not protected or stored inside

Critical Facilities and Lifelines

Hail can lead to the temporary incapacitation of roads when small hail stones build up so deep that they block roads. Hail has also been observed to block storm drains and prevent proper runoff, potentially resulting in flooding as a secondary hazard. Most structures, including the Region's critical facilities, should be able to provide adequate protection from hail but the structures could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

Economy

The economic impact from hail can be severe on impacted areas, and potentially long lasting. Reported direct damages to crops and property have totaled over $78,615,700 in Region 1 over the last 71 years, but severe indirect economic impacts can also be felt through businesses forced to close for repairs.

Environmental and Cultural Resources

While hail is a natural environmental process, it can cause significant environmental damage, breaking tree limbs, damaging trees, and other plants in bloom, and destroying crops. Some cultural and historic properties may also potentially be at risk of damage from hail.

Development Trends

Hail can strike anywhere in the Region, so any growth or new development in the counties will increase exposure to hail damage. Insurance will be an important tool to offset the potentially substantial dollar losses associated with hail. Areas with high concentration of infrastructure are likely to see greatest economic losses from damages caused by hail events.

Risk Summary and Overall Significance by Jurisdiction

The counties in Region 1 will continue to experience hail on a regular basis. Hail damage to property is expected to be highest in the municipalities; much of the damage to both property and crops is covered under insurance policies.

Table 4-48 Hail Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential	County
Campbell	Significant	Likely	Limited	High
Crook	Significant	Likely	Negligible	Medium
Johnson	Significant	Likely	Negligible	Medium
Sheridan	Significant	Likely	Negligible	High
Weston	Significant	Likely	Negligible	High

4.2.8 Hazardous Materials

Hazard/Problem Description

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

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

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

- Explosives
- Compressed gasses: flammable, non-flammable compressed, poisonous
- Flammable liquids: flammable (flashpoint below 141 degrees Fahrenheit) combustible (flashpoint from 141 - 200 degrees)

- Flammable solids: spontaneously combustible, dangerous when wet
- Oxidizers and organic peroxides
- Toxic materials: poisonous material, infectious agents
- Radioactive material
- Corrosive material: destruction of human skin, corrodes steel

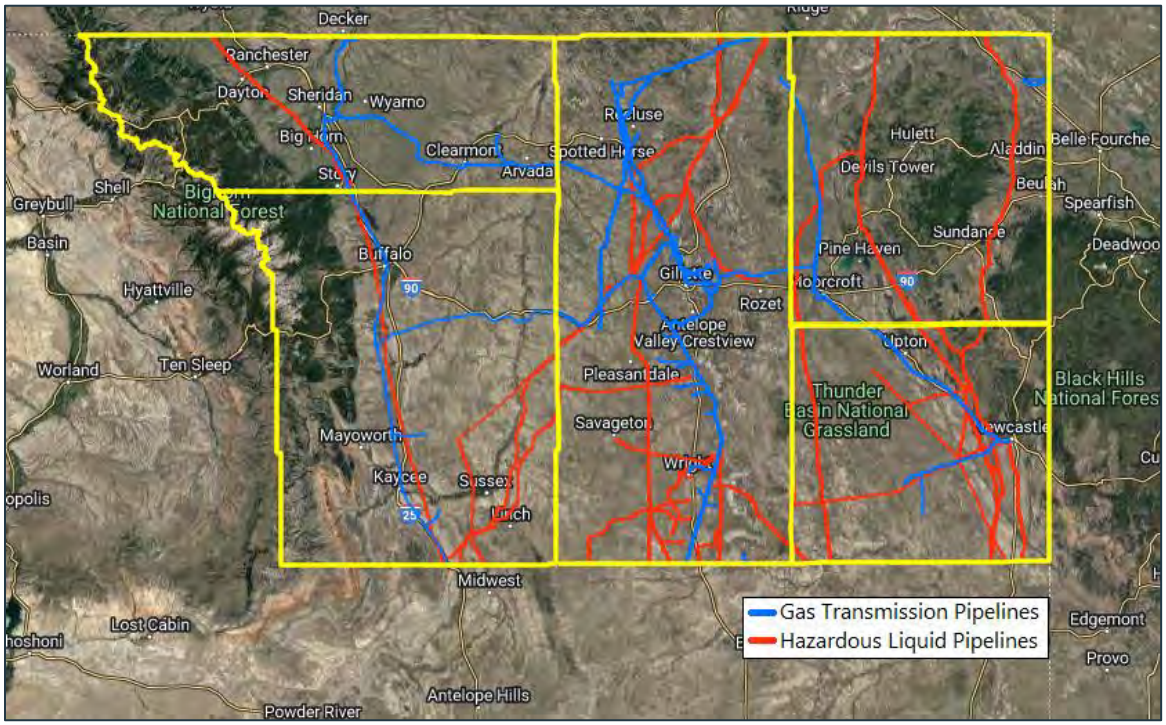
Region 1 is home to several oil fields, gas plants, refineries, propane storage facilities, mines, and an ammonium nitrate facility. Numerous highways, rail lines, and pipelines run across the Region, creating a likely potential for hazardous materials releases. A commodity flow study being conducted on I-90 and I-25 in Johnson County this summer will provide more detailed data on the type and quantity of hazardous materials being transported through the Region on the Interstates.

Geographical Area Affected

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

In transit, hazardous materials generally follow major transportation routes where possible (including road, rail and pipelines), creating a risk area immediately adjacent to these routes. Figure 4-22 below showcases the gas and hazardous liquid pipelines for the three counties in Region 1 with the highest hazardous material incidents.

Figure 4-22 Region 1 Gas and Hazardous Liquid Pipeline Locations

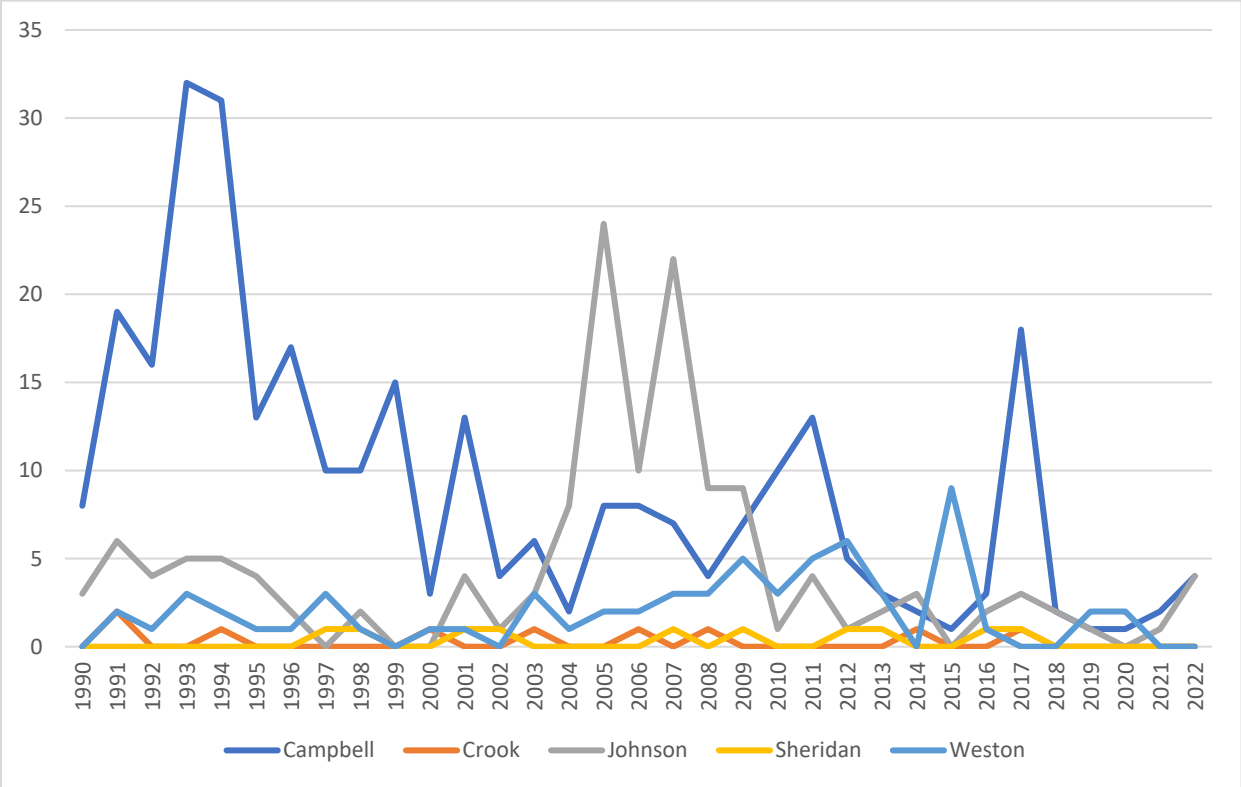


Source: https://pvnpms.phmsa.dot.gov/PublicViewer/

Past Occurrences

There are a variety of mechanisms to get an idea of the number and types of historical hazardous materials spills in the Region. One such repository is the catalog of hazardous materials spill and accident reports at the National Response Center (NRC) as part of the Right to Know Network (RTK NET). The figure below shows a 32 year record for reported incidents in Region 1.

Figure 4-23 Hazardous Materials Spills/ Accidents Reported to the NRC for Region 1: 1990-2022



Source: https://nrc.uscg.mil/

According to the data, during the time period between 1990 and 2022 the Region saw on average 16 NRC-reported incidents per year, which means that most counties can reasonably expect multiple hazardous materials responses annually. The more extensive oil and gas and mining operations in Campbell County make it the more prone to incidents than other counties in the Region. The county data is further broken down in the table below:

Table 4-49 NRC-Reported Incidents by County: 1990-2022

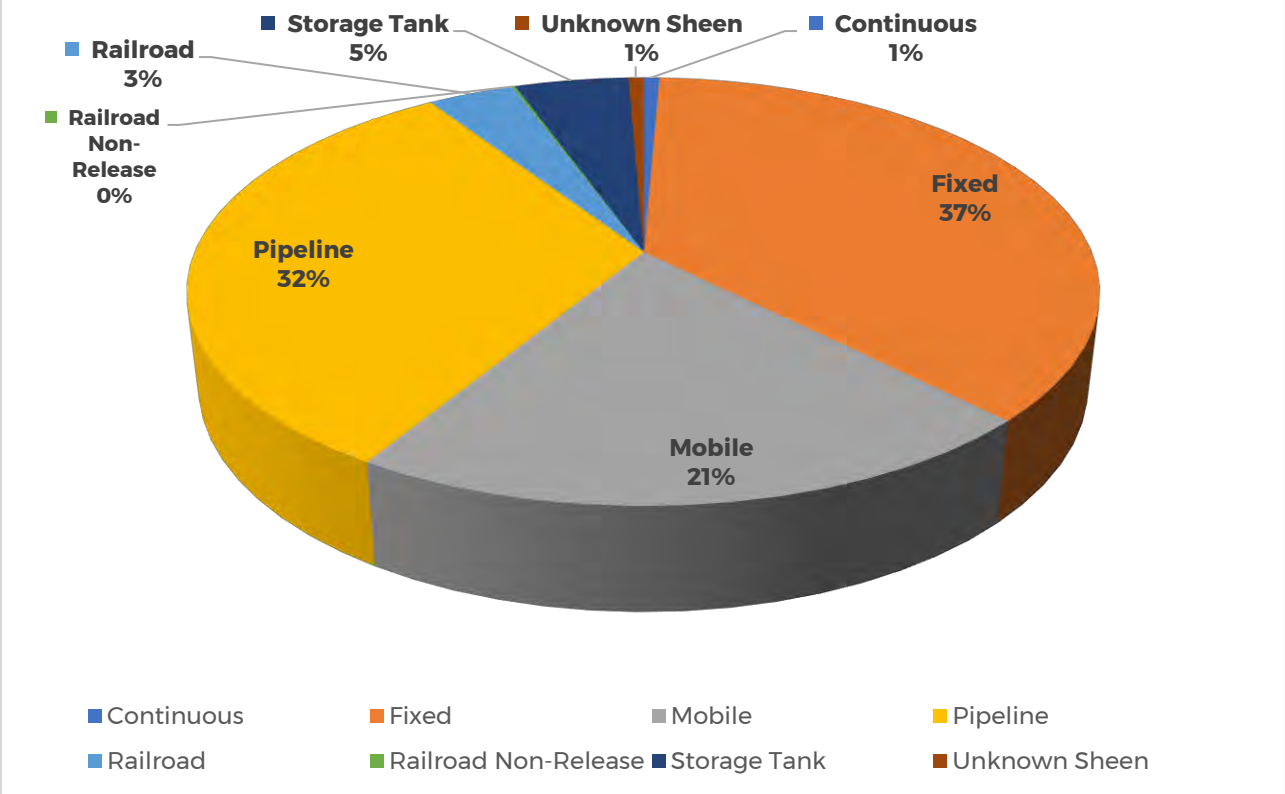
Year	Campbell	Crook	Johnson	Sheridan	Weston	Total
1990	8	0	3	0	0	**11**
1991	19	2	6	0	2	**29**
1992	16	0	4	0	1	**21**
1993	32	0	5	0	3	**40**
1994	31	1	5	0	2	**39**
1995	13	0	4	0	1	**18**

Year	Campbell	Crook	Johnson	Sheridan	Weston	Total
1996	17	0	2	0	1	**20**
1997	10	0	0	1	3	**14**
1998	10	0	2	1	1	**14**
1999	15	0	0	0	0	**15**
2000	3	1	0	0	1	**5**
2001	13	0	4	1	1	**19**
2002	4	0	1	1	0	**6**
2003	6	1	3	0	3	**13**
2004	2	0	8	0	1	**11**
2005	8	0	24	0	2	**34**
2006	8	1	10	0	2	**21**
2007	7	0	22	1	3	**33**
2008	4	1	9	0	3	**17**
2009	7	0	9	1	5	**22**
2010	10	0	1	0	3	**15**
2011	13	0	4	0	5	**22**
2012	5	0	1	1	6	**13**
2013	3	0	2	1	3	**9**
2014	2	1	3	0	0	**6**
2015	1	0	0	0	9	**10**
2016	3	0	2	1	1	**7**
2017	18	1	3	1	0	**23**
2018	2	0	2	0	0	**4**
2019	1	0	1	0	2	**4**
2020	1	0	0	0	2	**3**
2021	2	0	1	0	0	**3**
2022	4	0	4	0	0	**8**
Yearly Avg.	**9.0**	**0.3**	**4.4**	**0.3**	**2.0**	**16.0**

Source: https://nrc.uscg.mil/

The NRC also tracks incidents by type. The following figure shows the percentage of each type of incident over the 32-year period between January 1990 and December 2022.

Figure 4-24 Hazardous Materials Incidents Reported to the NRC by Type - Region 1: 1990-2022



Source: https://nrc.uscg.mil/

In addition to local first responders, eight Regional Emergency Response Teams (RERT) across the State of Wyoming respond to a variety of incidents, including those incidents involving hazardous materials. The Region 1 RERT is located in Gillette, in Campbell County.

According to the HMPCs, small-level hazardous materials incidents occur frequently throughout the year in Region 1. During discussions, the committees noted roads, rail and pipelines throughout the Region. Uranium shipments traverse several of the counties in the Region; while these shipments are regarded as relatively low-risk, the frequency of shipments may increase once the new uranium processing plant starts up. Johnson County expressed concerns over oil pipeline ruptures, and fires at coal bed methane compressor stations. Campbell County reported the main category of hazmat transported through their County are flammables; crude oil and other flammables are also the most numerous at fixed facilities. Crook County recommended upgrading this hazard to High significance, from Medium in their previous mitigation plan.

Frequency/Likelihood of Future Occurrence

The Region experiences multiple hazardous materials incidents each year, with various degrees of impact; there is effectively a 100% chance that the Region will see a hazardous materials incident in any given year, making the likelihood of occurrence **highly likely**. Hazardous material spills and releases, both from fixed facilities and during transport, will continue to occur in each county in Region 1 annually.

Changing Future Conditions

Changes in future conditions are unlikely to impact the rates of occurrence for human-caused hazards, such as hazardous material incidents. However, it is possible that an increase or change in the occurrence of other hazards, such as severe storms and fire events, may increase the likelihood of an accidental hazardous materials releases from transportation incidents.

Potential Magnitude (Extent)

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

- Injury
- Loss of life (human, livestock, fish and wildlife)
- Evacuations
- Property damage
- Air pollution
- Surface or ground water pollution/contamination
- Interruption of commerce and transportation

Numerous factors go into the ultimate impacts of a hazardous materials release, including method of release, the type of material, location of release, weather conditions, and time of day. This makes it difficult to nail down precise impacts. Materials found in Region 1 will have at least one of the impacts listed above, and probably more.

Vulnerability Assessment

Region 1 has energy pipelines, railroad tracks which carry many types of hazardous materials, and both state and Interstate highways running through its boundaries. A variety of hazardous materials originating in the Region or elsewhere are transported along these routes, and could be vulnerable to accidental spills. Consequences can vary depending on whether the spill affects a populated area vs an unpopulated but environmentally sensitive area.

People

Hazardous materials incidents can cause injuries, hospitalizations, and even fatalities to people nearby. People living near hazardous facilities and along transportation routes may be at a higher risk of exposure, particularly those living or working downstream and downwind from such facilities. For example, a toxic spill or a release of an airborne chemical near a populated area can lead to significant evacuations and have a high potential for loss of life.

In addition to the immediate health impacts of releases, a handful of studies have found long term health impacts such as increased incidence of certain cancers and birth defects among people living near certain chemical facilities. However there has not been sufficient research done on the subject to allow detailed analysis.

Property

The impact of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e., liquid spill) may also be limited to the extent of the spill and remediated if needed. A blanket answer for potential impacts is hard to quantify, as different chemicals may present different impacts and issues. Property within a half mile in either direction of designated hazardous materials routes is at increased risk of impacts. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to property. However, some larger incidents involving pipelines, railroads,

or explosive materials may cause significant and overwhelming damage to the surrounding communities.

No specific hazardous materials routes or route restrictions are designated in Region 1; any routes used to carry hazardous materials introduce an element of risk of materials release to the area immediately adjacent to them. The Region noted that many petroleum and other flammable products are transported by truck and rail, and many have mixed payloads that don't list material amounts.

Critical Facilities and Lifelines

Impacts of hazardous material incidents on critical facilities are most often limited to the area or facility where they occurred, such as at a transit station, airport, fire station, hospital, or railroad. However, they can cause long-term traffic delays and road closures resulting in major delays in the movement of goods and services. These impacts can spread beyond the planning area to affect neighboring counties, or vice-versa. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to critical facilities.

The Right-to-Know Network lists 32 licensed hazardous waste handlers in Region 1, as broken down in Table 4-50. There are 18 RMP facilities located in Region 1, as noted in Table 4-51 below. Some of these are discussed in more detail in the Annexes.

Table 4-50 Hazardous Materials Handlers in Region 1

County	Treatment, Storage or Disposal	Large Quantity Generator	Transporter	Total
Campbell	0	1	14	15
Crook	0	0	1	1
Johnson	0	0	3	3
Sheridan	0	0	4	4
Weston	0	7	2	9
Total	**0**	**8**	**24**	**32**

Source: http://www.rtknet.org/db/erns

Table 4-51 Risk Management Plan (RMP) Facilities in Region 1

County	Community	Number of Facilities
Campbell	Gillette	9
Campbell	Wright	1
Crook	Moorcroft	4
Johnson	NA	0
Sheridan	Sheridan	2
Weston	Newcastle	2
	Total	**18**

Source: http://www.rtknet.org/db/erns

Economy

Potential losses can vary greatly for hazardous material incidents. For even a small incident, there are cleanup and disposal costs. In a larger scale incident, cleanup can be extensive and protracted. There can be deaths or injuries requiring doctor's visits and hospitalization, disabling chronic injuries, soil and water contamination can occur,

necessitating costly remediation. Evacuations can disrupt home and business activities. Large-scale incidents can easily reach $1 million or more in direct damages.

Environmental and Cultural Resources

Hazardous material incidents may affect a small area at a regulated facility or cover a large area outside such a facility. Widespread effects occur when hazards contaminate the groundwater and eventually the municipal water supply, or they migrate to a major waterway or aquifer. Impacts on wildlife and natural resources can also be significant. These types of widespread events may be more likely to occur during a transportation incident, such as a pipeline spill, and can have far reaching and devastating impacts on the natural environment and habitats.

Development Trends

Future development is expected to increase the number of people potentially exposed to the impacts of hazardous materials incidents. The number of hazardous materials that are stored, used, and transported across the County may continue to increase over the coming years if regional growth continues. However, according to the 2021 Wyoming State Hazard Mitigation Plan, the number of hazardous materials incidents occurring annually have been trending downward since a statewide peak in 2005.

Risk Summary and Overall Significance by Jurisdiction

Stationary facilities with hazardous materials are identified and mapped throughout the Region. Transportation routes are also identified. Special care should be taken to cross-reference any new development areas with identified sources for potential hazardous materials incidents.

Table 4-52 Hazardous Materials Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Significant	Highly Likely	Limited	High
Crook	Significant	Likely	Limited	High
Johnson	Limited	Highly Likely	Limited	Medium
Sheridan	Significant	Highly Likely	Limited	Medium
Weston	Significant	Highly Likely	Limited	Medium

4.2.9 High Winds and Downbursts

Hazard/Problem Description

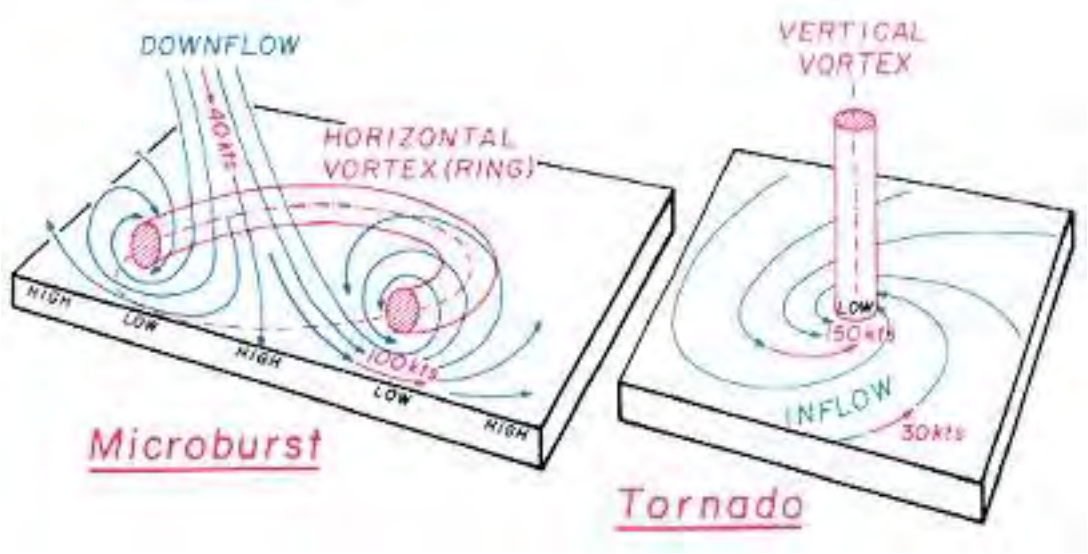
Wind is a nearly constant presence in Wyoming, and can often be overlooked as a hazard. Wyoming's wind is also becoming a positive economic factor, as renewable wind energy is developed around the state.

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

thunderstorm. Microbursts and macrobursts are categories of downbursts, classified by length of duration, velocity of wind, and radius of impact.

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

Figure 4-25 Schema of Microburst and Tornado



Source: www.erh.noaa.gov

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

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

Figure 4-26 Aerial Image of Downburst Damage

Source: T. Fujita

Geographical Area Affected

High winds are common throughout the planning area. Note that while the number of non-thunderstorm high wind events reported in the counties of Region 1 are low, the residents of the area are used to high winds and may be less likely to report them as an "event" compared to other parts of the country.

Past Occurrences

In the counties in Region 1, most documented wind events causing damage typically range between 50 and 76 mph; max wind speeds of up to 91 mph have been recorded. It should be noted that the data is limited by what the NCEI is able to record, and what equipment was in place at the time, and that the timespan of available records for each county differs. The HMPCs observed that the number of high wind events seem to be increasing in recent (2015-2018) years, possibly due to the jet stream dipping further south. Weston County noted a wind event in 2016 resulted in downed power lines and significant damage in Upton and Newcastle.

Table 4-53 Summary of Wind Weather Events and Impacts

Region 1 (1950-2022)						
Total Number of Wind Events*	Total Property Damage	Total Crop Damage	Total Fatalities	Total Injuries	Average Recorded Wind Speed (Knots)	Max Recorded Wind Speed (knots)
1327	$2,416,700	$5,000	0	8	55	91
Campbell County (1950-2022)						
464	$1,201,600	$5,000	0	7	55	91
Crook County (1950-2022)						
306	$547,000	$0	0	0	54	75

Region 1 (1950-2022)						
Johnson County (1950-2022)						
180	$36,500	$0	0	0	55	70
Sheridan County (1950-2022)						
186	$13,000	$0	0	0	57	83
Weston County (1950-2022)						
191	$618,600	$0	0	1	52	90

Source: NOAA; *It's important to note that more than one event may be associated with a single storm

While high winds can occur anytime, they are most common in the Region during the months of May through September, and between 3:00 and 10:00 pm.

Figure 4-27 Wind Events, Wyoming Region 1, 1950-2022

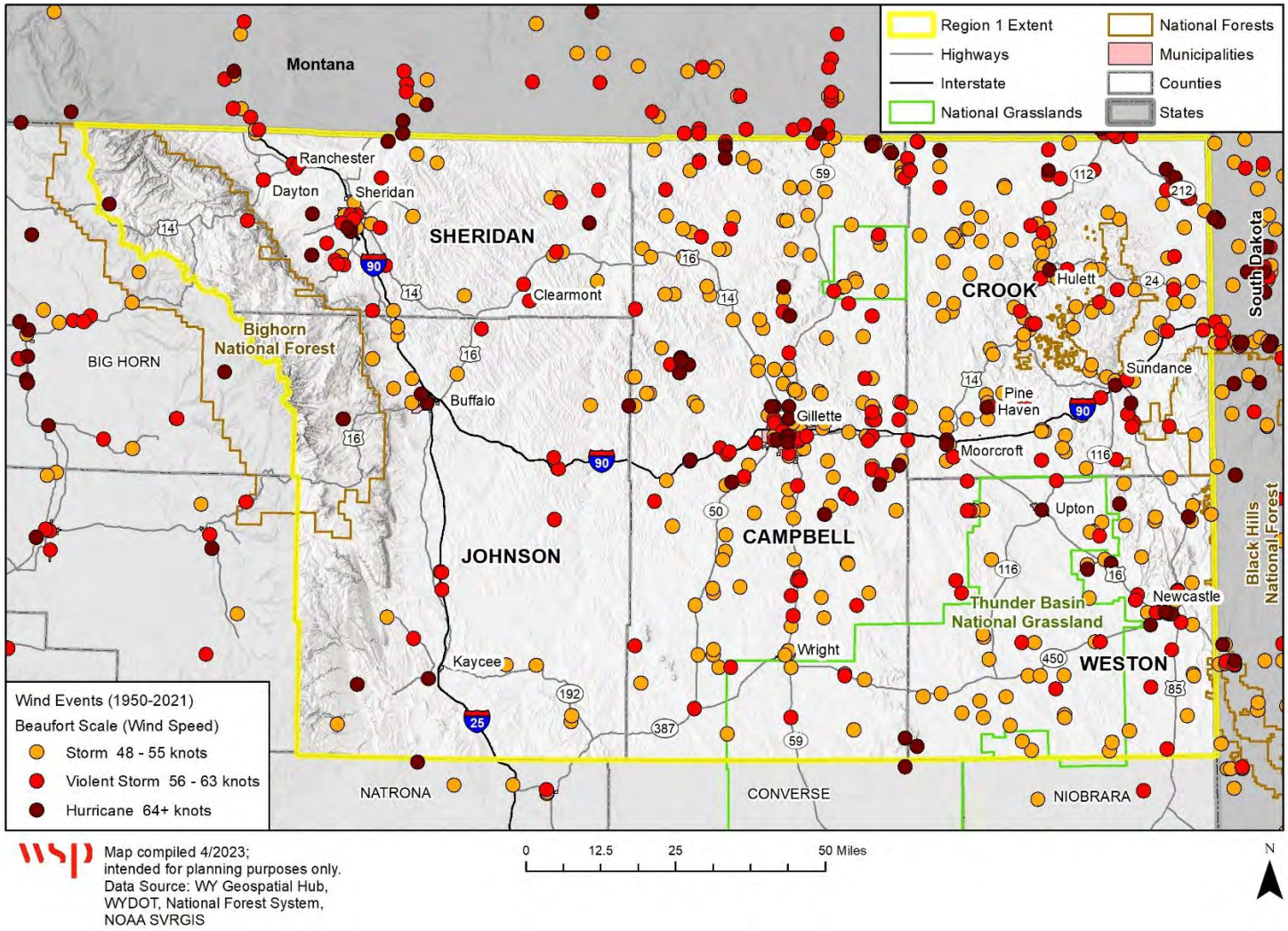
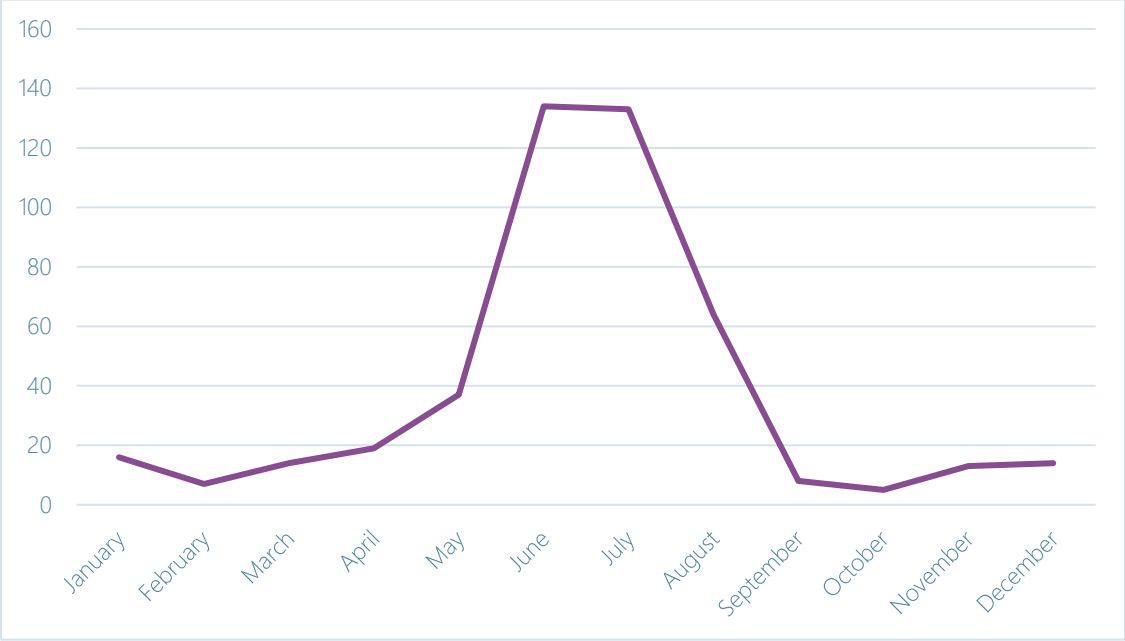


Figure 4-28 Number of Region 1 High Wind Events by Month, 1950-2022



Source: NOAA

Frequency/Likelihood of Future Occurrences

NOAA records 1,327 confirmed and documented high wind incidents specifically impacting the Region, or zones tied to the Region since 1950; it should be noted that as technology has improved, the numbers of incidents recorded in more recent years have gone up dramatically.

Total recorded data for Region 1 averages to 8.6 recorded incidents per year. This trend is expected to continue, and the region can expect multiple high wind incidents every year for the foreseeable future.

Changing Future Conditions

There presently is not enough data or research to quantify the magnitude of potential change that changing future conditions may have on windstorms. Future updates to the mitigation plan should include the latest research on how the windstorm hazard frequency and severity could change. The level of significance of this hazard should be revisited over time.

Potential Magnitude (Extent)

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Windstorms in the Region are rarely life threatening, but do disrupt daily activities, cause damage to buildings, and structures, and increase the potential for other hazards, such as wildfire; therefore, magnitude of wind is ranked as **limited**. Winter winds can also cause damage, close highways (blowing snow), and induce avalanches. Winds can also cause trees to fall, particularly those killed by pine beetles or wildfire, creating a hazard to property or those outdoors.

Damaging wind is measured using the Beaufort Wind Scale as shown in Table 4-54. This scale only reflects land-based effects and does not take into consideration the effects of wind over water. Winds up through Beaufort 12 can be experienced in the Region.

Table 4-54 Beaufort Wind Scale

Beaufort Number	Description	Windspeed (MPH)	Land Conditions
0	Calm	<1	Calm. Smoke rises vertically.
1	Light air	1 – 3	Wind motion visible in smoke.
2	Light breeze	3 – 7	Wind felt on exposed skin. Leaves rustle.
3	Gentle breeze	8 – 12	Leaves and smaller twigs in constant motion.
4	Moderate breeze	13 – 17	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	18 – 24	Branches of a moderate size move. Small trees begin to sway.
6	Strong breeze	25 – 30	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	High wind, Moderate gale, Near gale	31 – 38	Whole trees in motion. Effort needed to walk against the wind. Swaying of skyscrapers may be felt, especially by people on upper floors.
8	Gale, Fresh gale	39 – 46	Some twigs broke from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	47 – 54	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over. Damage to circus tents and canopies.
10	Storm, Whole gale	55 – 63	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	Violent storm	64 – 72	Widespread vegetation damage. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	Hurricane	≥ 73	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris may be hurled about.

Source: National Oceanographic and Atmospheric Association

Per NCEI, the most damaging event in the Region caused $200,000 damage to property; the Region has only seen crop damage due to one storm, which caused $4,000 in damage. These incidents can be used as worst case scenarios, though more damage could occur with the right combination of factors.

The following maps show annual average wind speeds across the US and across Wyoming (Figure 4-29 and Figure 4-30). The blue box corresponds to the planning area. Wyoming has some of the highest annual average wind speeds in the nation. While the threat varies across the planning area, all parts of the Region are susceptible to damaging wind events.

Figure 4-29 Annual Average Wind Speed – United States

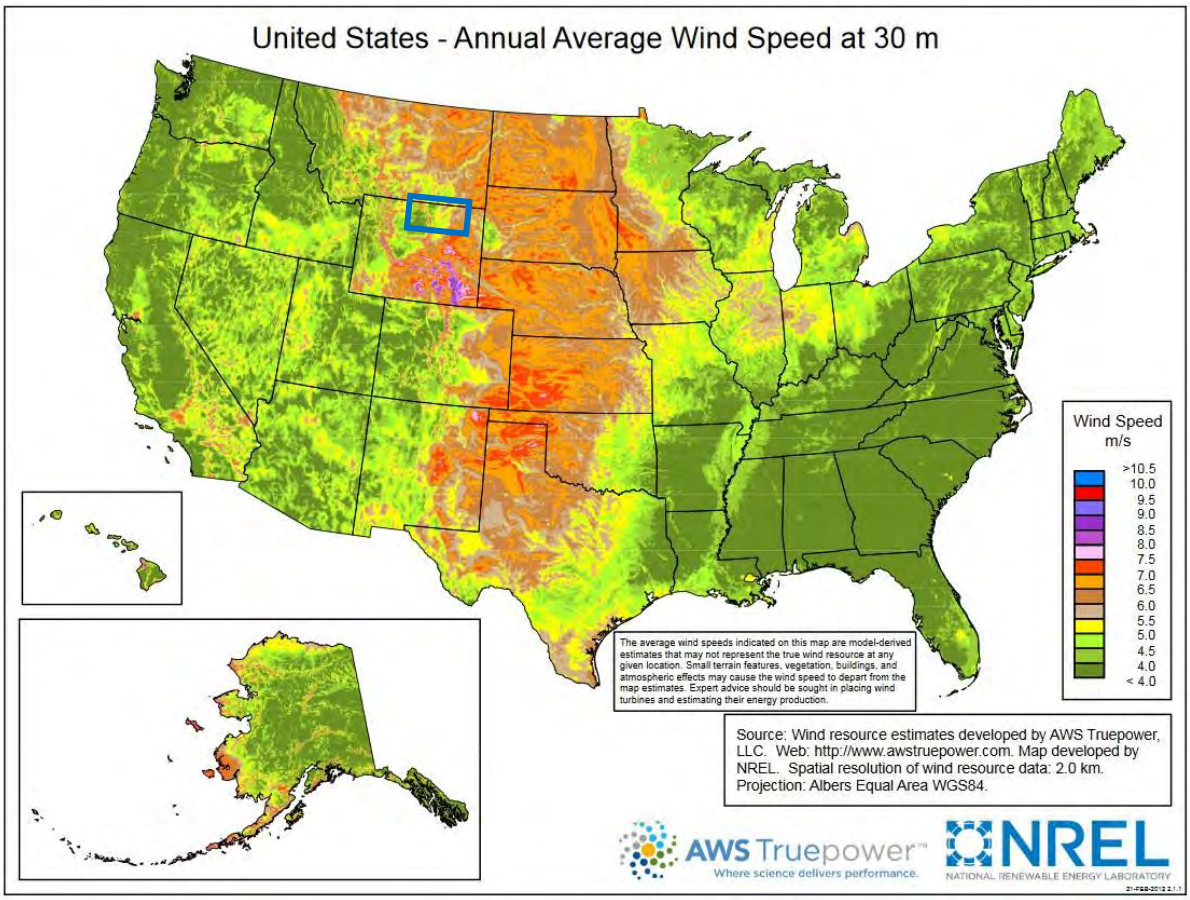
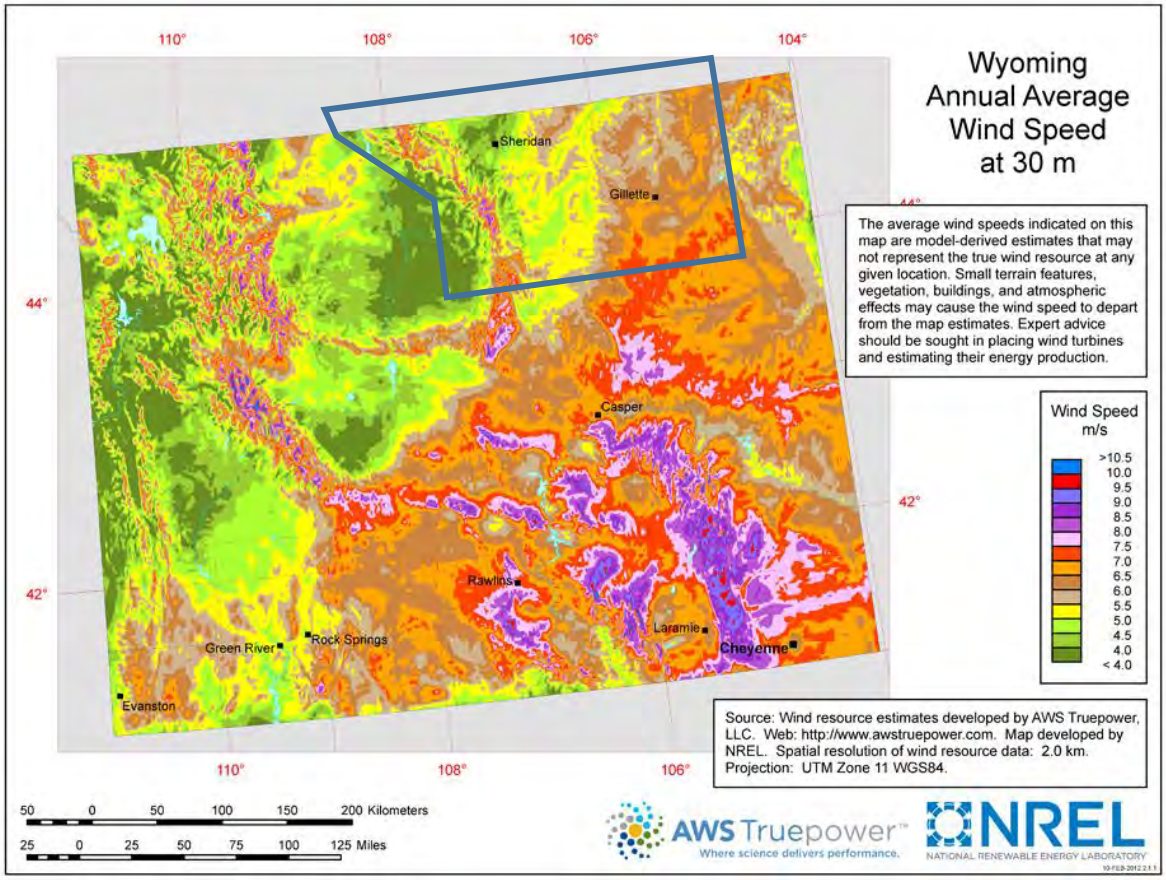


Figure 4-30 Annual Average Wind Speed – Wyoming



Vulnerability Assessment

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

Specific vulnerabilities from high wind events include damage to poorly constructed buildings, building collapse and damage, flying debris, semi rollovers and car accidents, and downed power lines and electric system damage. Cascading hazards caused by high winds can include power loss; depending on the time of year, winds can also exacerbate snow and blizzards by creating deep snow drifts over roads and affecting the normal flow of traffic. Damages recorded by the NCEI for the county include downed power lines, torn off roofs and building damage, and downed tree limbs and debris. Sheridan County reported that power outages due to high wind are more frequent, although the impact of these events is typically fairly low. In the winter, Chinook winds can create problems with drifting snow.

People

Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out. It is not uncommon for residents living in more remote areas of the county to be isolated after such events.

Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support.

Property

All property is vulnerable during high wind events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Generally, damage is minimal and goes unreported. Property located at higher elevations and on ridges may be more prone to wind damage. Property located under or near overhead lines or near large trees may be damaged in the event of a collapse.

The NCEI reported several wind events in Region 1 that resulted in significant damages to structures. Campbell County experienced the majority of high wind events in Region 1 resulting in a considerable amount of property damages estimating nearly $1,201,600.

Critical Facilities and Lifelines

High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating populations, and disrupting ingress and egress. Cascading hazards caused by high winds can result in power loss; depending on the time of year, winds can also exacerbate snow and blizzards by creating deep snow drifts over roads and affecting the normal flow of traffic. Wind can also disrupt daily activities for a significant time after an event, such as when facilities are damaged and need to undergo repairs.

Economy

Economic impacts of severe wind are typically short term. These events can disrupt travel into and out of all areas of the county and create perilous conditions for residents, tourists, and nature alike. Wind can also damage crops and impact the regional agricultural industry. A review of the USDA Risk Management Agency records shows between 2007 and 2021 the Region has had a total of $165,163 indemnity payments for a total 1814.1 acres lost to wind events. Additionally, the NCEI reported a total of $2,416,700 in property damages in Region 1 between both types of wind events since 1955. Because state or presidential emergency or disaster declarations have not been necessary in the aftermath of wind events in the Region, and because damage to personal property is dealt with by numerous private insurance companies, it is difficult to estimate actual monetary impacts that have occurred due to damaging winds.

Environment and Cultural Resources

The environment is highly exposed to high winds. Environmental impacts include the downing of trees and localized flattening of plants by high wind. Natural habitats such as streams and trees risk major damage and destruction. Cultural resources such as historic buildings and landmarks that are not structurally sound could be more at risk for damage in high winds.

Development Trends

Historical data demonstrates that the most critical area of the state for high wind hazards is the eastern one third, including much of Region 1. Future residential or commercial buildings will still be exposed to this hazard though growth rates are low to moderate in the Region.

Risk Summary and Overall Significance by Jurisdiction

Many areas of the United States are prone to damaging wind events, and while the counties of Region 1 may not be counted in a high category for occurrences across the nation, it does have a history of such episodes which should be anticipated for the future. Primary damage is structural and utility-borne. Although minimal deaths and injuries have been reported, the frequency of occurrence is due consideration, as well as the hazard to rural citizens and town populations from falling trees, power poles, and flying debris. Scattered reports document property damage (including damage to private utilities) occurring as a result of wind events, yet cumulative losses due to wind damage have been negligible.

Table 4-55 High Winds and Downbursts Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Significant	Likely	Negligible	Medium
Crook	Significant	Likely	Negligible	Medium
Johnson	Significant	Likely	Negligible	Medium
Sheridan	Significant	Likely	Negligible	Medium
Weston	Significant	Likely	Negligible	Medium

4.2.10 Landslide/Rockfall/Debris Flow

Hazard/Problem Description

A landslide is a general term for a variety of mass movement processes that generate a downslope movement of soil, rock, and vegetation under gravitational influence. Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated by the U.S. Geological Survey that nationally they cause between $2 billion and $4 billion in damages, and from 25 to 50 deaths annually. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide include saturation by water, erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt, and tend to worsen the effects of flooding that often accompany these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Generally, significant land sliding follows periods of above-average precipitation over an extended period, followed by several days of intense rainfall. It is on these days of intense rainfall that slides are most likely.

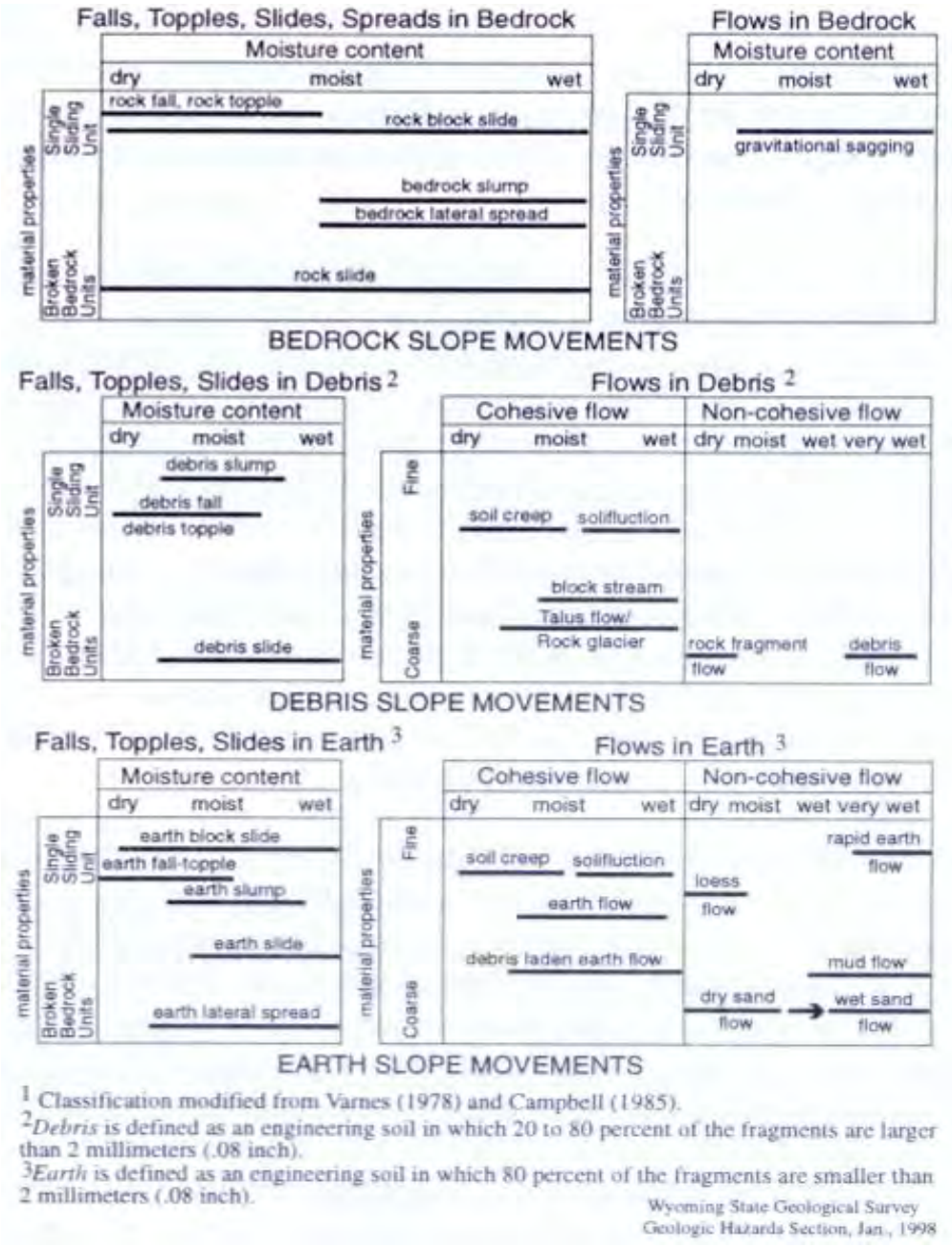
Areas that are generally prone to landslide hazards include existing old landslides; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. Landslides are often a secondary hazard related to

other natural disasters. Landslide triggering rainstorms often produce damaging floods. Earthquakes often induce landslides that can cause additional damage.

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

There are many types of landslides present in Wyoming. To properly describe landslide types, the Geologic Hazards Section developed a landslide classification modified from Varnes (1978) and Campbell (1985). As can be seen in Figure 4-31, five basic types of landslides occur in three types of material. Falls, topples, slides, lateral spreads, and flows can occur in bedrock, debris, or earth. While individual landslide types can occur in nature, most landslides are complex, or composed of combinations of basic types of landslides.

Figure 4-31 Wyoming Landslide Classifications



[1] Classification modified from Varnes (1978) and Campbell (1985).
[2] *Debris* is defined as an engineering soil in which 20 to 80 percent of the fragments are larger than 2 millimeters (.08 inch).
[3] *Earth* is defined as an engineering soil in which 80 percent of the fragments are smaller than 2 millimeters (.08 inch).

Wyoming State Geological Survey
Geologic Hazards Section, Jan., 1998

Rockfall

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

transportation corridors and communication systems, and result in other property damage.

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

Debris Flow

Debris flows, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. They are a combination of fast-moving water and a great volume of sediment and debris that surges down slopes with tremendous force. These flows generally occur during periods of intense rainfall or rapid snowmelt and may occur with little onset warning, similar to a flash flood. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that are typically about 10 miles per hour but can exceed 35 miles per hour. Figure 4-32 describes identifying characteristics of debris flows. The consistency of debris flow ranges from watery mud to thick, rocky mud that can carry large items such as boulders, trees, and even cars. Debris flows from many different sources can combine in channels, and their destructive power may be greatly increased. When the flows reach the flatter ground, the debris spreads over a broad area, sometimes accumulating in thick deposits that can wreak havoc in developed areas. Mudflows are covered under the National Flood Insurance Program; however, landslides are not.

Figure 4-32 Field Evidence of Debris Flow

Geographical Area Affected

Landslides are one of the most common geologic hazards in Wyoming. Figure 4-33 shows Region 1's overall landslide susceptibility. As shown in the map, the areas that are relatively highly susceptible to landslide hazards include the western and northwestern portion of Sheridan, the western portion of Johnson, the central and southeastern portion of Crook and the northeastern portion of Weston. Many of these slide areas have been studied by the Wyoming Geological Survey, WYDOT and others.

Campbell County Landslide Areas

In Campbell County, the primary areas of concern surround Highway 59 and Highway 14, towards the northern parts of the county; during the 2018 plan update, the HMPC noted regular damage to fences in this area. Areas of complex slope movement and slump are particularly noticeable, though some debris and/or earth flow may occur as well in the Highway 59 corridor in the northeast portion of the county. West of highway 50 and north of highway 387, closer to the boundary with Johnson County, are some cases of complex slope movement, debris/earth flow, and slump, about 15 miles from the Town of Wright. Historically, slope movement has resulted in damage to homes in Gillette, resulting in the City establishing engineering requirements for structures being built in slide-prone areas.

Crook County Landslide Areas

Crook County has a prevalence of slump and complex slope movement kinds of landslides, in particular. While some debris/earth flow movements can also occur throughout the county, slump is common around Hulett, north and west of Sundance, and north of Pine Haven. Complex slope movements can take place around the Black Hills National Forest boundary within Crook, and spread throughout the middle, eastern, and southern parts of the county. Minor areas of unstable rock may also be found between Interstate 90, Highway 112, and Highway 24, for example.

Johnson County Landslide Areas

Landslide-prone areas can be found surrounding the Bighorn National Forest northwest of the county, and the overall north and west portions of the county. Most landslide risk comes from complex slope movement, though debris/earth flow slides, unstable rocks, and slump areas can also be found, all west of Interstate 25. During the 2018 plan update, the HMPC noted impacts on I-90 often leading to closures, particularly between Buffalo and Sheridan.

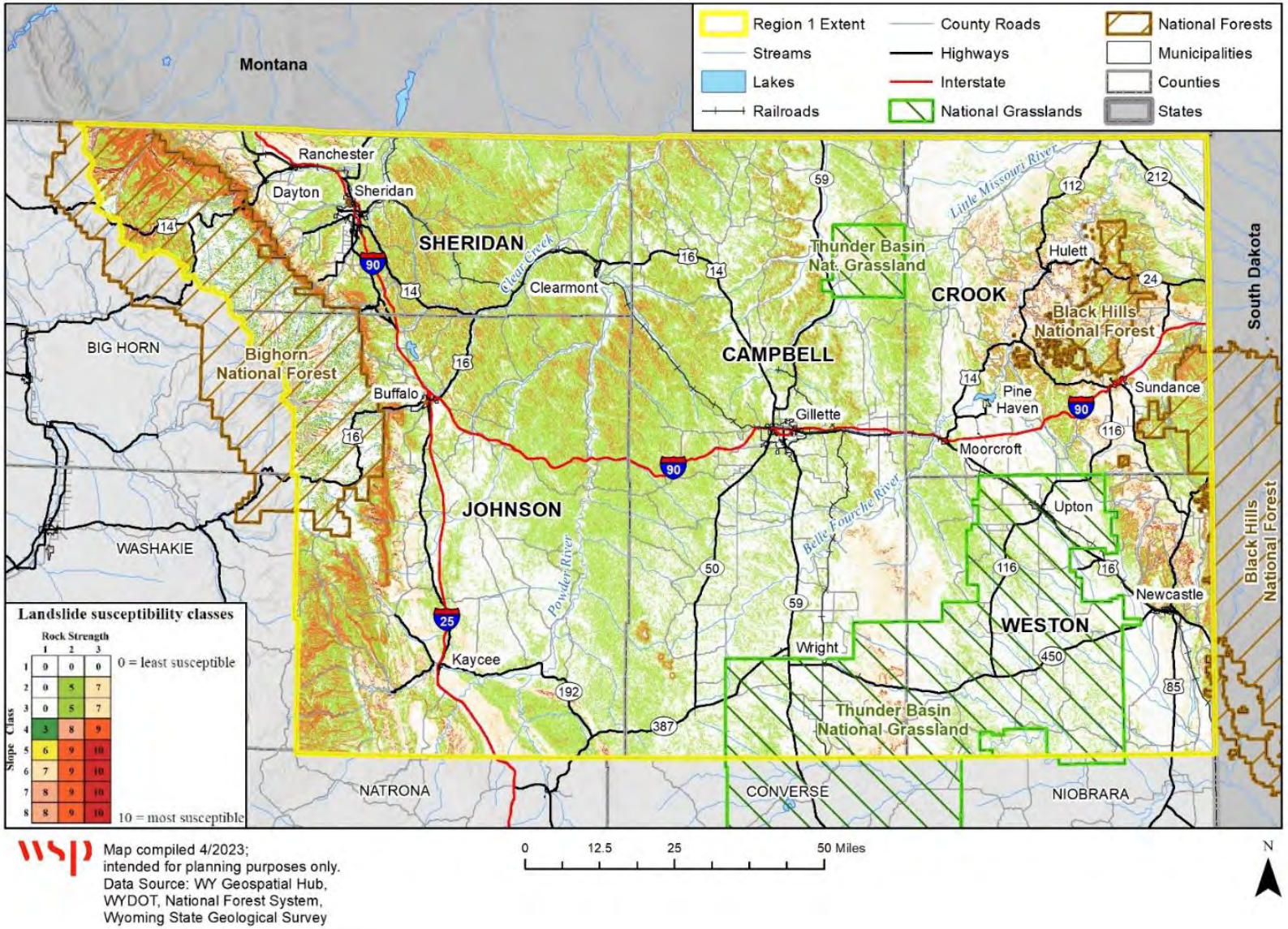
Sheridan County Landslide Areas

Sheridan County has regions of prevalent complex slope movement, in particular, to the west and sprinkled throughout the middle of the county, along with some minor slump areas. Some slump and debris/earth flow areas can also be found near the edges of the Bighorn National Forest, running through the county in a northwest-southwest fashion. Some unstable rock areas can be seen near Highway 14, near the central-west portion of the county, on the boundary with the Bighorn National Forest, as well as Jim Creek Hill and the Soldier Creek drainage. During the 2018 plan update, the HMPC noted impacts on I-90 often leading to closures, particularly between Buffalo and Sheridan. The City of Sheridan has had several landslides in the city, particularly near the Junior High School where a retaining wall was constructed to mitigate future problems.

Weston County Landslide Areas

Weston County's landslide hazard areas are all located on the northeast and east of the county, to the right of Highway 16 up to Newcastle, and the right of the railway tracks southwest of the county. While complex slope movement types of landslides are the most prevalent, some slump and debris/earth flow areas can also be found on the east and northeast. During the 2018 plan update, the HMPC reported landslide incidents affecting Highway 85, and the water line to stock tanks.

Figure 4-33 Region 1 Landslide Susceptibility

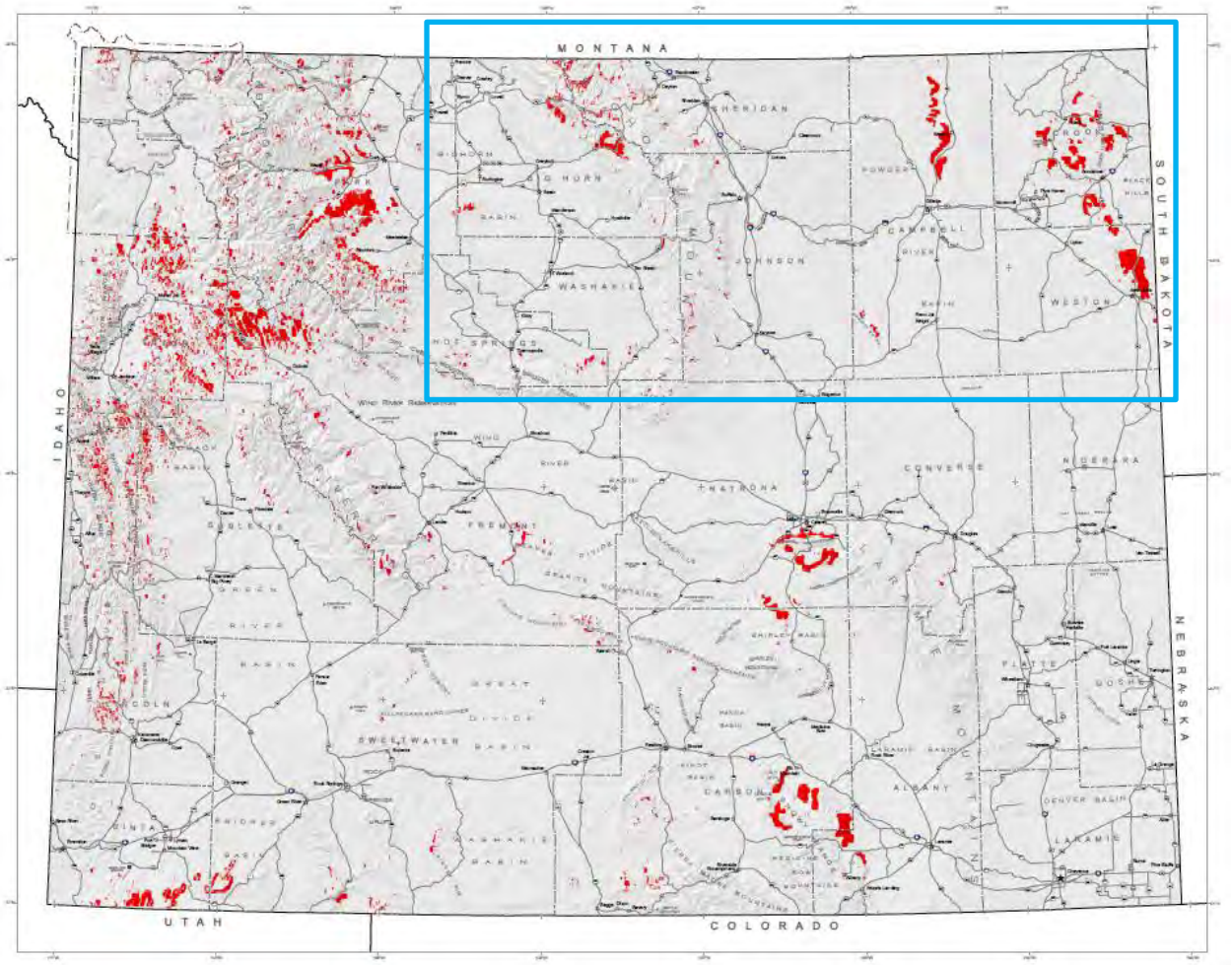


Past Occurrences

Landslides, debris flows, and rockfalls occur regularly in Wyoming and the Region, though limited information was available on previous occurrences that caused a particularly high amount of damage or incurred some other cost or unique impact.

Figure 4-34 is the Preliminary Map of Landslides in Wyoming, which is published by WGS in October 2013. The generalized landslide distribution in Wyoming is shown on the map. Most of the mapped landslides occur in mountainous areas with levels of precipitation significantly greater than in the state's basins. As shown in the map for Region 1 (blue rectangle), previous landslide occurrences are in the western portions of Sheridan and Johnson Counties, although Johnson County does not have many occurrences mapped, northern and southwestern portions of Campbell County, central and southern portions of Crook County, as well as eastern and northeastern portions of Weston County.

Figure 4-34 Map of Landslides in Wyoming



On July 22, 2011, President Obama declared a major disaster for the State of Wyoming for emergency work and the repair or replacement of facilities damaged by the severe storms, flooding, and landslides in Albany, Big Horn, Carbon, **Crook**, Fremont, Goshen, **Johnson**, Lincoln, Platte, **Sheridan**, Sublette, Teton, Uinta, Washakie, and **Weston** Counties. This declaration made Public Assistance funding available.

In Campbell County, for example, landslide risk is generally isolated to less populated areas, with the most significant risk to transportation facilities, namely roads, highways, bridges and railroad infrastructure, rather than life and property. The most significant impact tends to be when no alternative route exists between populated areas and access is blocked by the presence of a landslide. Highway 59, located in the Moyer Springs Quadrangle, is a key piece of infrastructure that, if blocked by a landslide, would cause significant disruption to transportation.

In Crook County, WYDOT spent an estimated $7.8 million between 2004 and 2012, to fix three slide areas that had damaged state highways. There is still ongoing work on a major slide near Devils Tower. Landslides can also damage utility lines and disrupt services around Crook County.

Johnson County, though not heavily prone to landslides, has actually suffered from two landslide events that caused a total of $100,500 in property damages. The I-90 corridor between Buffalo and Sheridan in Johnson and Sheridan counties has been prone to recurring landslides. WYDOT has spent an unknown amount of funding to repair and mitigate impacts.

Frequency/Likelihood of Occurrence

The probability of a landslide causing damage in the Region is difficult to determine because of the poor historic data. However, WSGS mentions that landslides are one of the most common geologic hazard in Wyoming. Landslides also occur every year in Wyoming, however, most occur in remote areas and do not typically cause damage. In addition, given the analysis of topographic map quadrangles by the WSGS, along with landslide-prone location data, it is reasonable to assume that damaging events have between 10 and 100% chance of occurrence on an annual basis. Therefore, landslides, rockfalls or debris flows are **likely** to occur. Heavy periods of precipitation or significant development could affect slope stability. Typically, there is a landslide/rockfall 'season' that coincides with increased freeze-thaw cycles and wetter weather in the spring and early summer, as previously mentioned.

Changing Future Conditions

Landslides or mudflows can be triggered by climatic events, such as periods of intense rainfall and runoff events. Projected climate change-associated variance in rainfall events may result in more high intensity events, which may increase landslide frequency. In addition, the increased potential of wildfire occurrence also escalates the risk of landslide and debris flows in the period following a wildfire, when slopes lack vegetation to stabilize soils and burned soil surfaces create more rainfall runoff.

Potential Magnitude (Extent)

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

During the 2023 Plan Update, the HMPC mentioned the concern regarding the potential for sloughing of hillsides post-wildfire events, which would be detrimental to natural resources.

Vulnerability Assessment

People

People could be susceptible if they are caught in a landslide or debris flow, potentially leading to injury or death. There is a danger to drivers operating vehicles, as rocks and debris can strike vehicles passing through the hazard area or cause dangerous shifts in roadways. Similar to the methodology used in the flood section, the total people at risk were estimated by multiplying the average number of persons per household in the County and each applicable incorporated jurisdiction with the number of residential parcels in landslide-prone areas to estimate the population residing in landslide hazard areas. As shown in Table 4-56, there are approximately 20,947 people potentially residing in landslide susceptible areas. Campbell has the most population that resides in landslide susceptible areas. Moreover, there are areas prone to landslides along Interstate 25 near the City of Sheridan, and on Highways 112, 24, 85, 14, and 116 in particular. However, it is not likely that landslides will occur without warning, and direct impacts to people are suspected to be minimal.

Property

During the 2023 development of this regional plan, a GIS analysis of exposure to landslide hazard areas was performed. The following table shows the number of parcels that are located in areas that are of the highest, moderately high, and moderate landslide susceptibility, together with the improved and content values of these parcels, categorized by jurisdictions. This is based on a parcel-level analysis.

The Region has approximately $3.6 billion of total exposure value, which considers improved values of properties as well as estimated content values. There are 9,428 total properties potentially within landslide hazard zones based on this analysis. The greatest financial exposure of general property is in Campbell County with over $1.3 billion worth of parcels. Also, Campbell has the greatest number of properties potentially at risk (3,797 properties). A more detailed, site-specific analysis would be needed to assess actual risk within the identified parcels.

Table 4-56 Landslide Exposure by County, Jurisdiction and Landslide Class

County	Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Campbell	Gillette	1	203	2,363	2,567	$563,282,485	$308,666,801	$871,949,286	6,572
	Wright	-	-	52	52	$12,633,213	$9,294,729	$21,927,942	122
	Campbell Unincorporated	35	21	1,122	1,178	$273,450,318	$143,048,024	$416,498,342	2,995
	Total	**36**	**224**	**3,537**	**3,797**	**$849,366,016**	**$461,009,554**	**$1,310,375,570**	**9,688**
Crook	Hulett	4	40	-	44	$10,705,907	$6,787,651	$17,493,558	100
	Moorcroft	-	-	50	50	$10,394,837	$6,650,837	$17,045,674	110
	Pine Haven	-	-	95	95	$20,287,758	$10,143,879	$30,431,637	250
	Sundance	24	162	13	199	$42,325,582	$27,604,039	$69,929,621	442
	Crook Unincorporated	150	347	440	937	$148,782,091	$81,319,840	$230,101,931	1,373
	Total	**178**	**549**	**598**	**1,325**	**$232,496,175**	**$132,506,245**	**$365,002,420**	**2,275**
Johnson	Buffalo	6	27	387	420	$109,662,644	$60,049,759	$169,712,403	854
	Kaycee	-	1	-	1	$207,987	$103,994	$311,981	2
	Johnson Unincorporated	101	106	550	757	$199,047,110	$105,978,100	$305,025,210	1,554
	Total	**107**	**134**	**937**	**1,178**	**$308,917,741**	**$166,131,852**	**$475,049,593**	**2,410**
Sheridan	Clearmont	-	-	-	-	-	-	-	-
	Dayton	-	35	2	37	$11,970,186	$5,985,093	$17,955,279	82
	Ranchester	-	-	-	-	-	-	-	-
	Sheridan	10	164	705	879	$243,887,700	$140,354,283	$384,241,983	1,783
	Sheridan Unincorporated	163	450	843	1,456	$535,389,521	$277,488,335	$812,877,856	3,118
	Total	**173**	**649**	**1,550**	**2,372**	**$791,247,407**	**$423,827,711**	**$1,215,075,118**	**4,984**
Weston	Newcastle	-	8	303	311	$45,664,074	$29,951,579	$75,615,653	618
	Upton	-	-	3	3	$393,591	$381,413	$775,004	2

County	Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
	Weston Unincorporated	93	99	250	442	$100,166,385	$52,485,858	$152,652,243	969
	Total	**93**	**107**	**556**	**756**	**$146,224,050**	**$82,818,849**	**$229,042,899**	**1,589**
	Grand Total	**587**	**1,663**	**7,178**	**9,428**	**$2,328,251,389**	**$1,266,294,210**	**$3,594,545,599**	**20,947**

Source: WYGS Landslide susceptibility data, Wyoming CAMA 2022, WSP GIS Analysis

Critical Facilities and Lifelines

In addition to buildings, utilities and transportation structures are also vulnerable to the impact and ground deformation caused by slope failures. They present a particular vulnerability because of their geographic extent and susceptibility to physical distress. Lifelines are generally linear structures that, because of their geographic extent, have a greater chance of being affected by ground failure due to greater hazard exposure.

Extension, bending, and compression caused by ground deformation can break lifelines. Failure of any component along the lifeline can fail to deliver service over a large region. Once broken, transmission of the commodity through the lifeline ceases, which can have catastrophic repercussions including loss of power to critical facilities such as hospitals, impaired disposal of sewage, contamination of water supplies, disruption of all forms of transportation, and release of flammable fuels. Therefore, the overall impact of lifeline failures, including secondary failure of systems that depend on lifelines, can be much greater than the impact of individual building failures.

The tables below summarize the results of the critical facilities analysis, highlighting the exposure of critical facilities throughout the County to landslide hazards. The facilities that are at risk highest landslide susceptibility are solely communication and transportation related. More than half of the facilities that are at risk of moderately high landslide susceptibility are transportation related. More than half of the facilities that are at risk of moderate landslide susceptibility are communication related.

Table 4-57 Critical Facilities at Risk to Highest Landslide Susceptibility by County & FEMA Lifeline

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	-	-	-	-	-	-	11	**11**
Crook	2	-	-	-	-	-	1	**3**
Johnson	5	-	-	-	-	-	1	**6**
Sheridan	17	-	-	-	-	-	1	**18**
Weston	4	-	-	-	-	-	-	**4**
Total	**28**	**0**	**0**	**0**	**0**	**0**	**14**	**42**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 4-58 Critical Facilities at Risk to Moderately High Landslide Susceptibility by County & FEMA Lifeline

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	6	6	-	-	-	1	-	**13**
Crook	6	1	-	1	3	3	21	**35**

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Johnson	1	-	-	-	-	-	14	**15**
Sheridan	4	-	-	-	-	7	14	**25**
Weston	4	1	-	-	-	-	1	**6**
Total	**21**	**8**	**0**	**1**	**3**	**11**	**50**	**94**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 4-59 Critical Facilities at Risk to Moderate Landslide Susceptibility by County & FEMA Lifeline

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Campbell	98	39	-	-	1	6	13	**157**
Crook	4	-	-	5	-	2	9	**20**
Johnson	38	-	-	-	-	1	26	**65**
Sheridan	35	2	2	-	1	1	12	**53**
Weston	12	2	-	1	2	2	-	**19**
Total	**187**	**43**	**2**	**6**	**4**	**12**	**60**	**314**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

Economy

Economic impacts typically center around transportation routes temporarily closed by debris flow or landslide activity. These roads may be used to transport goods across the County or provide access by visitors and tourists. Depending on the amount of damage, the road may simply need to be cleaned off or may require some level of reconstruction.

Environmental and Cultural Resources

As primarily a natural process, landslides and debris flows can have varying impacts on the natural environment. Debris flows have the potential to permanently alter the natural landscape. The impacts of landslides and debris flows on historical and cultural structures would be similar to the impacts on the general property.

Development Trends

The severity of landslide problems is directly related to the extent of human activity in the hazard areas. Human activities such as property development and road construction can exacerbate the occurrence of landslides. Landslide areas tend to be picturesque and often within mountainous locations, and therefore attract development and recreation. Development in landslide areas frequently consists of vacation homes and represents a potential risk for injury, loss of life and property. Therefore, development trends should take place carefully to prevent landslide damage to property or people. Adverse effects can be

mitigated by early recognition, 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. Current development trends in the Region do not appear to be increasing exposure to landslides.

Risk Summary and Overall Significance by Jurisdiction

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

Table 4-60 Landslide Hazard Risk Summary by County

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Limited	Occasional	Significant	Medium
Crook	Limited	Occasional	Limited	Low
Johnson	Significant	Occasional	Significant	Medium
Sheridan	Significant	Occasional	Significant	Medium
Weston	Limited	Occasional	Limited	Low

4.2.11 Lightning

Hazard/Problem Description

Lightning is a danger across Wyoming. Lightning is a sudden electrical discharge released from the atmosphere that follows a course from cloud to ground, cloud to cloud, or cloud to surrounding air, with light illuminating its path. The length and duration of each lightning stroke vary, but typically average about 30 microseconds. Lightning's unpredictable nature causes it to be one of the most feared weather elements.

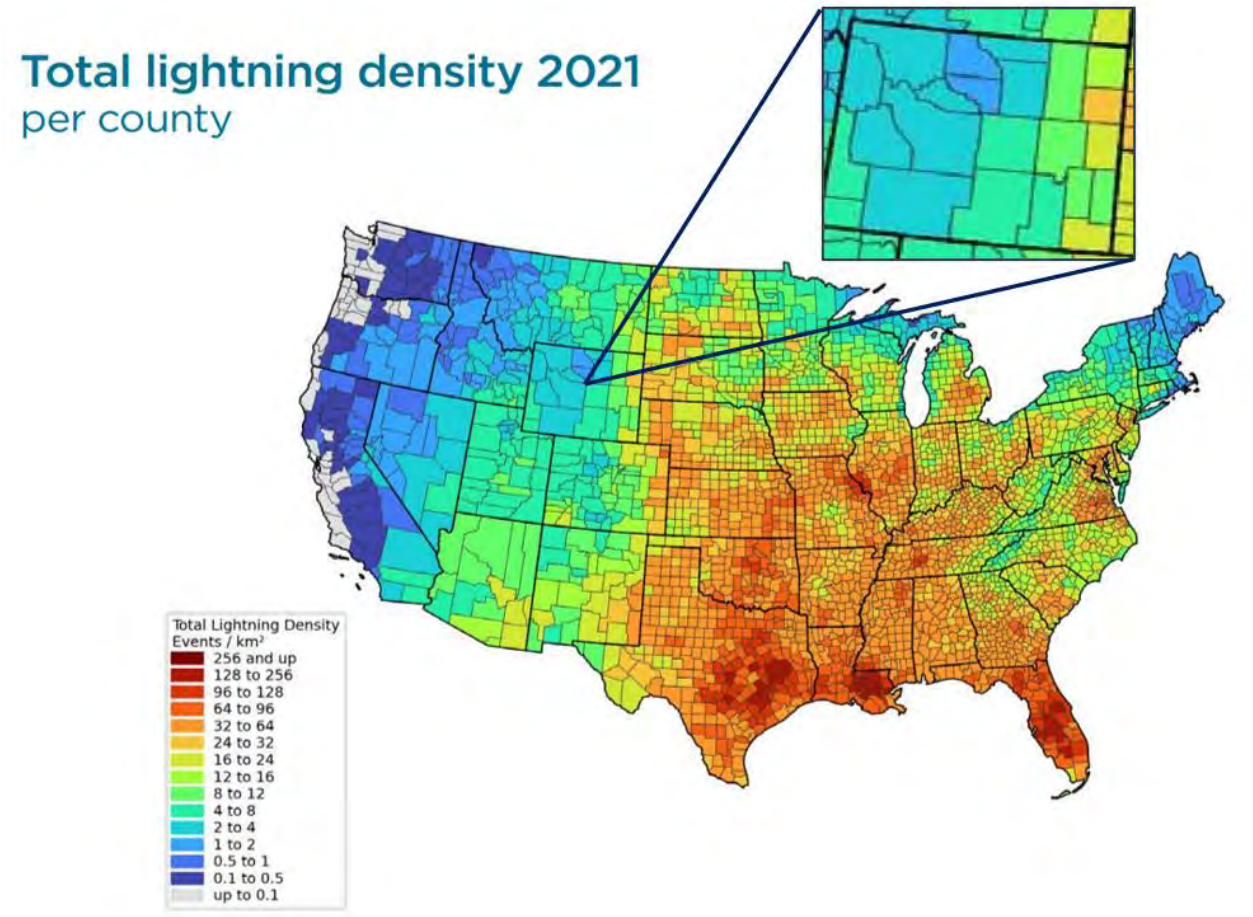
Anyone that is caught in an exposed area during a thunderstorm could be at risk to a lightning strike. In Wyoming, outdoor enthusiasts venturing to high and exposed areas should be especially cautious because rapid thunderstorm development with associated lightning can place even the most experienced persons in jeopardy without warning. Lightning strikes can cause power outages. Lightning is also the leading cause of wildland fires in Wyoming, and is indirectly responsible for millions of dollars' worth of fire damage.

Geographical Area Affected

All of the region is susceptible to lightning impacts, particularly the higher elevation mountainous areas; therefore, the geographic area of lightning is ranked as moderate.

Figure 4-35 shows the total lightning density in the U.S. in 2021. These values can vary by 50 percent in a year depending on whether there is a drought or enhanced monsoonal flow. However, the locations of maximum and minimum strikes do not change much from year to year.

Figure 4-35 U.S. Total Lightning Density 2021 by County



Source: Vaisala Lightning Report 2021

Past Occurrences

Nationwide lightning strikes are routinely monitored by Vaisala, Inc. with accuracies to within 1-kilometer resolution. Vaisala's National Lightning Detection Network (NLDN) recorded 347,035 cloud to ground lightning flashes in Wyoming in 2015; they also record an average of 279,632 cloud to ground lightning flashes per year between 2006 and 2015 for the state.

Nationally, Wyoming ranks 36th in number of lightning fatalities, 33rd in injuries, and 40th in property damage from 1959 to 1994 according to the National Oceanic and Atmospheric Administration, National Severe Storms Laboratory (NOAA, NSSL). Wyoming is number one in the nation in lightning deaths per capita according to the National Weather Service. According to the NCEI, lightning has been responsible for 1 death, 3 injuries, $250,000 in property damage in Wyoming between 1996 and 2022; these incidents are listed in Table 4-61.

Table 4-61 Region 1 Lightning History 1960– 2022

County	Number of Events	Injuries	Fatalities	Property Damage	Crop Damage	Total Damage
Campbell	4	1	0	$ 0	$ 0	$ 0
Crook	4	2	0	$ 250,000	$ 0	$ 250,000
Johnson	0	0	0	$ 0	$ 0	$ 0

County	Number of Events	Injuries	Fatalities	Property Damage	Crop Damage	Total Damage
Sheridan	1	0	1	$ 0	$ 0	$ 0
Weston	1	0	0	$ 8,000	$ 0	$ 0
Total	10	3	1	$ 258,000	$ 500	$ 250,000

Source: 2016 Wyoming State Hazard Mitigation Plan

On July 9, 2001, a lightning strike ignited a sporting goods store in Moorcroft; most of the building was destroyed in the fire. On July 11, 2010, a 63-year-old man was struck by lightning in the Big Horn Mountains; he died from cardiac arrest the following day in a Billings hospital.

The HMPCs reported that lightning strikes are very common, and have led to losses of livestock, damage to houses, fences, and a haystack fire that led to $6M in damages. Lightning has at least twice struck communications towers, knocking out radio systems. The City of Buffalo lost power for five hours due to a lightning strike in 2018; damage from this strike was informally estimated at around $25,000. Johnson County Emergency Management noted damage from the most recent lightning strike to the Pack Saddle Public Safety Radio Tower was $8,000. Livestock strikes are more common than strikes to humans. Crook County's HMPC felt this hazard should be raised to High significance due to past damages and potential for wildfire starts.

The Campbell County Emergency Manager provided additional information on lightning injuries and damages during the period of 2005-2015:

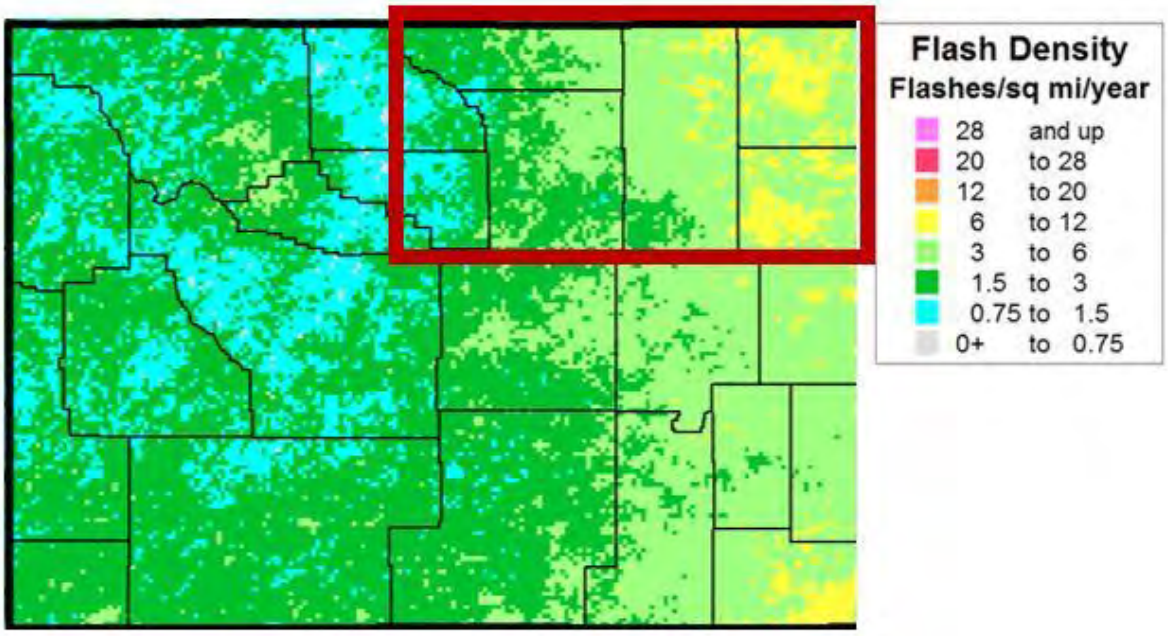
- Two people were directly struck by lightning, one while mowing his lawn in Gillette in 2015, and one while driving his motorcycle near the Port of Entry in 2005; both were hospitalized.
- Three vehicles have been struck while driving, and the driver of one truck was hospitalized because of the strike.
- During the 10-year period, lightning has caused fire or damage to six homes and two businesses.

Frequency/Likelihood of Occurrence

Nationwide, lightning strikes are routinely monitored by Vaisala, Inc. with accuracies to within a 0.625-mile (1 kilometer) resolution. The Wyoming annual lightning strike frequency is depicted in Figure 4-36 for the period of 2005 through 2014. Clearly the eastern plains have more than three times the cloud to ground lightning strikes as the western half of the state. Region 1's flash density varies considerably, ranging from 0.75 to 6 flashes per square mile per year in Sheridan and Johnson Counties, to 3 to 12 flashes per square mile per year in Crook and Weston Counties, some of the highest in the state. Despite annual variation, the locations of maximum and minimum strikes do not change much from year to year.

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

Figure 4-36 Average Annual Lightning Flash Density (flashes/sq. mi./year) 2005-2014 Over Wyoming



Source: Illustration courtesy of Vaisala Inc.

U.S. statistics show that one in 345,000 lightning flashes results in a death and one in 114,000 results in an injury nationwide. According to meteorologists at Vaisala, Inc., the odds for an American being hit by lightning sometime in the course of an 80-year lifespan is about 1 in 3,000. Any persons caught in the open without cover during a lightning storm are vulnerable to strikes.

Although lightning strikes occur with high frequency throughout Region 1, Table 4-61 shows that strikes resulting in injuries or reportable damage are somewhat less common. Based on this data, the chance of a loss or injury-causing lightning strike in any given year ranges from around 7% in Weston County, to 9% in Sheridan County, to 18% in Campbell, Crook & Johnson Counties.

Changing Future Conditions

As the atmosphere warms further due to climate change, the increased heat in the atmosphere provides more energy for severe storms. The frequency of severe weather events has increased steadily over the last century. Historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration, and frequency of storm events. All these impacts could have significant economic consequences.

A warming climate may also affect the frequency of lighting; in 2014 researchers at the University of Berkeley conducted a study that found that for every one-degree Celsius rise in the average global temperature, there will be a 12 percent increase in the amount of lightning strikes.

Potential Magnitude (Extent)

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. Due to the high elevation and varied topography of the Region, the counties in Region 1 are at risk to experience lightning in any of these categories. The LAL is reproduced in Table 4-62.

Table 4-62 Lightning Activity Level of Scale

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

Source: National Weather Service

Lightning can cause deaths, injuries, and property damage, including damage to buildings, communications systems, power lines, and electrical systems. It also causes forest, brush and structural fires. Damage from lightning occurs in four ways:

- Electrocution, severe electrical shock, and burns of humans and animals
- Vaporization of materials in the path of the strike
- Fire caused by the high temperatures associated with lightning
- Power surges that can damage electrical and electronic equipment

When people are struck by lightning, the result is deep burns at the point of contact (usually on the head, neck and shoulders). Approximately 70% of lightning survivors experience residual effects such as vision and hearing loss or neuropsychiatric issues. These effects may develop slowly and only become apparent much later. Death occurs in 20% of lightning strike victims.

Lightning strikes cause intense but localized damage. In contrast to other hazards, lightning does not cause widespread disruptions with the community. Structural fires, localized damage to buildings, damage to electronics and electrical appliances, and electrical power and communications outages are typical consequences of a lightning strike. Additionally, indirect fatalities may result via electrocution when a person steps from a vehicle into standing water that was previously “charged” by a live powerline that was knocked loose by a lightning strike.

The indirect social and economic impacts of lightning damage are typically associated with the loss of electrical power. Since society relies heavily on electric power, any disruption in the supply, even for a short time period, can have significant consequences.

Wildfires can also be an indirect result of a lightning strike. Johnson County HMPC reported that lightning is a major cause of wildfires in that county.

Past events in Region 1 indicate that the potential magnitude of lightning events will likely be limited—isolated deaths and/or injuries may occur; major or long-term property damage that threatens structural stability due to structural damage or fires; and/or interruption of essential facilities and services for 24-72 hours due to structural damage or utility outages.

Vulnerability Assessment

People

Anyone who is outside during a thunderstorm is at risk of being struck by lightning. Aspects of the population who rely on constant, uninterrupted electrical supplies may have a greater,

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

According to the Vaisala Group and National Lightning Detection Network, Wyoming ranked 37th among the 50 U.S. states, Puerto Rico, and Washington D.C. for overall lightning deaths between 1959 and 2009. This would suggest that lightning is not a major hazard for Wyoming. However, the state had the second highest per capita fatality rate within that same time period at 1.27 deaths per million people.

Nationwide, 85% of lightning victims are children and young men ages 10-35 engaged in outdoor recreation or work. Outdoor recreation is a major economic contributor to Region 1. People may often find themselves outside and need to be especially watchful of the weather during the summer months when afternoon thunderstorms are more common.

Because of concerns over the threat of lightning to citizens involved in outdoor activities, a coalition of governmental entities including the Campbell County School District, City of Gillette, Town of Wright and Campbell County Public Lands Board (Cam-Plex) have contracted with Thorguard Lightning Detector Systems for installation of a predictive sensor and alerting system. This system will cost approximately $100,000 which will cover the major outdoor events and large park areas of Gillette and Wright. The system is scheduled to be installed by September 2018, and will provide predictive warnings of the electrical charge buildup(s) prior to a lightning strike discharge. Those warnings will be issued by a warning siren/strobe system and via text and email alerting. Campbell County Emergency Management has established a host site in Gillette for one of the detection systems for the U.S. Public Lightning Network (USPLN) operated by TOA Systems. The site consists of a lightning sensor coupled with a GPS sensor which establishes the time of a strike within hundredths of a second and the data is routed to the company via the internet. In return, Emergency Management has access to the strike data.

Property

According to the event details collected in the NCEI database, the majority of reported damages from lightning are fires to private structures, damage to chimneys or steeples, or small grass fires. Property is more vulnerable to lightning than population because of the exposure ratios. Buildings remain exposed. Mitigation techniques such as choice of building materials or landscaping help reduce the vulnerability of these properties, but there is not data available to segment these properties out of the overall vulnerability assessment.

Critical Facilities and Lifelines

Some essential infrastructures and facilities can be impacted by lightning. Emergency responders, hospitals, government services, schools, and other important community assets are not more vulnerable to lightning than the general vulnerabilities established for property and population. Some aspects of infrastructure are constructed of materials and/or located in places that increase their vulnerability to lightning. Sometimes, communications and infrastructure are interrupted by lightning strikes. These events raise the vulnerability of the essential functions by delaying response times, hindering interagency communication efforts, or endangering or damaging communication networks.

Economy

Economic impact of a severe thunderstorm is typically short term. Lightning events can cause power outages and fires. Generally, long-term economic impacts are caused by hazards that

result from a severe thunderstorm, including wildfires ignited by lightning. Similarly with the previous section, lightning can cause structural damage or damage to electrical systems to private buildings as well as critical infrastructure.

Environmental and Cultural Resources

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

Finally, lightning can also have many cascading impacts, including power failure and ignition of wildfires.

Development Trends

Any development built above ground will be susceptible to lightning strikes. Buildings should be built with grounding, when possible, to prevent the ignition of structure fires. Development trends are not likely to increase risk from lightning.

Risk Summary and Overall Significance by Jurisdiction

Lightning is an annual occurrence in Region 1, although strikes with recorded damage or injuries are much rarer. Anything that can conduct electricity and is exposed is vulnerable to lightning strikes and their effects. Future impacts from lightning are difficult to determine because of the erratic nature of storms.

Table 4-63 Lightning Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Significant	Likely	Limited	Medium
Crook	Significant	Likely	Limited	High
Johnson	Significant	Occasional	Limited	Medium
Sheridan	Significant	Occasional	Limited	Medium
Weston	Significant	Occasional	Limited	Medium

4.2.12 Mine and Land Subsidence

Hazard/Problem Description

Underground coal mining began in Wyoming during the 1860s. Many of the early coal mines were not designed and constructed well. Many were also shallow, and often had minimal ground support in the form of mine timbers. As a result, the underground pillars can fail. If enough pillars fail, the caprock in the mine will collapse. The effect of the collapse reaches the surface in some cases. If that happens, a subsidence pit, a sinkhole, or a trough forms. Mine subsidence is hence generally defined as the movement of the ground surface as a result of readjustments of the overburden, due to collapse or failure of the underground mine workings. However, not all subsidence from mining is due to poor design. Most underground mines eventually have roof failures due to lack of maintenance and continuous loading of the unsupported rock layers overhead. In some cases, the pillars were pulled as mining retreated from an area. In other cases where fires occurred in the mines, the result is a loss of strength in the pillars and caprock. In addition to mine subsidence cases, general/natural land subsidence

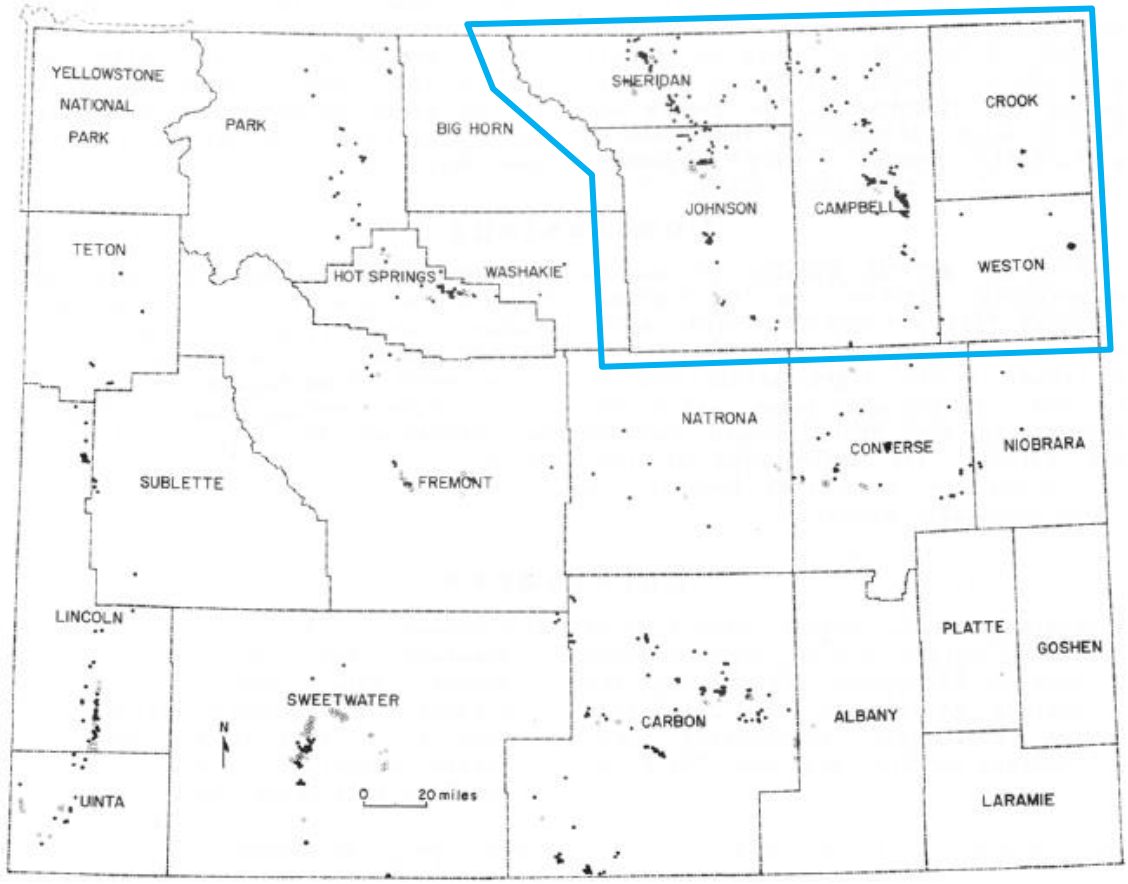
is defined as the sinking of the land over manmade or natural underground voids. Examples of natural causes of subsidence include minerals being dissolved by water, which create pockets or voids, or even limestone erosion that can take place alongside other water-soluble materials. The Campbell County HMPC noted that coal seams in the region can catch fire. These fires can burn deep in the subsurface and are extremely difficult to extinguish (see Coal Seam Fire section). The HMPC expressed a concern that subsurface voids caused by underground fires could also be a potential source of subsidence.

The Abandoned Mine Land Division (AML) of the Wyoming Department of Environmental Quality (DEQ) maintains an inventory of abandoned mines in the state and have recorded and actively pursued mitigation of mined out areas throughout the state. Two AML GIS inventory projects have been completed, one in 2001 and the other in 2004, where staff physically visited and geolocated mined out areas. One recent mitigation project included generating GIS layers using historic mine maps to identify mined out abandoned coal mines. The layer was then overlaid with known infrastructure such as pipelines, power lines, roads, and other utilities, as well as general developed areas to provide GIS mapping of areas with potential subsidence risks due to mined out sites. Since then, a further refinement of underground coal mine boundaries' intersection with infrastructure has occurred under AML Project 17.6B – Mine Subsidence Mitigation. Project 17.6B targets undermined infrastructure in order to be proactive in addressing mine subsidence. Many of the projects include grouting as a stabilization technique. The Wyoming AML Program has accurately mapped approximately 3,000 of the nearly 4,000 reported abandoned mining sites. A high-level map showing numbers of abandoned coal mines in areas around the state is included below in Figure 4-37. More detailed, local information is available through the Wyoming AML Program upon request.

Geographical Area Affected

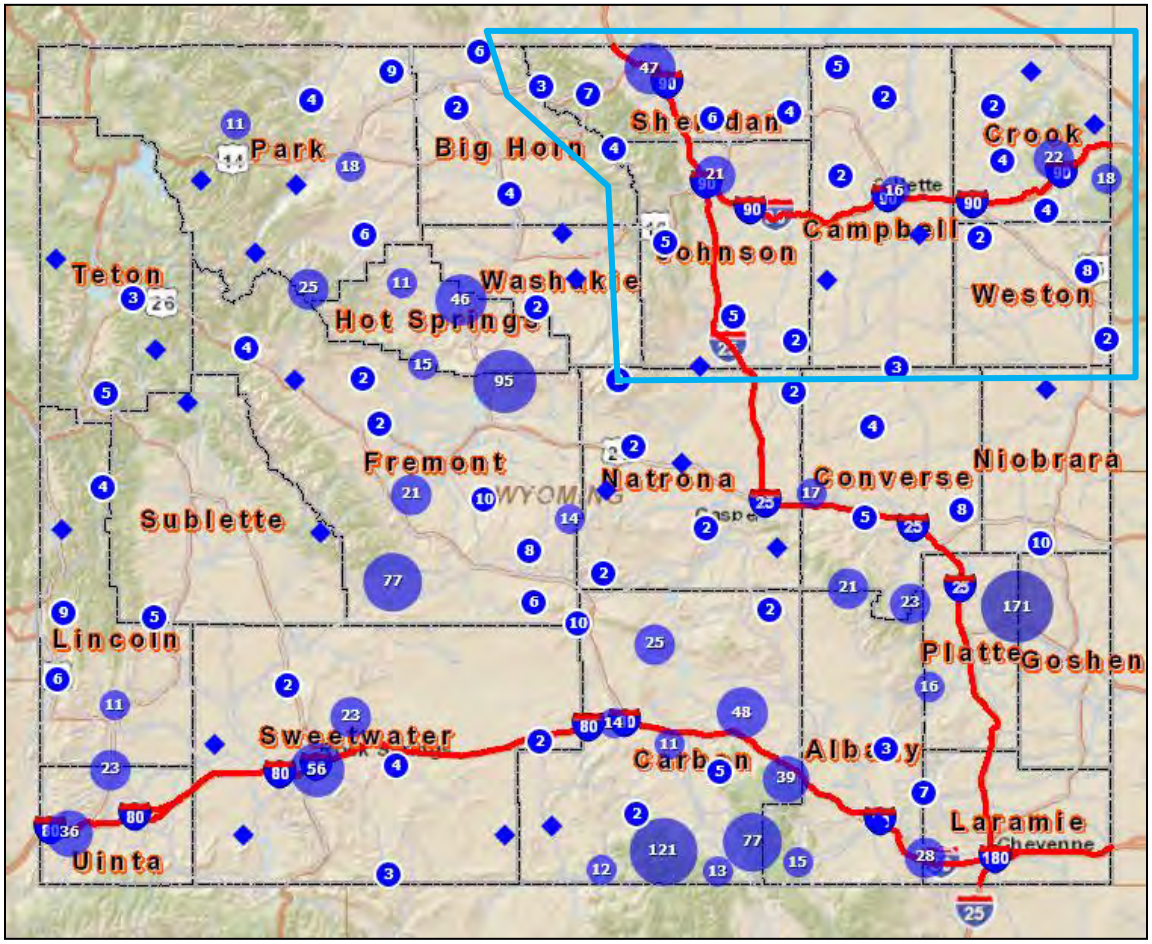
A map showing documented subsidence is shown in Figure 4-37 and Figure 4-38. Gray areas represent mined-out areas with subsidence.

Figure 4-37 Mine Subsidence in Wyoming



Solid gray polygons represent mined-out areas where subsidence occurs.
Source: 2016 Wyoming Multi-Hazard Mitigation Plan

Figure 4-38 Abandoned Mine Sites with Subsidence-Prone Underground Workings



Source: 2021 Wyoming Multi-Hazard Mitigation Plan

There are numerous abandoned mine sites with subsidence-prone underground workings in Sheridan County, especially in the northern areas close to Interstate 90. Crook and Johnson Counties also have a fair amount of these mine sites, with most also seemingly near major/interstate roads (likely due to the fact that major roads are often built near railroads, which were critical for transportation when the mines were in use). Campbell and Weston have the fewest number of abandoned underground mines, with those in Campbell also located near major roads, and the ones in Weston primarily located in the western edges (though two show up in the northwestern corner of the county).

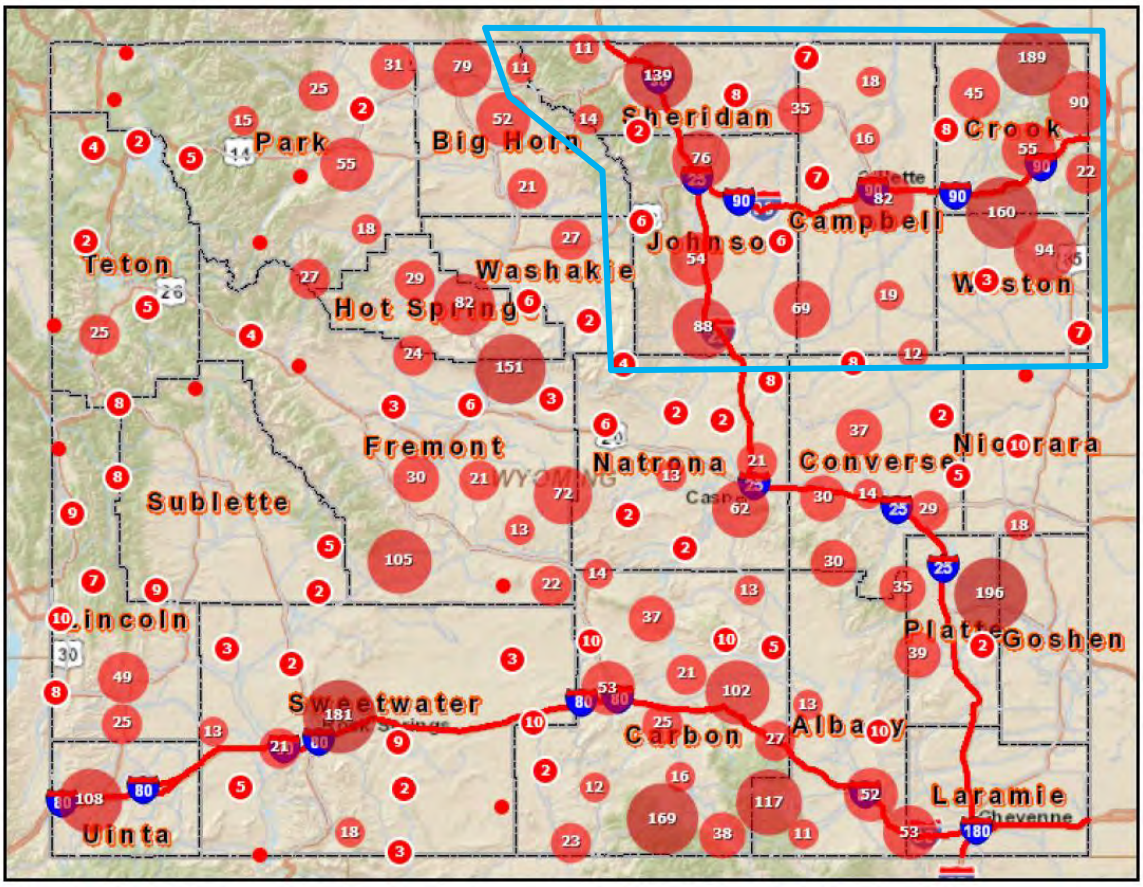
Past Occurrences

The 2021 Wyoming Hazard Mitigation Plan addresses mine subsidence, given that incidents do occur occasionally throughout the state. Over the past several years, the Wyoming Abandoned Mine Lands (AML) Program at the Wyoming Department of Environmental Quality (DEQ) has funded a few large subsidence mitigation projects annually. This is in addition to a large number of traditional mine reclamation projects on both coal and non-coal mine sites, along with smaller projects aimed at protecting individual homeowners. Recent subsidence mitigation projects have focused on protecting critical infrastructure.

However, recent events have taken place near the City of Sheridan, Sheridan County, and Gillette, Campbell County. Figure 4-39 below displays the number of mined-out areas and mine subsidence events throughout the Region. Though all counties in the Region show a

large number in mine subsidence occurrences, the events may have taken place many years back and not reflect present-day risk potential.

Figure 4-39 Mined-out Areas and Mine Subsidence Cases in Wyoming



Source: 2021 Wyoming Multi-Hazard Mitigation Plan

Likelihood of Future Occurrence

Although many areas of the state have already implemented mitigation projects designed to reduce or remove the impacts from underground mining and subsidence, subsidence may still occur in some areas. The rating for this hazard is **occasional** (between a 1% and 10% probability of occurrence in the next year). The potential for future damage from this hazard could additionally be reduced by mass adoption of a recent state effort, which created an assistance program for mine subsidence threats: the Wyoming Mine Subsidence Insurance Program. This program can help everyday citizens protect their home and business investments, given the insurance is affordable and addresses this specific hazard.

Changing Future Conditions

The extent and magnitude of subsidence can vary based primarily on human activities. As of 2021 there is not any active underground coal mines in Wyoming according to WOHS, thus the risk associated with active mines is not anticipated to increase. Development activity above unidentified or abandoned coal mines may increase the risk of subsidence, but development trends are not indicative of an upward trend as of 2023.

Potential Magnitude (Extent)

Many mines in the Region have already been identified and mitigation work has been undertaken in the past to remove the threat posed to the surrounding area; many identified mines that remain unmitigated pose little to no threat to infrastructure or property in the surrounding area. Any identified or unidentified mines located under or around buildings, roads, pipelines, or other critical infrastructure can pose higher risk to the surrounding area, including collapse, flooding, and unsettling of the ground. These risks vary by mine and area. While there is not currently a classification scale for mine subsidence, the anticipated extent could range from settlement that could be measured in inches (less than 1% of surface contraction), to several feet, to complete collapse of land surface into sinkholes (100% of surface above an underground void). All possible ranges of subsidence are possible in mined areas in the Region.

Vulnerability Assessment

People

According to the Wyoming DEQ, an average of 20 to 30 people die each year in abandoned mines nationwide. Information on injuries and deaths specific to subsidence incidents in Region 1 are not readily available. Hunters, hikers, cave explorers, and others recreating on public and private lands are at risk of death or serious injury. The AMLP has cataloged many abandoned mine sites in Wyoming, but many more exist in remote areas and on private land.

Property

There has been property and infrastructure damage associated with mine subsidence in Wyoming communities before. The dollar amounts of the damage are not readily available. Underground coal fires can also happen in abandoned mines.

The dollar impact attributed to these types of events is difficult to predict. An indirect measure of the impacts is the existing cost of mitigating the hazards. The AML Program has spent $303.4 million through 2013, mitigating the effects of mine subsidence alone, as part of the abandoned mine reclamation program.

Critical Facilities and Lifelines

Damage to critical facilities and lifeline infrastructure is also possible from mine subsidence. Pipelines, above and below ground utility lines, roads, bridges, and communication infrastructure may all be vulnerable to the effects of mine subsidence

Economy

Economic impacts of mine subsidence are largely the result of direct property damages and the costs of recovery and rebuilding. The Wyoming Mine Subsidence Insurance Program (WMSIP) provides coverage to eligible residential and commercial property owners throughout the state for damages resulting from mine subsidence.

Environmental and Cultural Resources

Abandoned mines and resultant subsidence can result in significant negative impacts on the environment. According to the USGS, ground subsidence can result in disturbances to the surface environment, damage to vegetation, and disruptions of the historical hydrological patterns. Additionally, fires can start by spontaneous ignition when water and air enter abandoned mine workings via subsidence cracks and pits. These fires can in turn spread to unmined coal as they create more cavities, more subsidence, and more cracks and pits through which air can circulate.

Development Trends

Locations where mine subsidence may occur are located throughout the Region 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 that all mined out areas in Wyoming have been mapped, it is unknown whether all locations of potential subsidence have been located appropriately. The uncertainty regarding the locations of more potential subsidence areas means there is the possibility that development may occur in a subsidence-prone location without the knowledge of contractors or developers. Given this fact, there is no way to determine with certainty the likelihood that development will occur in a subsidence-prone location. Therefore, putting a risk factor to this hazard, as it relates to development within Wyoming's borders, is rather complicated.

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 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.

Risk Summary and Overall Significance by Jurisdiction

While hundreds of mine subsidence events have taken place across the Region, vulnerability to the hazard is generally **low** due to minimal or no damages incurred by the jurisdictions or the individual populations. However, this risk should be further investigated when siting future development, especially in Crook, Sheridan, and Campbell Counties (though Weston and Johnson could prove fairly vulnerable as well, given their history of events).

Table 4-64 Mine Subsidence Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Significant	Occasional	Negligible	Low
Crook	Significant	Occasional	Negligible	Low
Johnson	Significant	Occasional	Negligible	Low
Sheridan	Significant	Occasional	Negligible	Low
Weston	Significant	Occasional	Negligible	Medium

4.2.13 Severe Winter Weather

Hazard/Problem Description

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

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

criteria may vary between locations. Winter Weather Advisories are issued when a low pressure system produces a combination of winter weather that presents a hazard but does not meet warning criteria. (Source: National Weather Association Online Glossary, http://www.weather.gov/glossary/)

Heavy snow can immobilize the counties in Region 1, isolating communities, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns. Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damages are repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

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

Winter storms in the counties of the Region, including strong winds and blizzard conditions, may cause localized power and phone outages, closures of streets, highways, schools, businesses, and non-essential government operations, and increase the likelihood of winter-weather related injury or death. People may be stranded in vehicles or other locations not suited to sheltering operations or isolated from essential services. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter storms include the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can pose significant budget impacts, as can repairing the associated damages caused by downed power lines, trees, structural damages, etc. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

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

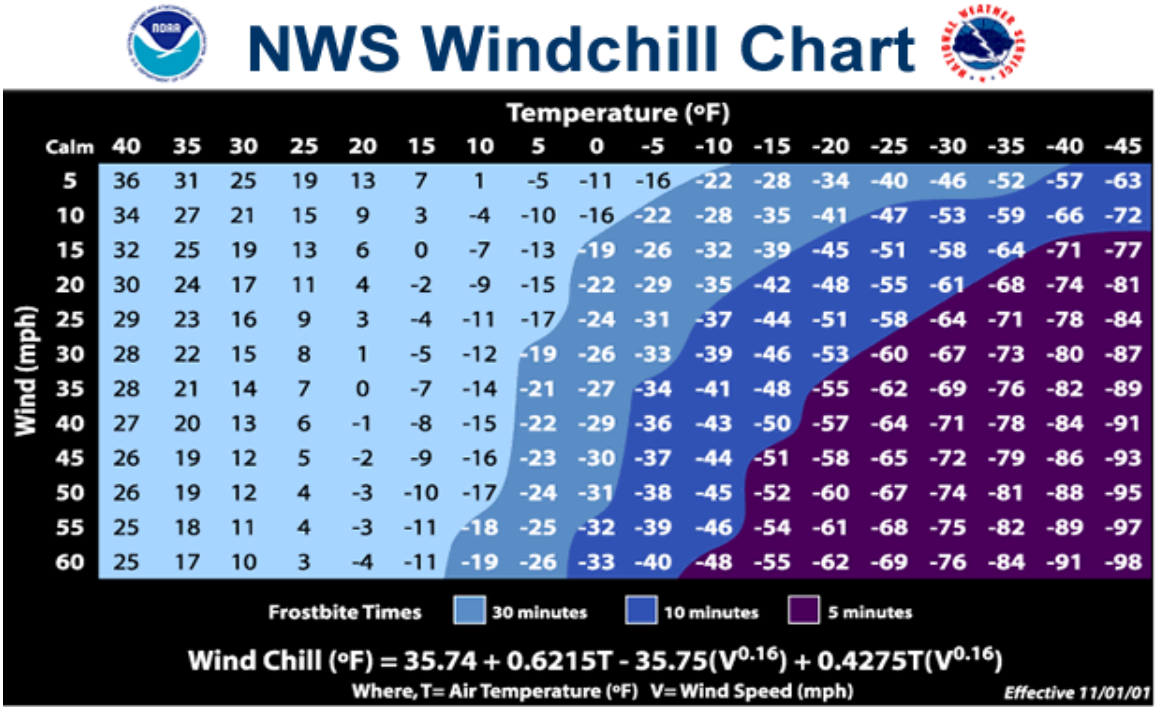
What constitutes extremely cold temperatures varies across different areas of the United States, based on normal climate temperatures for the time of year. In Wyoming, cold temperatures are normal during the winter. When temperatures drop at least 20 degrees below normal winter lows, the cold is considered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

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

In 2001, the NWS implemented an updated Wind-Chill Temperature index. This index was developed to describe the relative discomfort/danger resulting from the combination of wind

and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4-40National Weather Service Wind-Chill Chart



Source: NOAA

Geographical Area Affected

Winter storms are a yearly feature of the Wyoming climate and may occur anywhere in the state. Generally, severe winter storms and extreme cold events are considered regional, which implies the storms impact multiple counties simultaneously, often for extended time periods. It is possible for the geographic extent of the hazard to vary significantly within a single county - a regional storm may directly impact only a small portion of the planning area while still extending over a large portion of the surrounding area. However, even in these instances, while the percent of the planning area directly affected ranges from less than 10% to 100% depending on the specific circumstances, if any portion of the planning area is impacted by the storm, then the entire planning area suffers indirect impacts. Therefore, they are considered to have an extensive geographic impact rating.

Past Occurrences

NCEI data on winter storms and extreme cold events in Region 1 extends from January 1996 through January 2023. During that time, the counties in Region 1 experienced 1,254 winter weather incidents, including blizzards, heavy snow, winter storms and winter weather. It is important to note that the vast majority of this number of events are often the same storm being reported for each individual county. Table 4-65 below includes a breakdown of the reported events by county. The Region experiences an average of 14.3 winter weather incidents annually. There have been five fatalities associated with these incidents, and seven reported injuries. (Many minor injuries from winter weather likely go unreported.) Total reported property damages in the Region amounted to $5,700,000. $1,150,000 of this property damage

occurred in a single storm on October 3, 2013, that dropped up to two feet of snow in some areas, causing tree damage, power outages and utility damage, and blocked roads.

The most significant blizzard in Wyoming's history occurred from January 2, 1949 to February 20, 1949. Snowfall in parts of eastern and southeastern Wyoming measured up to 30 inches, with drifts 20 to 30 feet high. Seventeen people perished, along with 55,000 head of cattle and over 105,000 sheep. Total economic loss was more than $9 million dollars. In 2009 dollars, the loss would be over $81 million.

The most extreme cold event on record in Wyoming occurred in March 1975, when zero-degree temperatures combined with 40-50 mph winds caused livestock losses worth $12,312,872 (adjusted to 2016). Another cold wave in December 1983 brought low temperatures between -20˚F and -40˚F, resulting in $6,650,688 in damages, primarily from freezing water pipes.

In late January 1996, record low temperatures were recorded for many areas. Low temperatures in the western Bighorn Mountains dropped to between ten below zero and 45 below zero during this time across the State of Wyoming. On the 1st, strong winds lowered wind chill temperatures to as low as 60 below zero in some locations. Some young livestock were frozen. The cold also froze many pipes and caused some water lines to break or leak. A number of schools and events were canceled across the state during this time. About forty residences were without natural gas in the Big Horn Basin on the 3rd due to the cold causing a valve malfunction. Many accidents occurred on the 1st due to poor visibility. One person froze to death just north of Buffalo, WY early on the 2nd after walking for help after his car broke down.

On December 30th, 2014, northerly flow following the passage of an Arctic cold front brought brutally cold temperatures and dangerous wind chills to much of western and central Wyoming. The Daniel cooperative observer recorded a low temperature of -48F on the morning of Wednesday, December 31st. In addition, many locations across Fremont, Hot Springs, Lincoln, Sweetwater and Washakie counties saw temperatures of -30F to -35F. Wind chill temperatures of -30F were common.

In late April 2022, a strong spring storm system brought heavy snow to much of northeastern Wyoming, with blizzard conditions across a good portion of the plains. Heavy snow of ten to 20 inches fell over much of Campbell County and portions of extreme northeastern Wyoming, with snowfall amounts of five to ten inches common elsewhere. Strong winds produced considerable blowing and drifting snow, with drifts of six to ten feet in areas that saw the heaviest snow. Interstate 90 was closed for over 24 hours across northeastern Wyoming. The HMPC reports that multiple local businesses and schools also closed for multiple days.

Table 4-65 Winter Weather Events Summary 1996-2023

County	Blizzard	Heavy Snow	Winter Storm	Winter Weather	Fatalities/ Injuries	Property Damage	Crop Damage	Total Damage
Campbell	35	16	101	46	0 / 0	$980,000	$0	$980,000
Crook	47	34	166	76	0 / 0	$2,190,000	$0	$2,190,000
Johnson	19	48	164	3	4 / 7	$165,000	$0	$165,000
Sheridan	15	108	107	1	1 / 0	$1,000	$0	$1,000
Weston	30	34	135	68	0 / 0	$2,364,000	$0	$2,364,000

Source: NCEI. The "Winter Storm" column includes events labeled as blizzards, heavy snow, winter storm or winter weather.

Frequency/Likelihood of Occurrence

Winter storms and extreme cold are an annual occurrence in Wyoming, often occurring multiple times each winter, and affecting entire regions in their size and scope. Since 1996, the counties of Region 1 have averaged between 7 and 12 recorded severe winter weather events

per year. This frequency indicates that this hazard is all but guaranteed to occur multiple times per year in the future.

It is important to note that the lack of specific historical accounts on extreme cold temperatures does not necessarily indicate a low frequency of occurrence. Residents of Wyoming are used to cold weather, and may be less likely to report events that might be considered extreme in other areas.

Changing Future Conditions

A warming climate may also result in warmer winters, the benefits of which may include lower winter heating demand, less cold stress on humans and animals, and a longer growing season. According to the Fifth National Climate Assessment, increasing average temperatures have occurred across all seasons, but are most pronounced in winter for the Northern Great Plains region (which includes Wyoming). However, the potential benefits of warmer winters are expected to be offset by the negative consequences of warmer summer temperatures.

Potential Magnitude (Extent)

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

The National Weather Service (NWS) describes different types of snow events as the following:

- Blizzard - Winds of 35 mph or more with snow and blowing snow reducing visibility to less than ¼ mile for at least 3 hours.
- Blowing Snow - Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- Snow Squalls - Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- Snow Showers - Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- Snow Flurries - Light snow falling for short durations with little or no accumulation.

The HMPCs reported that Interstate closures are common during winter storm events, which leads to the need to shelter stranded motorists, can create economic impacts, and can cause

problems due to diverted semis on city streets. Access to rural homes can also become an issue, especially during prolonged storms; residents are encouraged to keep a 3-day supply of food, medication, and oxygen. Impacts on livestock and wildlife are also a major concern.

The Sheridan County HMPC reported that they average 73" of snowfall annually. Building collapses are common, especially during Fall and Spring snowstorms.

The HMPCs noted power outages often result from severe winter weather. In March 2007, power was knocked out to Story for 3-4 days due to tree branches falling on power lines. Impact to older bridges was a concern for the HMPCs, specific bridges have not been identified. Newer bridges typically have mitigation built into the design.

The HMPCs also observed that supplying oxygen to home care individuals becomes problematic, as the locations of these individuals are not mapped. Home oxygen users are directed to notify the power company to prioritize restoration for them. Alternative supplies are available in town.

Extreme cold creates additional problems. The HMPCs reported that -20 ˚F winds are common, and temperatures as low as -40 ˚F have been seen in the planning area. This causes water mains to freeze up, especially in the transitional seasons. Gas lines can crack, which has caused one house explosion. Extreme cold puts pressure on the electric grid and natural gas supply. Home electrical fires from space heaters are common.

The HMPCs noted that ice jams are also an issue, and can lead to major flooding problems; there was a major one near Dayton in 2016. While sometimes the jam resolves itself, they have sometimes had to use backhoes to break it up. Winter storms usually cover a significant part of the state, and as such are easier to describe regionally than on a county by county basis.

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

Vulnerability Assessment

People

Since 1960, the Region has averaged one fatality every 7.3 years from severe winter weather. The threat to public safety is typically the greatest concern during severe winter storms. While virtually all aspects of the population are vulnerable to severe winter weather, there are segments of the population that are more vulnerable to the potential indirect impacts of a severe winter storm than others, particularly the loss of electrical power. As a group, the elderly or disabled, especially those with home health care services that rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes or other special needs housing may also be vulnerable if electrical outages are prolonged. If they do not have a back-up power source, rural residents and agricultural operations reliant on electricity for heating and water supplies are also especially vulnerable to power outages.

Extreme cold/wind chill pose the greatest danger to outdoor laborers, such as highway crews, police and fire personnel, and construction. The elderly, children, people in poor physical health, and the homeless are also vulnerable to exposure. Overall, the population has a medium exposure to severe cold.

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

Wyoming is becoming a preferred retirement area in the US. Sheridan county and other locales in Region #1 rank among the top destinations in the state. Those who have lived in areas with more temperate climates are leaving due to cost of living/tax burden issues upon

retirement. As a result, folks with no prior knowledge of (or experience dealing with) cold weather/snow conditions are moving into this area. This retirement influx, and "aging in place syndrome" will exacerbate the scope of "vulnerable populations." Due to expectations/demand from the influx of these retirees, local governments will likely see increased pressure and demands for winter/cold weather-related request for assistance.

Property

Since 1960, the Region has sustained an average of $211,111 in property damage per year from severe winter weather. Property vulnerabilities to severe weather include damage caused by high winds, ice, or snowpack and subsequently melting snow. Vehicles may be damaged by the same factors, or temporarily unusable due to the driving conditions created by severe winter weather. Contents of homes, storage units, warehouses and storefronts may be damaged if the structures are compromised or fail due to the weather, or during potential flooding caused by melting snow. Very wet snowpacks down densely and is very heavy. This may create strains on structures, causing partial or entire collapses of walls, roofs, or windows. This is impacted both by architecture and construction material, and should be assessed on a building-by-building basis. These records are probably tracked via insurance or other private vendors. Crops, livestock and other agricultural operations are also highly vulnerable to severe winter storms.

Extreme cold/wind chill presents a minimal risk to the structures of Region 1. Property damage occurs occasionally when water pipes freeze and break. Homes without adequate insulation or heating may put owners at a higher risk for damages or cold-related injury. In cases of periods of prolonged cold, water pipes may freeze and burst in poorly insulated or unheated buildings. Vehicles may not start or stall once started due to the cold temperatures and the risks of carbon monoxide poisoning or structure fires increases as individuals attempt to warm cars in garages and use space heaters. Stalled vehicles, or those that fail to start, may result in minor economic loss if individuals are unable to commute between work, school, and home. Driving conditions may deteriorate if extreme cold/wind chill prolongs icy road conditions, which will impact commutes and emergency response times as well. Landscaping and agricultural products may be damaged or destroyed by unseasonable occurrences of extreme cold/wind chill, causing plants to freeze and die. This may increase the indirect vulnerabilities to severe cold by causing greater economic costs and losses for the year. The overall vulnerability of general property is low.

Critical Facilities and Lifelines

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

Like general property, extreme cold/wind chill events have a limited impact on the physical property of essential infrastructures and facilities. Communications lines such as fiber optic cables can freeze. There may be incidents of delayed emergency response due to stalled vehicles, delays in dispatching due to frozen communications lines, or an increased volume in calls. Hospitals may see an increase in cold-related injuries directly or injuries associated as secondary effects of the cold (traffic accidents, broken bones or severe cuts due to slips, etc.) and a prolonged extreme cold/wind chill event may impact hospital personnel capabilities. Personnel working in the cold, such as firefighters, EMTs, police officers and construction workers, have a higher vulnerability due to exposure times, and response capabilities may be hindered. Human services programs that care for at-risk individuals and families may be stressed, but usually can still adequately provide services through the duration of the extreme

cold/wind chill event. Unusually high volumes of individuals seeking shelter or food may overwhelm some facilities if the event is prolonged. There may be an increased number of displaced individuals or families due to flooding caused by ruptured pipes, which may strain local aid organizations such as the American Red Cross. Older venues or historical properties suffer the same vulnerabilities associated with private and general properties that are older, with the added vulnerability of damaging historic and often irreplaceable property in the process. If the event is extremely extended and impacts multiple other counties and states, which in turn impacts the availability of mutual assistance, the risk factors may increase. The overall vulnerability of essential infrastructure and community assets is medium.

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

Economy

Closure of major transportation routes during severe winter storms could temporarily isolate communities and further isolate the more remote areas in the Region. Depending on the length of the closure it could also hinder the local economy by disrupting tourism and out of county visitors, as well as the potential impacts to shipping delays from a closure. Snow removal costs can also impact budgets significantly. As mentioned in the past occurrences section, the region has had many documented instances where winter weather has closed Interstate 90 for extended periods of time.

Environmental and Cultural Resources

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

Development Trends

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

Due to the relative prevalence of cold incidents across the Region, it is common practice to build infrastructure with the appropriate safeguards to protect it from extreme cold incidents. This practice will continue as infrastructure is built to face the realities of living in Wyoming.

Public education efforts may help minimize the risks to future populations by increasing knowledge of appropriate mitigation behaviors, clothing, sheltering capacities, and decision making regarding snow totals, icy roads, driving conditions, and outdoor activities (all of which are contributors to decreased public safety during severe winter storms). New establishments or increased populations who are particularly vulnerable to severe winter storms (such as those with health concerns or those who live in communities that may be isolated for extended

periods of time due to the hazard) should be encouraged to maintain at least a 72-hour self-sufficiency as recommended by FEMA. Encouraging contingency planning for businesses may help alleviate future economic losses caused by such hazards while simultaneously limiting the population exposed to the hazards during commuting or commerce-driven activities.

Risk Summary and Overall Significance by Jurisdiction

Residents of the Region are generally well-adapted to severe winters and cold temperatures. Nevertheless, Severe Winter Storms are generally a high significance hazard in the Region due to the widespread nature, severity, and potential impacts to life and property.

Table 4-66 Winter Weather Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Significant	Highly Likely	Limited	High
Crook	Significant	Highly Likely	Limited	High
Johnson	Significant	Highly Likely	Limited	High
Sheridan	Significant	Highly Likely	Limited	High
Weston	Significant	Highly Likely	Limited	High

4.2.14 Tornado

Hazard/Problem Description

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

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

Rating a Tornado

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

Table 4-67 Fujita Scale Description

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

Source: NOAA

Changes to Tornado Rating Scale

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

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

Table 4-68 The Enhanced Fujita Tornado Scale

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

Fujita Scale			Operational EF-Scale	
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

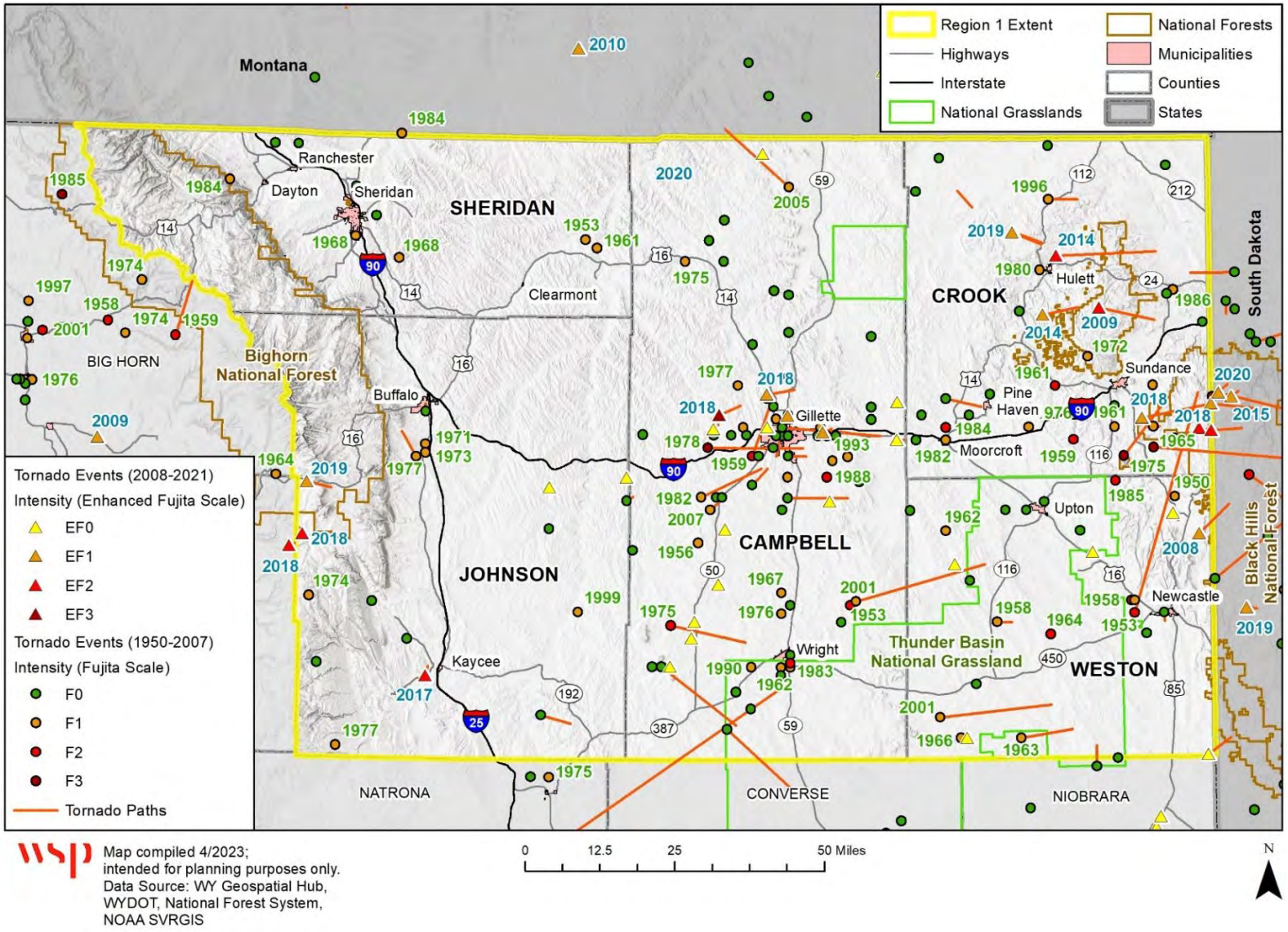
Source: NOAA

Throughout this section, tornadoes prior to 2007 are rated using the F scale; tornadoes after 2007 are rated using the EF scale.

Geographical Area Affected

The entire area of the Region is susceptible to tornadoes. While some areas may have seen more tornadoes than others, this is more of a statistical anomaly than a causal result. Like other hazard events, greatest losses are likely to be in the cities, where there is a greater concentration of infrastructure. Figure 4-49 displays the location of historic tornado events in Region 1 from 1950-2021.

Figure 4-41 Region 1 Tornadoes Events 1950-2021



Past Occurrences

Tornado statistics, especially prior to the 1970s, must be viewed as incomplete since many twisters have occurred without being witnessed. Wyoming's open rangelands experience little if any damage from these storms, so many go unreported. Many documented tornadoes occurring in the counties in Region 1 are given low ratings on the Fujita Scale (F/EF-0 to F/EF-1) simply because these tornadoes are often formed over open land and result in little or no damage.

Since 1950 to 2023, there have been 186 tornadoes between the five counties of Region 1, as documented by the National Climatic Data Center. Seventy eight (78) of these tornadoes resulted in damage or injuries, for a total of 2 fatalities, 31 injuries, and $10,143,100 in total recorded property damage in the Region.

Table 4-69 Tornado History by County, Region 1 (1950-2022)

County	Total Incidents	Greatest Magnitude (F / EF)	Damage-Causing Incidents	Fatalities	Injuries	Property Damage
Campbell	92	F2	34	2	26	$ 8,931,580
Crook	32	F3	21	0	3	$848,120
Johnson	22	EF2	8	0	2	$ 25,530
Sheridan	10	F1	5	0	0	$ 30,060
Weston	27	F2	10	0	2	$ 307,810
Total	175	--	71	2	33	$10,143,100

Source: NOAA

Table 4-70 History of Damage-Causing Tornadoes, Region 1 (1950-2022)

County	Date	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Weston	1950-06-14	1	0	0	$50	$0
Weston	1953-05-28	2	0	0	$5,000	$0
Campbell	1953-06-12	2	0	0	$5,000	$0
Campbell	1956-06-21	1	0	0	$50,000	$0
Campbell	1958-06-03	1	0	0	$50	$0
Campbell	1958-06-03	1	0	0	$50	$0
Weston	1958-06-12	2	0	0	$50,000	$0
Crook	1958-07-10	0	0	0	$50	$0
Weston	1958-07-10	1	0	0	$50	$0
Campbell	1959-05-27	2	0	0	$50,000	$0
Crook	1959-06-25	2	0	0	$50,000	$0
Crook	1961-05-18	2	0	0	$50,000	$0
Sheridan	1961-05-20	1	0	0	$50,000	$0
Crook	1961-07-17	1	0	0	$500	$0
Campbell	1962-06-11	2	0	4	$50,000	$0
Weston	1962-06-11	1	0	0	$5,000	$0
Campbell	1962-06-11	1	0	0	$500	$0

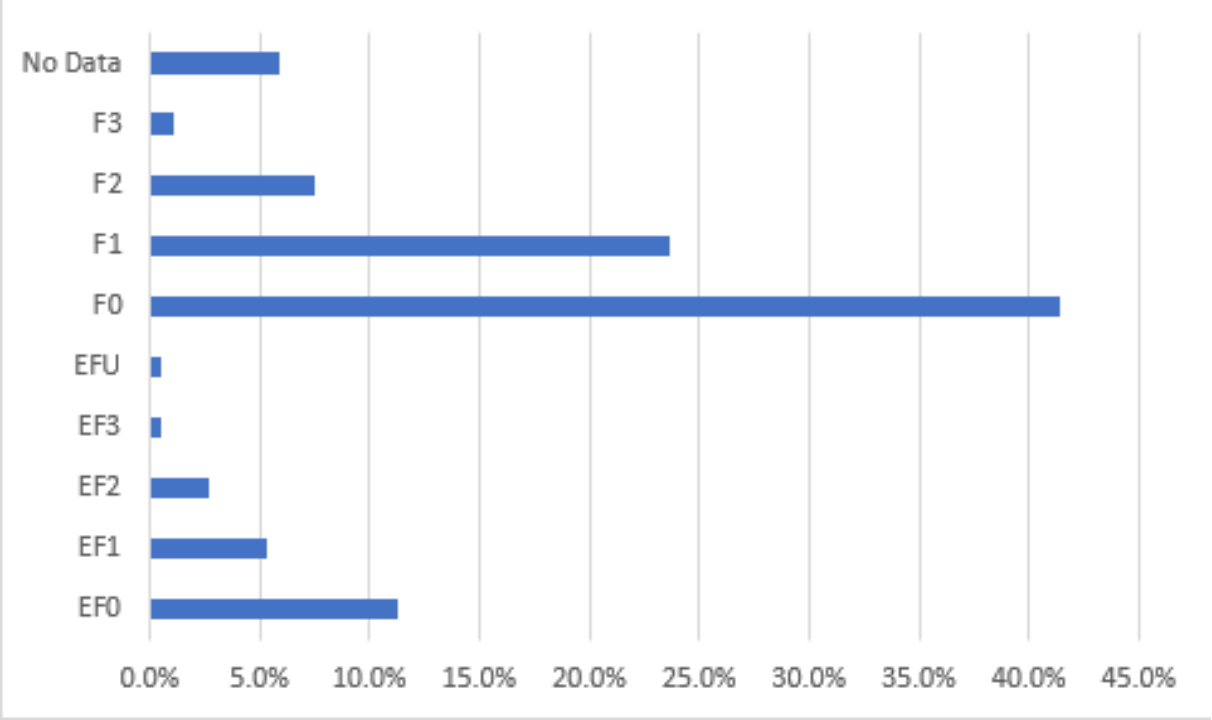
County	Date	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Weston	1963-07-14	1	0	0	$5,000	$0
Weston	1964-07-02	2	0	0	$50,000	$0
Crook	1965-07-12	3	0	0	$500,000	$0
Campbell	1966-07-22	2	0	6	$50,000	$0
Campbell	1966-07-28	0	0	0	$50	$0
Weston	1966-08-11	1	0	0	$500	$0
Campbell	1967-04-19	1	0	0	$500	$0
Sheridan	1968-06-07	1	0	0	$5,000	$0
Sheridan	1968-06-11	1	0	0	$5,000	$0
Johnson	1971-06-03	1	0	0	$5,000	$0
Johnson	1974-08-14	1	0	2	$5,000	$0
Campbell	1975-06-25	2	0	1	$0	$0
Crook	1975-06-25	3	0	0	$50,000	$0
Crook	1975-06-25	1	0	0	$5,000	$0
Sheridan	1976-06-04	0	0	0	$50	$0
Sheridan	1976-06-04	0	0	0	$50	$0
Campbell	1976-06-05	0	0	0	$50	$0
Campbell	1976-06-05	0	0	0	$50	$0
Campbell	1976-06-05	0	0	0	$50	$0
Campbell	1976-06-05	0	0	0	$50	$0
Crook	1976-06-05	0	0	0	$50	$0
Crook	1976-06-05	0	0	0	$50	$0
Campbell	1976-06-13	0	0	0	$50	$0
Campbell	1976-06-16	0	0	0	$50	$0
Crook	1976-07-12	1	0	0	$50,000	$0
Campbell	1976-08-15	1	0	0	$500,000	$0
Johnson	1977-05-09	1	0	0	$500	$0
Johnson	1977-06-20	1	0	0	$50	$0
Campbell	1977-06-25	1	0	0	$50	$0
Campbell	1978-05-22	1	0	0	$500,000	$0
Campbell	1978-05-23	3	0	0	$500,000	$0
Crook	1980-06-14	1	0	0	$500	$0
Campbell	1982-06-14	1	0	0	$500	$0
Campbell	1982-06-14	0	0	0	$50	$0
Johnson	1982-07-05	0	0	0	$500	$0
Crook	1982-07-24	1	0	0	$5,000	$0
Campbell	1983-07-17	1	0	0	$50,000	$0
Crook	1984-05-31	2	0	0	$50,000	$0
Weston	1985-05-10	2	0	0	$5,000	$0

County	Date	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Crook	1986-07-04	1	0	0	$50,000	$0
Campbell	1988-05-06	2	0	2	$500,000	$0
Campbell	1990-05-24	1	0	0	$5,000	$0
Campbell	1990-05-24	0	0	0	$5,000	$0
Weston	1991-05-12	1	0	0	$500,000	$0
Campbell	1993-08-19	1	0	0	$500,000	$0
Crook	1996-05-07	1	0	0	$50	$0
Crook	1998-06-13	1	0	0	$20,000	$0
Johnson	1999-08-11	1	0	0	$10,000	$0
Johnson	2017-12-06	2	0	0	$10,000	$0
Weston	2001-06-09	0	0	2	$0	$0
Campbell	2005-08-12	2	2	13	$5,000,000	$0
Campbell	2008-06-02	0	0	0	$10,000	$0
Crook	2009-07-13	2	0	2	$300,000	$0
Crook	2014-06-13	2	0	1	$100,000	$0
Crook	2014-06-25	1	0	0	$10,000	$0
Campbell	2014-06-26	0	0	0	$10,000	$0
Johnson	2017-06-12	2	0	0	$10,000	$0
Campbell	2018-06-01	3	0	2	$50,000	$0
Campbell	2018-06-01	1	0	0	$0	$0
Johnson	2019-06-19	1	0	0	$2,000	$0
Johnson	2023-06-23	0	0	0	$0	$0
Total	--	--	2	31	$101,43,100	$0

Source: NOAA

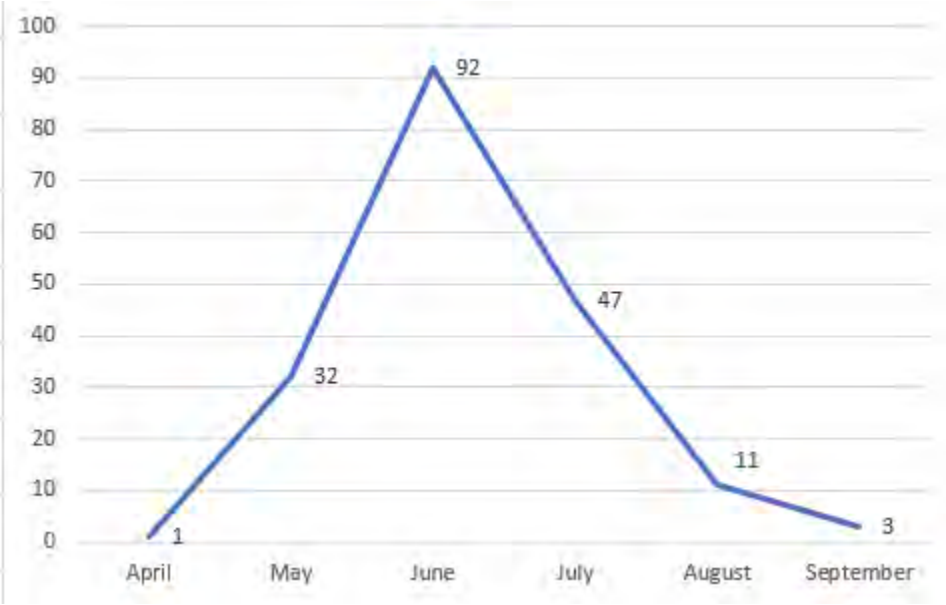
The NOAA data allows for examination and statistical analysis of tornadoes occurring in the Region. The majority of the historical tornadoes in the Region were rated F/EF0; the most powerful tornado recorded in Region 1 was rated as an EF3. The data also allows for the development of profiles on historical time periods of tornadoes. Figure 4-43 give historical perspective on the time of year that tornadoes in the region have occurred.

Figure 4-42 Region 1 Historical Tornadoes by Rating



Source: WSP analysis of NOAA data

Figure 4-43 Region 1 Historical Tornadoes by Month: 1950-2016



Source: WSP analysis of NOAA data

Historically, tornadoes occur in the spring/summer months between April and September, with the highest number of tornadoes occurring in June.

Historical tornadoes in Region 1 are most common during the months of May through August, and between the hours of noon and 10 pm, with peak hours being from 2 pm and 8 pm.

Most tornadoes recorded in Region 1 cause no recorded injuries, no recorded fatalities, and little to no damage to property ($0 - $50,000 range). Of the 186 tornadoes that have been recorded by NOAA in Region 1 from 1950 to 2021, 78 have caused recorded property damage or injuries, and none have caused recorded crop damage.

Johnson County HMPC reported an EF1 or EF2 tornado in 2017 southwest of Kaycee that damaged one roof, an unused mobile home, and downed a power line. A recent tornado event took place in Johnson County on June 1, 2018. A supercell storm produced two EF2 tornadoes that touched down in eastern Washakie and western Johnson counties and left thousands of trees destroyed in their wake. Further details on this event can be found in the Johnson County annex. Campbell County had 2 tornado fatalities from the 2005 Wright tornado, an F2 that also injured 13 people and caused $5 million in property damage, resulting in Presidential Disaster Declaration DR-1599. Sheridan County HMPC reported several barns had been impacted by tornadoes; they also noted a 2015 tornado that touched down in neighboring Big Horn County and traveled into Sheridan County near Highway 14. And on June 1st, 2018, four tornadoes touched down near Gillette, including an EF3, two EF1s and an EF0; the tornadoes damaged or destroyed several homes and outbuildings, flipped several vehicles, and snapped several utility poles. In 33 minutes, the tornadoes covered over 15 miles, destroying eight homes and damaging another 20 homes and properties in subdivisions north and northwest of Gillette. Damages were also reported at the Eagle Butte Coal Mine and the Dry Fork Power Station north of Gillette.

Frequency/Likelihood of Occurrence

There were 186 tornadoes in the Region recorded between 1950 and 2023; of those, 71 resulted in damage or injuries. The likelihood of a tornado touching down in any given year varies from 20% in Sheridan County to 160% in Campbell County. However, the likelihood of a damaging tornado in any given year varies from 9% in Sheridan County to 54% in Campbell County.

On average, Region 1 experienced 2.6 tornadoes per year, and 1.1 damaging tornadoes per year; this trend will likely continue into the future.

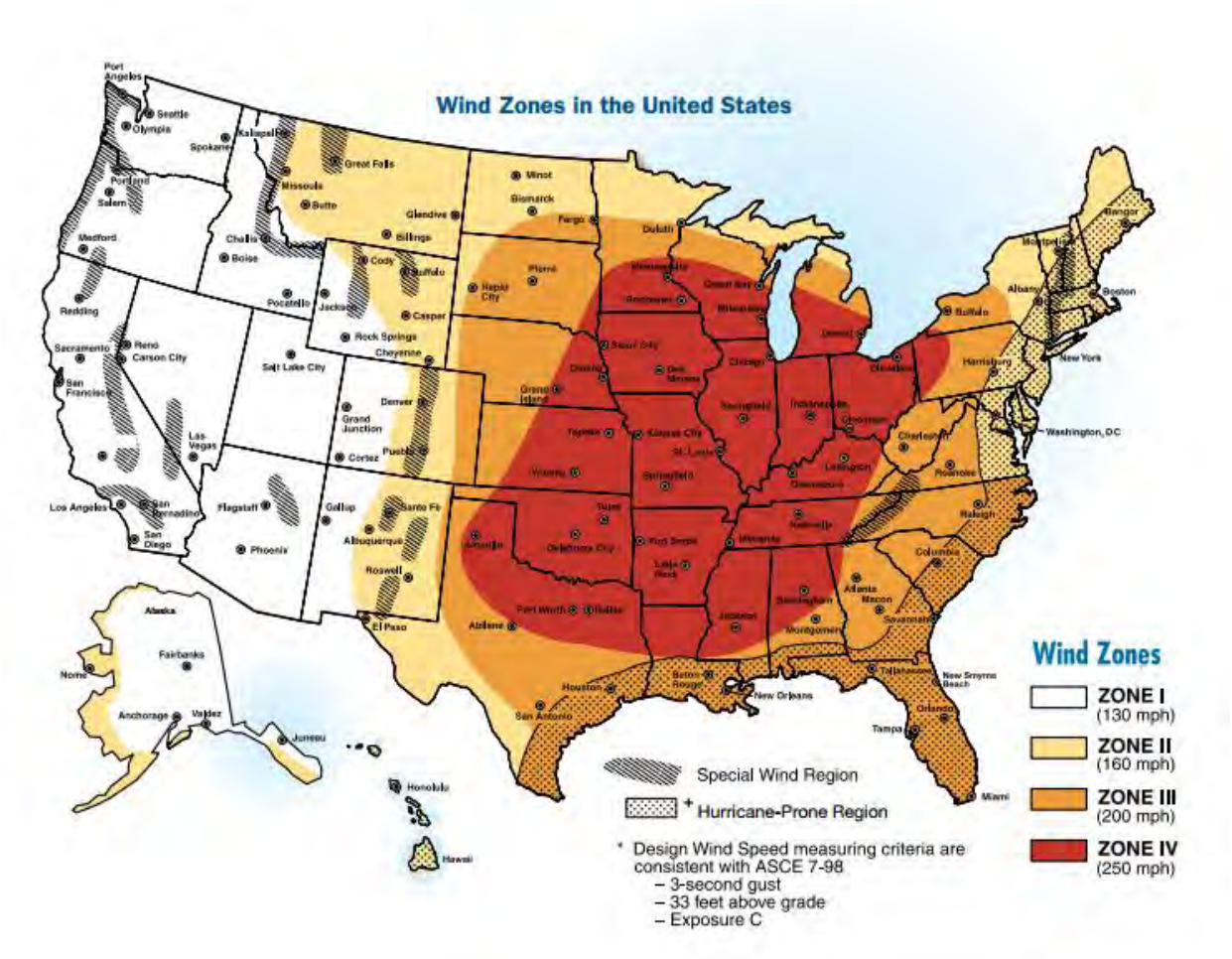
Changing Future Conditions

Climate change impacts on the frequency and severity of tornadoes are unclear. NASA's Earth Observatory has conducted studies which aim to understand the interaction between climate change and severe thunderstorms including those that spawn tornadoes (https://climate.nasa.gov/news/897/severe-thunderstorms-and-climate-change/). Based on these studies meteorologists are unsure why some thunderstorms generate tornadoes and others don't, beyond knowing that they require a certain type of wind shear. Tornadoes spawn from approximately one percent of thunderstorms, usually supercell thunderstorms that are in a wind shear environment that promotes rotation. Some studies show a potential for a decrease in wind shear in mid-latitude areas, particularly in the Mountain West. The level of significance of climate change on this hazard should be revisited over time as the science evolves.

Potential Magnitude (Extent)

The National Weather Service considers tornadoes to be among nature's most violent storms. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Tornadic winds can cause people and autos to become airborne, rip ordinary homes to shreds, and turn broken glass and other debris into lethal missiles. Even weaker tornados can cause large economic damages. The wind zone map shown below indicates the potential magnitude of wind speeds. All of Region 1 is located in Zone II, which can expect winds up to 160 mph. While EF3 tornadoes have been the strongest recorded in the Region, it is possible stronger tornadoes could occur.

Figure 4-44 Wind Zones in the United States



Source: FEMA

According to NCEI records, the storm of record for Region 1 occurred in Campbell County on August 12, 2005, when an F2 tornado touched down just north of Wright and traveled southeast into the town, striking a mobile home park and an elementary school. The tornado killed 2 people and injured 13 – all in the mobile home park – and caused $5,000,000 in property damage.

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

Vulnerability Assessment

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

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

People

It can be assumed that the entire planning area is exposed to some extent to tornadoes. Certain areas are more exposed due to geographic location and local weather patterns. Likelihood of injuries and fatalities would increase if warning time was limited before the event or if residents were unable to find adequate shelter.

Vulnerable populations are the elderly, low income, or linguistically isolated populations, people with life- threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern.

Individuals caught in the path of a tornado who are unable to seek appropriate shelter are especially vulnerable. This may include individuals who are out in the open, in cars, or who do not have access to basements, cellars, or safe rooms. The NCEI database reported 31 injuries and 2 injuries caused by tornado events in the Region.

Property

All property is vulnerable during tornado events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Construction practices and building codes can help maximize the resistance of the structures to damage. Mobile homes are more vulnerable to the impacts of a tornado event compared to stick-built and other housing types due to methods of construction.

Of the 186 tornadoes that have been recorded in Region 1 from 1950 to 2023, 71 have caused property damage. Campbell County accounted for $8,931,580 of the total property damages in the region, while Crook County totaled just $848,120 in recorded property damages. Across all counties, there was a total of $10,143,100 in property damages which annualizes to approximately $140,000 in damages for the Region.

Critical Facilities and Lifelines

All critical facilities and infrastructure are likely exposed to tornadoes. The most common problems associated with this hazard are utility losses. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function. Roads may become impassable due to downed trees or other debris.

Tornadoes can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Of particular concern are roads providing access to isolated areas and to the elderly. Any facility that is in the path of a tornado is likely to sustain damage.

The most serious damage would be seen in the direct path of the tornado, but secondary effects could impact the rest of the county through loss of government services and interruptions in the transportation network.

Economy

Tornado events are generally short-lived, but the impacts may last longer. Damages to commercial and private structures have the potential to be significant. Debris from the tornado would need to be collected and properly disposed of. Such an event would likely have substantial negative effects on the local economy. Tourism may also be interrupted after a tornado event.

Environmental and Cultural Resources

Environmental features are exposed to tornado risk, although damages are generally localized to the path of the tornado. Trees are especially susceptible to damage during high winds. Broken tree branches and limbs have been reported to act as flying debris and cause damage

to property during tornado events. Historic buildings built prior to modern building codes would be more prone to damage.

Development Trends

Any future development that is exposed and above ground will be vulnerable to a direct or indirect hit by a tornado. Generally, most areas in the Region lack building codes. In areas where building codes are not in place and enforced, buildings may not be built to withstand tornado-force winds.

Risk Summary and Overall Significance by Jurisdiction

Tornadoes are a credible threat and will continue to occur in the counties of Region 1. Historically, the impacts to the county from tornadoes has been low; however, depending on a tornado's size, intensity and path, it can cause severe impacts to people, property and infrastructure. The likelihood of a tornado generally increases from west to east in the Region.

Table 4-71 Tornado Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Significant	Likely	Limited	High
Crook	Significant	Likely	Limited	Medium
Johnson	Significant	Occasional	Limited	Medium
Sheridan	Significant	Occasional	Limited	Medium
Weston	Significant	Likely	Limited	Medium

4.2.15 Wildfire

Hazard/Problem Description

Wildfire is defined as a highly destructive fire or any instance of uncontrolled burning in grasslands, brush, or woodlands. Wildfire increasingly encroaches into urban interface areas, as more people move closer to forest settings. As defined by the National Interagency Fire Center (NIFC), a "wildland fire" is any non-structure fire, other than prescribed fire, that occurs in the wildland. The term "wildland/urban interface" or WUI is widely used within the wildland fire management community to describe any area where man-made buildings are constructed close to or within a boundary of natural terrain and fuel, where high potential for wildland fires exists. "Aspect" refers to the cardinal direction a slope faces. "Fuel" consists of combustible material, including vegetation such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire.

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

Generally, there are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

- **Fuel**—Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also, to be considered as a fuel source are manmade structures, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of

wildfire. Fuel is the only factor that can be modified by humans. The main fuel types in Fremont County are crops and grasses, while there are also brush and pine fuels present in some areas in the southwest of the county.

- **Topography**—An area's terrain and slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement and types of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- **Weather**—Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will more readily ignite and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. Wind is the most influential weather factor of the three and its influence can increase rates of spread regardless of temperature and relative humidity.

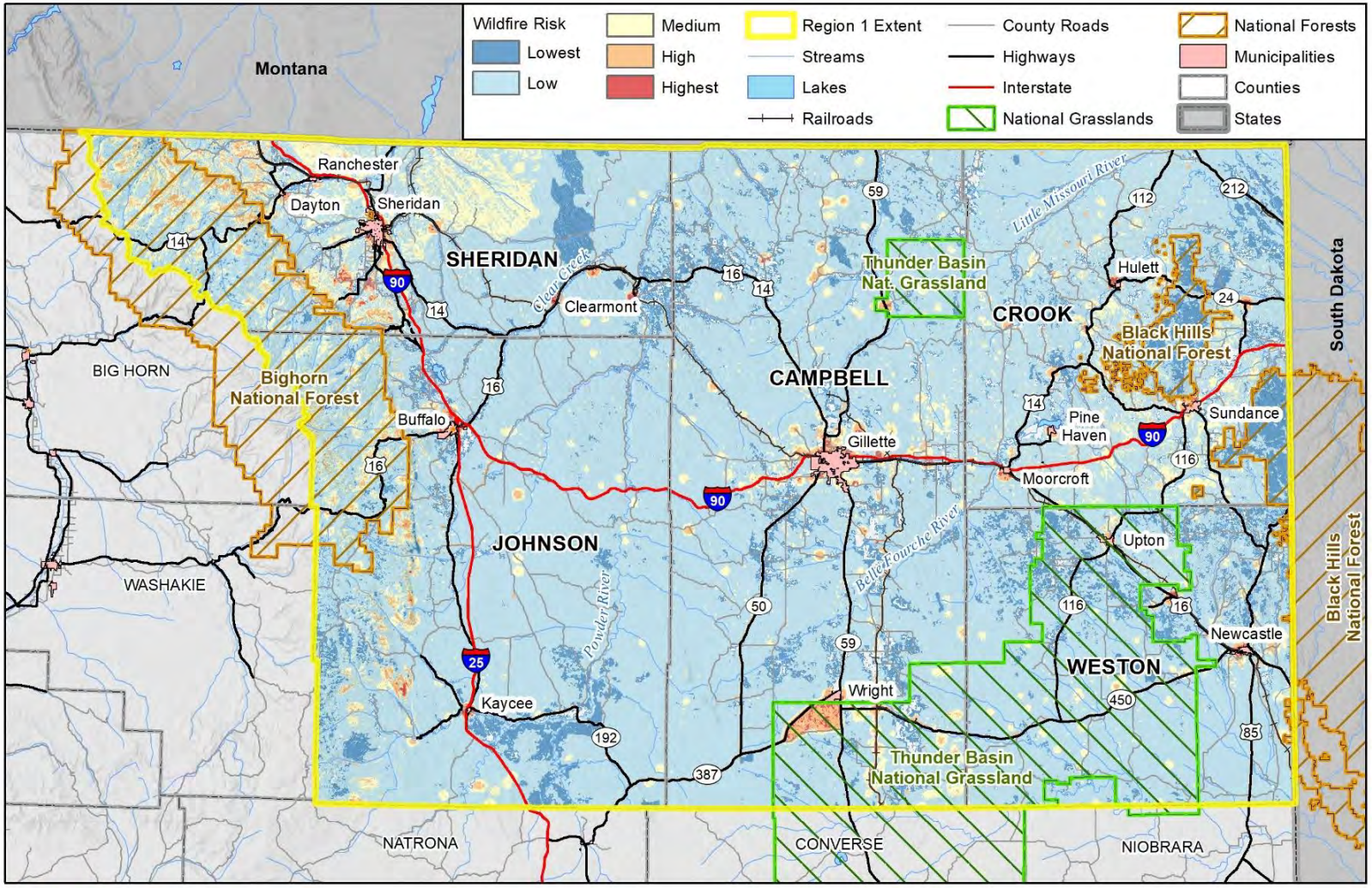
As the population and the wildland/urban interface in Wyoming increases, the risk of wildland fire becomes more significant. The past 100 years of wildland fire suppression has led to heavy vegetation growth and thus has greatly increased the potential fuel-load for a wildfire to burn. As the wildland/urban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

Geographical Area Affected

Certain areas within Region 1, because of their semi-arid climate and availability of fuel, are vulnerable to catastrophic wildland fires. Historically, over 50% of all wildfires in Wyoming involve wildland areas. A major portion of the Region is susceptible to wildfires, with the exception of areas above the tree line. According to the methodology for characterizing spatial extent, a **significant** portion of the planning area could be affected by wildfires.

Figure 4-45 shows the areas at greatest risk of wildfire, based on WYWRAP data. While the threat of wildfire is statewide and regionwide, the greatest risk to people and property is concentrated near inhabited areas. The county annexes also include maps illustrating this risk of wildfire in greater detail for each of the incorporated communities in the Region.

Figure 4-45 Region 1 Wildfire Risk

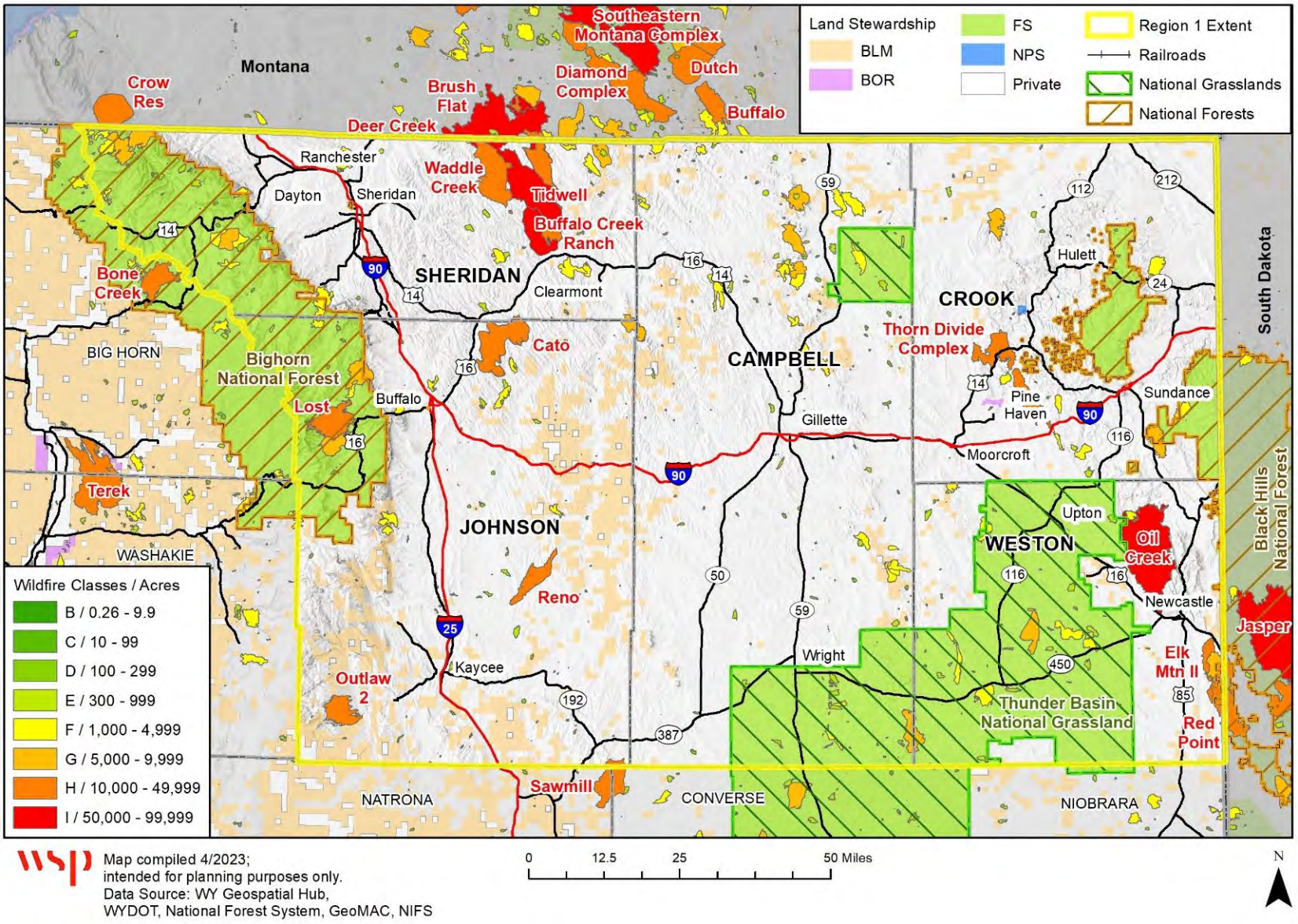


Past Occurrences

The Federal Wildland Fire Occurrence Database was used to analyze fire history in Region 1. The database, maintained by the USGS and other agencies, includes perimeter and point GIS layers for fires on public lands throughout the United States. The data includes fires dating back to 1980. The National Park Service, Bureau of Land Management, and U.S. Forest Service reports include fires of 10 acres and greater. The database is limited to fires on federal lands, though. Some fires may be missing altogether or have missing or incorrect attribute data. Some fire information may be lacking in the database because historical records were lost or damaged, fires were too small for the minimum cutoffs, documentation was inadequate, or fire perimeters had not yet been incorporated into the database. Also, agencies are at different stages of participation. For these reasons, the data should be used cautiously for statistical or analytical purposes.

Figure 4-46 shows wildfires that have affected the area based on the Federal Wildland Fire Occurrence Database. Some of the largest recorded fires occurred in the north and eastern parts of Sheridan County (near the boundary with Montana), as well as in the eastern-southern parts of Weston County (along the boundary with South Dakota). Some of the more significant fires are discussed by county in the following section.

Figure 4-46 Region 1 Past Wildfire Occurrences, 2000-2023



Frequency/Likelihood of Occurrence

Wildfires are **Highly Likely** to occur in the Region each year. It is important to note that the risk of wildfires occurring may increase during times of drought, especially in prolonged droughts such as 2000 – 2004; 2012 was also a drought year and a bad year for fires in the region.

Changing Future Conditions

The effects of changing future conditions have the potential to impact wildfire behavior, the frequency of ignitions, fire management, and fuel loads. Increasing temperatures may intensify wildfire threat and susceptibility to more frequent wildfires in the state. Forests are also sensitive to variable precipitation events, as drought has contributed to trees being more susceptible to pests and pathogens, in turn contributing to greater amounts of standing dead fuels. The extending of the wildfire season into winter months, coinciding with seasonal high wind patterns, can also create dangerous fire behavior.

The Fifth National Climate Assessment notes that climate change is leading to larger and more severe wildfires in the western United States (https://nca2023.globalchange.gov/chapter/25/). Fire potential in Wyoming is projected to increase in coming years, driven largely by increased temperatures and decreased humidity. The assessment specifically notes that wildfire numbers and fire-season length increased from the 1970s to the 2000s by 889% and 85 days, respectively, in western Montana and Wyoming forests, with most ignited by lightning strikes rather than humans.

While the recent historic trend shows a general upward trend in acreage burned per year, it is noted that not all wildfires are considered destructive given that there are positive ecological benefits from periodic fires. Suppression resources have been more focused on wildfires with life and safety threats in recent decades.

Potential Magnitude (Extent)

Most of the counties' individual risk to wildfire is limited, given only around 10% to 25% of property is severely damaged, and facilities and services likely to become unavailable between 1 and 7 days. However, wildfire can have significant economic impacts as they often coincide with the busy tourist season in the summer months. These natural hazards makes the overall potential for magnitude of wildfires rather **critical**. More specific consequences are discussed by county in the next section. It is important to note that, while only a small amount of built environments (e.g., infrastructure in the towns and cities) might be affected from wildfires, agricultural lands and other amenities valuable to the Region can still be greatly damaged, in turn affecting other aspects and sectors of the economy in the Region.

Vulnerability Assessment

People

The most exposed populations are those living in the wildland-urban interface (WUI) zones, where residential properties are directly intruding into traditional wildland areas. The exposure of the population in these zones increases with the exposure of the corresponding general property, examined in the section below. Other indirect impacts from wildfires on people are related to dense smoke from fires within the region. Wildfires in the past three years have decreased the air quality throughout the entire Western United States. Dense smoke poses a risk to both people with compromised health as well as those considered healthy. A study from the University of California San Diego found that wildfire smoke is more harmful to respiratory health in humans than pollution from cars (NPR 2021). Studies have also shown an increase in ambulance calls, hospital visits, and an increase of people experiencing respiratory or cardiac emergencies (NPR 2020). A study from the U.S. EPA also linked inhalation of particle pollution with the body's reduced ability to remove inhaled foreign materials, such as viruses

and bacteria, from the lungs, further compounding the health impacts of smoke. Other particularly vulnerable groups include children, the elderly, or those with breathing conditions who may be exposed to high levels of smoke.

Population at-risk estimates were developed by multiplying the average household size from the U.S. Census Bureau for each county in the region by the number of residential structures found within each wildfire risk area based on WYWRAP data. These results are shown in Table 4-72 below. It is important to note that many of these structures may include seasonal homes that could be vacant, although the likelihood of them being occupied during fire season is higher.

Table 4-72 Region 1 Population at Risk to Wildfire Hazard

	Medium Wildfire Risk	High Wildfire Risk	Highest Wildfire Risk	Total
Campbell County	2,041	4,664	6,108	**12,813**
Crook County	458	597	1,888	**2,943**
Johnson County	379	844	787	**2,010**
Sheridan County	2,088	2,908	1,916	**6,912**
Weston County	314	719	795	**1,828**

Source: WYWRAP, Wyoming CAMA 2022, U.S. Census Bureau, WSP GIS Analysis

Property

The potential impacts of wildfire on property include crop loss, injury and death of livestock and pets, and damage to infrastructure, homes and other buildings located throughout the wildfire risk area, with greatest potential impact on property, buildings and infrastructure located within high and very high hazard zones including the WUI, and buildings and infrastructure located within forested lands, to include national forests and parks. Any flammable materials are vulnerable during a wildfire, including structures and personal property. The vulnerability of general property increases as the distance of the property to wildfire-prone areas decreases and is particularly high for structures located in the WUI. These structures receive an even higher level of vulnerability if the properties surrounding them are not properly mitigated for fire. Appropriate mitigation techniques include using non-flammable materials such as concrete for construction, leaving appropriate spaces between buildings and vegetation areas filled with non-flammable materials (such as decorative rock or stone), and clearing of underbrush and trees.

Another method of estimating vulnerability is to determine the value of structures that are located within wildfire risk areas. For this plan update, GIS was used to create a centroid, or point, representing the center of each parcel polygon, which was overlaid on the wildfire hazard layer. For purposes of this analysis, it was assumed that every parcel with an improved value greater than zero was developed in some way, thus only improved parcels and their values were analyzed. An analysis of the value of those parcels (the improvement value plus estimated value of building contents) quantifies the potential losses from wildfires. The results of this analysis are summarized in Table 4-73. The total values shown below include both structure value and contents and can be used as an estimate of potential losses since wildfires typically result in a total loss. An estimated $4.97 billion in total property value is potentially exposed to the wildfire hazard throughout Region 1. The majority of this exposure is in Campbell County, which alone comprises about 45% of the exposed property value in the region.

Table 4-73 Wildfire Hazard Exposure – General Property Summary by County

County	Jurisdiction	Parcel Count Highest	Parcel Count High	Parcel Count Medium	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Campbell	Gillette	1,726	1,181	391	3,298	$941,578,722	$607,363,249	$1,548,941,971	7,865
	Wright	263	8	-	271	$49,748,426	$31,865,357	$81,613,783	649
	Campbell Unincorporated	619	718	434	1,771	$387,992,699	$219,161,354	$607,154,053	4,298
	Total	**2,608**	**1,907**	**825**	**5,340**	**$1,379,319,847**	**$858,389,959**	**$2,237,709,806**	**12,813**
Crook	Hulett	102	3	-	105	$22,162,180	$14,477,991	$36,640,171	210
	Moorcroft	180	-	-	180	$29,764,931	$17,307,244	$47,072,175	410
	Pine Haven	189	23	-	212	$43,691,727	$23,213,488	$66,905,215	531
	Sundance	267	17	-	284	$50,121,332	$31,298,600	$81,419,932	655
	Crook Unincorporated	105	235	269	609	$121,147,825	$73,873,834	$195,021,659	1,136
	Total	**843**	**278**	**269**	**1,390**	**$266,887,995**	**$160,171,156**	**$427,059,151**	**2,943**
Johnson	Buffalo	151	107	8	266	$72,594,446	$46,772,942	$119,367,388	513
	Kaycee	70	-	-	70	$7,833,100	$4,612,481	$12,445,581	125
	Johnson Unincorporated	205	331	175	711	$164,295,965	$89,979,141	$254,275,106	1,372
	Total	**426**	**438**	**183**	**1,047**	**$244,723,511**	**$141,364,564**	**$386,088,075**	**2,010**
Sheridan	Clearmont	36	-	-	36	$3,840,575	$1,988,041	$5,828,616	77
	Dayton	169	59	15	243	$56,020,345	$28,722,525	$84,742,870	519
	Ranchester	172	14	3	189	$41,923,489	$22,240,350	$64,163,839	396
	Sheridan	246	191	166	603	$239,152,785	$156,506,231	$395,659,016	1,107
	Sheridan Unincorporated	489	1,101	778	2,368	$728,541,894	$381,353,632	$1,109,895,526	4,813
	Total	**1,112**	**1,365**	**962**	**3,439**	**$1,069,479,088**	**$590,810,778**	**$1,660,289,866**	**6,913**
Weston	Newcastle	52	48	12	112	$23,594,659	$17,083,788	$40,678,447	204
	Upton	233	24	2	259	$35,187,153	$20,429,941	$55,617,094	520

County	Jurisdiction	Parcel Count Highest	Parcel Count High	Parcel Count Medium	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
	Weston Unincorporated	134	265	131	530	$102,619,071	$58,309,279	$160,928,350	1,104
	Total	**419**	**337**	**145**	**901**	**$161,400,883**	**$95,823,008**	**$257,223,891**	**1,827**
	Grand Total	**5,408**	**4,325**	**2,384**	**12,117**	**$3,121,811,324**	**$1,846,559,464**	**$4,968,370,788**	**26,506**

Source: WYWRAP, Wyoming CAMA 2022, WSP GIS Analysis

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

Critical Facilities and Lifelines

Wildfire impacts to critical facilities can include structural damage or destruction, risk to persons located within facilities, disruption of transportation, shipping, and evacuation operations, and interruption of facility operations and critical functions. To estimate the potential impact of wildfire on critical facilities and lifelines, a GIS overlay was performed with the wildfire hazard layers and the critical facility point data. Replacement values were not available with the data thus an estimate of potential monetary loss could not be performed. Impacts to any of these facilities could have wide ranging ramifications, in addition to property damage and other cascading impacts.

The total counts and types of critical facilities by FEMA Lifeline category are summarized below. As shown in these tables, the majority of exposed critical facilities are in Campbell County.

Table 4-74 Critical Facilities at Risk to Medium Wildfire Risk by Jurisdiction and FEMA Lifeline

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Campbell	26	11	-	1	1	2	7	**48**
Crook	5	3	-	1	-	-	6	**15**
Johnson	13	2	2	-	-	-	18	**35**
Sheridan	24	1	-	1	2	-	14	**42**
Weston	2	4	-	-	-	-	2	**8**
Total	**70**	**21**	**2**	**3**	**3**	**2**	**47**	**148**

Source: WYWRAP, HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 4-75 Critical Facilities at Risk to High Wildfire Risk by Jurisdiction and FEMA Lifeline

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Campbell	62	17	2	2	2	8	34	**127**
Crook	5	4	-	1	-	-	41	**51**
Johnson	11	1	-	-	-	1	59	**72**
Sheridan	16	2	-	-	1	5	31	**55**

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Weston	15	1	-	-	-	-	4	**20**
Total	**109**	**25**	**2**	**3**	**3**	**14**	**169**	**325**

Source: WYWRAP, HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 4-76 Critical Facilities at Risk to Highest Wildfire Risk by Jurisdiction and FEMA Lifeline

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Campbell	41	8	-	-	3	7	19	**78**
Crook	1	-	2	3	-	6	9	**21**
Johnson	7	-	2	-	1	3	2	**15**
Sheridan	17	6	-	-	1	10	17	**51**
Weston	1	10	-	-	4	6	1	**22**
Total	**67**	**24**	**4**	**3**	**9**	**32**	**48**	**187**

Source: WYWRAP, HIFLD, National Bridge Inventory, WSP GIS Analysis

Facilities in the region such as those summarized in the tables above may be exposed directly or indirectly to wildfire. Direct exposures are similar to those of General Property and increase as the infrastructure or facilities and capabilities move into the WUI zones. Communication infrastructure and lines passing through susceptible areas such as forests are more exposed than those located in cities and more urbanized areas. The indirect vulnerability of response capabilities increases seasonally and with the number of occurrences. Though the populations making up the response capability systems are not directly exposed to all fire events, the response of some of the personnel to an event lessens the capabilities overall for responses to other emergency situations. If there is a large increase in the number of simultaneous wildland fires, even small ones, the response capability of the Region could easily be compromised.

Economy

The economic impacts of wildfire include loss of property, direct agricultural sector job loss, secondary economic losses to businesses in or near wildland resources like parks and national forests, and loss of public access to recreational resources. Tourism in Region 1 plays a significant economic role, with the presence of many outdoor recreational opportunities both in the region and nearby. Damage to these assets or disruption of access to them can have far reaching negative impacts to the local economy. Fire suppression may also require increased cost to local and state government for water acquisition and delivery, especially during periods of drought when water resources are scarce.

Environmental and Cultural Resources

A percentage of the Region includes National Forest and Grasslands, which contains many natural and cultural resources potentially at risk. Wildfires can often lead to contamination of

drinking water, both at the surface level and in wells. Wildfires in the national forests may also have a regional impact on summer tourism and other economic sectors.

Wildfire can have negative impacts where significant areas of sagebrush are burned within crucial mule deer winter range and sage-grouse breeding and winter habitats, for example. Nevertheless, natural resources and spaces can actually benefit from wildland fire, to encourage a healthy ecological redevelopment of areas impacted by pests or other such deterrents to the environment's native species growth.

Historic and cultural resources exhibit a vulnerability rating similar to those in general property, however, where vulnerability ratings increase the closer into the WUI the property is, and the less mitigated the landscaping surrounding the property is. In addition, older buildings may be exempt from internal fire mitigation such as sprinklers and fire suppression technology, which may increase the vulnerability of the resource. Examples of buildings of this exempt nature may include historic buildings in downtown and tourist areas, such as museums or restaurants.

Development Trends

The wildland/urban interface (WUI) is a very popular building location, as shown by national and statewide trends. More and more homes are being built in the interface. Overall, Wyoming has less developed WUI than most western states. Throughout Wyoming there remains potential for future home construction in undeveloped, forested private lands adjacent to fire-prone public lands. Building homes in these high-risk areas would put lives and property in the path of wildfires. Regulating growth in these areas will be a delicate balance between protecting private property rights and promoting public safety. Should the region begin to experience this type of WUI growth, local government may wish to consider: regulation of subdivision entrance/exit roads and bridges for the safety of property owners and fire personnel; building considerations pertaining to land on slopes greater than 25% (in consideration of access for fire protection of structures); and water supply requirements set forth to include ponds, access by fire apparatus, pumps, and backup generators. Such standards serve to protect residents and property, as well as emergency services personnel and government/public resources.

Risk Summary and Overall Significance by Jurisdiction

Wildfires occur within the region on an annual basis. Based on GIS analysis of the WYWRAP wildfire risk areas and property values, the Region has nearly $5 billion in property value potentially at risk to wildland fires. Though it is not likely that the areas at risk will simultaneously face a completely destructive event, this figure provides the upper end of what could be affected. Overall, wildfire is a **high** significance hazard to the Region. Overall county ratings are noted in the table below.

Table 4-77 Wildfire Hazard Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Significant	Highly Likely	Critical	High
Crook	Significant	Highly Likely	Critical	High
Johnson	Significant	Highly Likely	Critical	High
Sheridan	Significant	Highly Likely	Critical	High
Weston	Significant	Highly Likely	Critical	High

4.2.16 Coal Seam Fire

Hazard/Problem Description

The Earth's crust is layered, composed of different rocks and minerals. Coal seams are layers within this structure which contain deposits of coal. Coal is a combustible black or brownish-black sedimentary rock that forms over millions of years from the remains of plants and trees that lived and died in ancient swamps and marshes. These organic materials are subjected to heat and pressure over time, causing chemical and physical changes that transform them into coal. A coal seam is a concentrated layer or bed of coal within the Earth's crust, as shown in Figure 4-47. Coal seams come in different sizes and thicknesses, ranging from a few centimeters to several meters thick.

Figure 4-47 Coal Seams in Sandstone and Tonsteins in Superior, Wyoming

Source: James St. John via Wikimedia commons

Coal seam fires are fires that occur within underground coal seams or in coal waste piles on the surface. These fires can burn for extended periods, often for years or even decades. Coal seam fires can start due to natural or human causes. Natural causes can include lightning strikes or spontaneous combustion, which happens when the heat generated by the coal's internal processes ignites the surrounding material. Human causes can range from accidental ignition during mining operations to intentional burning for waste management or clearing land.

Once ignited, coal seam fires are difficult to extinguish as coal contains a significant amount of carbon, which acts as fuel. These fires can smolder underground, hidden from sight, and release toxic gases, smoke, and carbon dioxide into the atmosphere. The fire can spread along the coal seam and may even migrate to adjacent coal seams through interconnected fractures and faults.

Coal seam fires present several challenges and hazards. They can cause land subsidence, making the ground unstable and leading to the collapse of buildings, roads, and other structures. The combustion of coal releases harmful gases, such as carbon monoxide (CO) and sulfur dioxide (SO2), which can pose health risks to nearby communities. The smoke and particulate matter emitted by the fires can also cause air pollution and affect air quality over a wide area. A primary concern is their potential to spark grass fires and wildfires on the surface.

Additionally, extinguishing coal seam fires can be complex and time-consuming. Various methods may be employed, depending on the situation, including excavating and removing the burning coal, isolating the fire by creating trenches or barriers to prevent its spread, injecting water or fire-retardant materials into the coal seam, and using controlled burns to consume the available oxygen and suffocate the fire. However, completely extinguishing coal seam fires can be extremely challenging and often requires significant resources and expertise. In some cases, it may be more feasible to contain the fire and minimize its impacts rather than attempting to fully extinguish it.

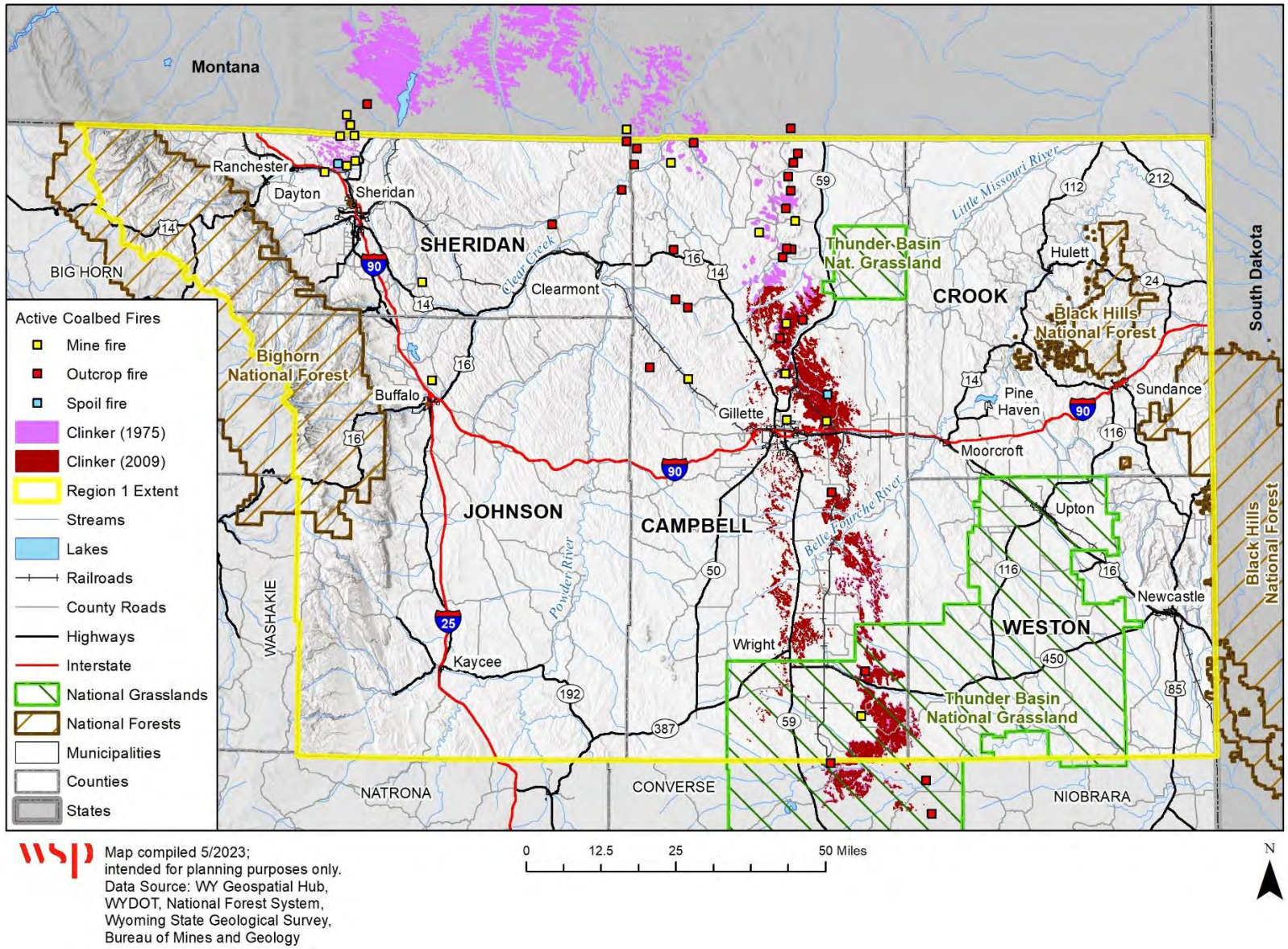
Geographical Area Affected

Limited – In addition to recorded occurrences of coal seam fires, the mapping of clinker is a useful indicator for identifying the historic occurrence and extent of coal seam fires. When a coal seam fire burns, it releases heat which can cause nearby rocks and minerals to undergo physical and chemical changes, leading to the formation of clinker. Clinker is a solid, fused mass of incombustible residue that forms during the combustion of coal. It is composed of minerals, ash, and other impurities that are present in the coal.

The clinker can be found on the surface or within underground areas affected by fire. A map of known coal seam fires and clinker outcrops are displayed in Figure 4-48, although it should be noted that there was no data available regarding clinker mapping in Johnson and Crook Counties. The HMPCs from these Counties indicated very low concern about coal seam fires, so there may not be a robust history of coal seam fires in those regions.

However, the extent of coal seam fires can extend far beyond the actual fire. In addition to heat, when a coal seam fire burns it releases gases and smoke. Once airborne, toxic gases and smoke can pollute air quality and water resources beyond any jurisdictional boundary.

Figure 4-48 Region 1 Coal Seam Fire and Clinker Locations



Past Occurrences

A history of coal seam fires in the Powder River Basin, compiled in February 2013, documented 49 known coal seam fires in Wyoming.[1] 30 of those fires were in Campbell County, at least 5 of which were active at the time of publication. An additional 14 were documented in Sheridan County, at least 10 of which were still active at the time of publication. One coal seam fire, which was still active at the time of publication, was documented in Johnson County. The names and locations of those fires are documented in Table 4-78 below.

Table 4-78 History of Coal Seam Fires in Region [1]

County	Fire Name	Size	Start Date (est.)	Status
Campbell County	Andrew Ditto Mine	Unknown	burning before 1927	Unknown
	Canfield	1100' x 400'; 9 ac; 60' deep	burning since 1925	Active
	D.C. Holler	< 100 sq ft	unknown	Unknown
	Davis	2 small fires	July 2002	Reclaimed
	Dead Horse Creek	2 acres	1949	Reclaimed
	E.W. Record	< 100 sq ft	unknown	Unknown
	Echeta	1.4 acres	August 1996	Active
	Elk Creek	15 acres	since 1907	Reclaimed
	Kasper (Cromack)	5 small fires	July 2002	Reclaimed
	Laur	300' x 400'	burning since 1939 or earlier	Reclaimed
	Little Thunder Basin	1200' x 600'; 70' deep	burning since 1870s or earlier	Reclaimed
	Matz	2 small fires	July 2002	Active
	Middle Prong Wild Horse	1200' diameter	unknown	Reclaimed
	Moyer Gulch	5 acres	1885	Reclaimed
	Padlock Ranch	Unknown	unknown	Reclaimed
	Peyrot	2 small fires	July 2002	Reclaimed
	Pownell	4 small fires	July 2002	Reclaimed
	Rawhide School	< 1000 sq ft	unknown	Unknown
	Rourke	8 small fires	July 2002	Reclaimed
	Shinn - Seacross Ranch	18 small fires over 100 acres	July 2002	Reclaimed
	Shinn 14	1 fire, odor smelt from ranch	July 2002	Reclaimed
	Swartz 11	1 small fire	July 2002	Extinguished
	Swartz 14	1 small fire	July 2002	Extinguished
	T7 Ranch	Unknown	since 1800s	Unknown
	Tarver	12 small fires	July 2002	Reclaimed
	Twentymile	unknown	unknown	Active
	Unnamed	Unknown	unknown	Unknown
	Unnamed	Unknown	unknown	Unknown
	Unnamed	3 fires	Fall 2004	Extinguished

1 *Known Historic Or Active Coal Fires In The Powder River Basin, Wyoming and Montana*, Compiled by E.L. Heffern February 2013

County	Fire Name	Size	Start Date (est.)	Status
	Wild Horse Ck CAMP1055	3 acres	after 1890s	Active
Johnson County	Rock Creek	4 acres mined; 0.3 ac active	Unknown	Active
Sheridan County	Acme No. 1 Mine	870 acres mined, 25 ac active	since at least 1940	Active
	Ankney Ranch	3.4 acres	within past decade or two	Active
	Belus Mine SHER1009	unknown	unknown	Extinguished
	Big Horn Mine SHER0026	50 acres	unknown	Active
	Carney Slack	250' x 130' x 5' slack pile	July 2006	Reclaimed
	Carney/Kleenburn Mines	475 acres mined; 1 ac active	after 1924	Active
	Coal Bank - PG Ranch	400' x 200'	unknown	Active
	Hotchkiss Mine	73 acres mined; 5 ac active	after 1920	Active
	Leiter	200' x 600'	before 1859	Active
	Old Monarch Mine	40 acres	after 1910	Unknown
	Plachek Mine	2 highwall fires; 1 ac active	after 1963; flared in 2005	Active
	SHER0027	1 acre	at least since early 1960s	Active
	Unnamed	1 acre	unknown	Unknown
	Welch Ranch (Acme 1N)	13 acres	since at least 2001	Active

Frequency/Likelihood of Occurrence

Likely – At least one active coal fire documented in the Past Occurrences section has been burning for more than a century, and several other have been burning since the mid-to-late 1920s. Due to the difficulty of extinguishing these fires, it is likely that there are currently several coal seam fires burning in Wyoming Region 1. While it is difficult to predict where the next one may ignite, many of the adverse effects of coal seam fires are present in these fires that are already burning. Therefore, it is likely that Wyoming Region 1 will be affected by a coal seam fire.

Changing Future Conditions

Coal seam fires release substantial amounts of carbon dioxide (CO2), a greenhouse gas that contributes to climate change. The continuous burning of coal releases significant quantities of CO2 into the atmosphere, adding to the overall carbon footprint and exacerbating global warming. In turn, a warming climate can create ideal conditions for coal seam fires to develop.

Increasing temperatures can lead to more frequent and intense heatwaves and droughts. An arid climate may lead to reduced ground moisture through evapotranspiration, making coal seams and surrounding materials more susceptible to ignition, and can help sustain fires over extended periods. A warm and dry environment allows for the uninterrupted spread of fire, both on the surface where open flames may ignite a coal seam, and underground where a coal seam can continue to spread. Extended periods of extreme heat and low precipitation can create a longer fire season, which creates increased favorability for wildfires that may in turn spark a coal seam.

Potential Magnitude (Extent)

Negligible/Limited – Coal seam fires are typically described in terms of the size of the area burned and the amount of time spent burning. In this sense, the potential magnitude of coal seam fires can be quite large. Early explorers to the Powder River Basin, including the Lewis and Clark expedition in the early 1800s, noted the presence of wild coal seam fires. Researchers, using fission-tracking data techniques on clinker in the area, have dated coal burn areas as old as the middle Pliocene (2.8 ± 0.6 million years ago). Further measures of coal seam fires can include the amount of CO2 or other VOCs released into the air by the fire. However, this measure will vary greatly depending on the size and location of the fire, as well as the composition of the coal, making it an imperfect metric to describe the magnitude of coal seam fires in Wyoming Region 1.

Given the extensive history of coal seam fires and coal mining in the area, modern development is largely disconnected from areas where coal seam fires have occurred historically and are likely to occur in the future. Consequently, less than 10% of property in the area would be expected to be severely damaged from a coal seam fire. Any acute injury or illness would be expected to be treated with local capabilities, although injury or illness from long-standing exposure to air-or-water borne pollutants may have chronic health effects. Coal seam fires are unlikely to cause interruption for facilities or services.

Vulnerability Assessment

People

Coal seam fires release a variety of pollutants into the atmosphere. The combustion of coal produces toxic gases such as CO, SO2, nitrogen oxides (NOx), and VOCs. These pollutants can contribute to poor air quality and pose health risks to nearby communities. The smoke and particulate matter emitted by the fires can also cause respiratory issues and exacerbate existing respiratory conditions.

Property

Coal seam fires can cause land subsidence, which refers to the sinking or settling of the ground, see Mine and Land Subsidence. As the underground coal burns, it can weaken the support structure, leading to the collapse of the surface and causing damage to buildings, roads, and infrastructure in the affected areas.

Critical Facilities and Lifelines

As noted in the Potential Magnitude section, development in Wyoming Region 1 is largely disconnected from areas where coal seam fires are likely to occur. Therefore, impacts to critical facilities and lifelines are likely to be limited to potential damage to roads through subsidence and impacts to water quality through particulate fallout.

Economy

Coal seam fires result in the loss of valuable coal resources, which impacts the economic viability of mining operations. The costs associated with firefighting, remediation, and rehabilitation efforts can be substantial. Additionally, the environmental and health impacts can have long-term economic implications for affected communities, including decreased property values and increased healthcare expenses.

Environmental and Cultural Resources

The environmental impacts of coal seam fires extend to ecosystems and biodiversity. The fires can destroy vegetation, disrupt habitats, and displace or harm animal species. The release of pollutants and the alteration of soil conditions can have long-term ecological consequences, affecting the natural balance of ecosystems.

The runoff from coal seam fires can contaminate nearby water sources with pollutants and harmful substances. The leaching of chemicals from the burning coal and the ash can enter streams, rivers, and groundwater, potentially affecting aquatic life and human water supplies.

Development Trends

Future development, including the construction of buildings, roads, and infrastructure, can lead to coal seam fires in Region 1. These activities may include drilling, mining, and other industrial activities that may inadvertently disturb coal seams, potentially providing pathways for oxygen to reach underground coal deposits and ignite or increase existing coal seam fires. These activities can also introduce new ignition sources, such as electrical equipment and accidental fires, which increases the risk of coal seam fires igniting.

To minimize risk to future development, careful planning and land-use practices are essential. Implementing comprehensive monitoring and early warning systems can help detect and address potential coal seam fire incidents. Proper management of mining and construction activities can also help mitigate the risk of coal seam fires.

Risk Summary and Overall Significance by Jurisdiction

While countless coal seam fires have existed in Region 1 throughout recorded history, vulnerability is generally **low** due to the minimal impact this hazard has had on individuals and communities in the Region. However, this risk should continue to be monitored when siting future development, especially in Campbell and Sheridan Counties, which have the most substantial history of coal seam fires.

Table 4-79 Coal Seam Fire Risk Summary

County	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Campbell	Limited	Likely	Limited	Medium
Crook	Negligible	Likely	Negligible/Limited	Low
Johnson	Negligible	Likely	Negligible/Limited	N/A
Sheridan	Limited	Likely	Limited	Low
Weston	Negligible	Likely	Negligible/Limited	N/A

5 Mitigation Strategy

44 CFR Requirement §201.6(c)(3):

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

5.1 Mitigation Strategy: Overview

This section describes the mitigation strategy and mitigation action plan for the Region 1 Hazard Mitigation Plan. It describes how the participating jurisdictions in the Region met the following requirements from the 10-step planning process:

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

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the work of each county's HMPC led to this mitigation strategy and action plan. Section 5.2 below identifies the goals of this plan, Section 5.3 describes how action items were identified, updated and prioritized, and Section 5.4 describes the mitigation action plan.

5.2 Goals and Objectives

44 CFR Requirement §201.6(c)(3)(i)

[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, each county's HMPC had organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals and mitigation actions were developed and updated based on these tasks. During the 2023 update of this plan, each county HMPC held a series of meetings designed to achieve a collaborative mitigation strategy as described further throughout this section.

During the online planning workshops held in May of 2023, the counties reviewed the results of the hazard identification and vulnerability assessment, capability assessment and goals from previous county-level hazard mitigation plans as well as the State of Wyoming Multi-Hazard Mitigation Plan (2021). This analysis of the risk assessment identified areas where improvements could be made, and provided the framework for the counties to update planning goals, and develop new or updated mitigation strategies.

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

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

Goals are stated without regard to implementation. The cost of implementation, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used to achieve the goals. Objectives are more specific and measurable than goals, and are used to define strategies to attain those goals. Objectives are sometimes developed in mitigation planning as an intermediate step between goals and mitigation actions or projects.

The update or development of goals for the counties in the region was initiated through a facilitated discussion at the online workshops held in 2023 (Hazard Risk Assessment and Goals meetings). The HMPC members were provided a PowerPoint presentation that explained goals, objectives and actions, and provided examples of each. The 2018 existing Regional Plan goals and related plan goals were noted in the PowerPoint, including the State of Wyoming Multi-Hazard Mitigation Plan (2021). This review ensured that the Regional Plan's mitigation goals were aligned and integrated with existing plans and policies. Based on discussion at the HMPC meetings the groups decided the goals from 2018 were still valid and should be carried forward in the 2023 plan update.

The goals and objectives for each county in the Region are noted below and in each county annex.

Campbell County Goals and Objectives

Goal 1: Reduce the impact of severe weather on people, property, or natural resources.

Objective 1.1: Improve severe weather detection and tracking capabilities.

Objective 1.2: Improve warning and communication capabilities.

Objective 1.3: Provide public education on personal preparation and appropriate response to severe weather events.

Objective 1.4: Promote appropriate shelter during severe weather.

Objective 1.5: Increase the local capacity to deal with psychological effects of emergency and disaster events.

Objective 1.6: Reduce Flood Damage.

Goal 2: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

Objective 2.1: Determine the need for volunteers and training.

Objective 2.2: Provide training and public education opportunities.

Goal 3: Maintain the reliability and resilience of critical infrastructure.

Objective 3.1: Work to harden critical public infrastructure.

Objective 3.2: Provide for continuity of both governmental and private sector functions.

Objective 3.3: Provide for continuity of public sector GIS data/information function.

Goal 4: Reduce the impact of human-caused incidents, emergencies or disasters.

Objective 4.1: Prepare the public to minimize the impact of hazardous material incidents.

Objective 4.2: Reduce the impact of terrorism within the jurisdictions.

Objective 4.3: Reduce the impact of incidents, emergencies and disasters on our Special Needs populations.

Goal 5: Reduce loss of life and property from fire.

Objective 5.1: Reduce the potential for fire in future developments.

Goal 6: Increase resilience through coordination of governmental policies, procedures, codes and regulations.

Objective 6.1: Review current planning documents and their ability to integrate with the Hazard Mitigation Plan to build resiliency to natural and human-caused incidents, emergencies and disasters.

Objective 6.2: Educate the public and contractors about the relationship between construction techniques and potential for disasters.

Crook County Goals

Goal 1: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the Town of Hulett.

Goal 2: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the Town of Moorcroft.

Goal 3: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the Town of Pine Haven.

Goal 4: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the City of Sundance.

Goal 5: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in Crook County.

Goal 6: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

Johnson County Goals and Objectives

Goal 1: To protect life and property from hazards.

Objective 1.1: To minimize loss of life and damage to property due to flooding in the Middle Fork of Powder River through the Town of Kaycee.

Objective 1.2: To minimize loss of life and damage to property due to wildland fire throughout the county.

Objective 1.3: To minimize the potential for loss of life and damage to property by reducing the potential for accidental or intentional release of hazardous materials.

Objective 1.4: To minimize the potential for loss of life and damage to property by being prepared to shelter travelers and residents during and after severe weather events.

Objective 1.5: To minimize the potential for loss of life and damage to property through an early warning system.

Objective 1.6: To minimize the potential for loss of life and damage to property by facilitating training of the Incident Command System (ICS) including and Emergency Operations Center.

Objective 1.7: To minimize the potential for loss of life and damage to property due to flooding of Clear Creek through the City of Buffalo.

Objective 1.8: To minimize the potential for loss of life and damage to property due to landslides.

Goal 2: To increase public awareness and education about hazards.

Objective 2.1: Provide resources for outreach and education programs to increase public and governmental awareness of risks associated with the identified hazards.

Objective 2.2: Provide information and education to the local city and county planning departments regarding the identified hazards, risks, and vulnerabilities within the county.

Objective 2.3: Provide education and assistance to rural areas about fire protection and fire safety.

Goal 3: The strengthen and improve disaster resistance of publicly and privately owned facilities and infrastructure.

Objective 3.1: To update facilities' capability to withstand identified hazards and risks.

Objective 3.2: To improve mapping of publicly-owned facilities.

Objective 3.3: To enhance mitigation project management.

Sheridan County Goals and Objectives

Goal 1: Mitigate the effect of hazards through education, ordinances, resolutions, and clear definition, and implementation of mitigation projects to reduce the loss of property and enhance life-safety.

Goal 2: Coordinate mitigation activities with all entities and stakeholders of Sheridan County to assess the hazards and take various actions to reduce or eliminate the risk factors of those hazards.

Goal 3: Reduce the economic impact on the local economy caused by the effects of hazards in the communities.

Goal 4: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

Weston County Goals and Objectives

Goal 1: Reduce the impact of severe weather on people, property, or natural resources.

Objective 1.1: Improve severe weather detection and tracking capabilities.

Objective 1.2: Improve warning and communication capabilities.

Objective 1.3: Provide public education on personal preparation and appropriate response to severe weather events.

Objective 1.4: Promote appropriate shelter during severe weather.

Objective 1.5: Increase the local capacity to deal with psychological effects of emergency and disaster events.

Objective 1.6: Reduce Flood Damage.

Goal 2: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

Objective 2.1: Determine the need for volunteers and training.

Objective 2.2: Provide training and public education opportunities.

Objective 2.3: Reduce the potential for fire in future developments.

Goal 3: Maintain the reliability and resilience of critical infrastructure.

Objective 3.1: Work to harden critical public infrastructure.

Objective 3.2: Provide for continuity of both governmental and private sector functions.

Objective 3.3: Provide for continuity of public sector GIS data/information function.

Goal 4: Reduce the impact of human-caused incidents, emergencies or disasters.

Objective 4.1: Prepare the public to minimize the impact of hazardous material incidents.

Objective 4.2: Reduce the impact of terrorism within the jurisdictions.

Objective 4.3: Reduce the impact of incidents, emergencies and disasters on our Special Needs populations.

Goal 5: Increase resilience through coordination of governmental policies, procedures, codes and regulations.

Objective 5.1: Review current planning documents and their ability to protect the public from natural and human-caused incidents, emergencies and disasters.

Objective 5.2: Educate the public and contractors about the relationship between construction techniques and potential for disasters

5.3 Identification and Analysis of Mitigation Actions

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

The next step in the mitigation strategy is to identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the effects of each hazard on new and existing buildings and infrastructure. During the 2023 Regional Plan update, each county HMPC analyzed viable mitigation options by hazard that supported the identified goals. The HMPCs were provided with the following list of categories of mitigation actions, which align with FEMA guidance and those of the National Flood Insurance Program's Community Rating System:

Plans and regulations: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.

Structural and infrastructure projects: Actions that involve the construction of structures to reduce the impact of a hazard. Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.

Natural systems protection: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.

Education and awareness: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

Operational Resiliency: Actions that protect people and property during and immediately after a disaster or hazard event.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified and profiled in Chapter 4 was evaluated. At the mitigation strategy workshops the counties were also provided a matrix showing examples of potential mitigation action alternatives from each of the above categories for each of the identified hazards. The counties were also provided a handout that explains the categories and provided further examples. The counties were asked to consider both future and existing buildings in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix A provides the matrix of alternatives considered. Each proposed action was written on a large sticky note and posted on flip charts in the meeting rooms underneath the

hazard it addressed. The result was several new project ideas intended to reduce the impacts of the identified hazards.

The mitigation strategy is based on existing local authorities, policies, programs, and resources, as well as the ability to expand on and improve these existing tools. As part of the Regional Plan development, the county planning teams reviewed existing capabilities for reducing long-term vulnerability to hazards. Those capabilities are noted by jurisdiction in the county annexes, and can be assessed to identify gaps to be addressed and strengths to enhance through new mitigation actions. For instance, gaps in design or enforcement of existing regulations can be addressed through additional personnel or a change in procedure or policy.

Based upon the capability assessment and key issues identified in the risk assessment, the counties came to consensus on proposed mitigation actions for each hazard for their jurisdictions. Certain hazards' impacts were best reduced through multi-hazard actions. A lead for each new action was identified to provide additional details on the project in order to be captured in the plan. Final action strategies are discussed in Section 5.4 and detailed within the respective annexes.

5.3.1 Prioritization Process

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

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

Other criteria used to evaluate the priority of a mitigation action included:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?

At the mitigation strategy workshops in 2018 the counties used STAPLEE to determine which of the new identified actions were most likely to be implemented and effective. Keeping the STAPLEE criteria in mind, each member voted for the new mitigation actions by sticking a colored dot on the sticky note on which the action was written. The number of dots next to each action was totaled as an indication of relative priority and translated into either high, medium, or low priority. The results of the STAPLEE evaluation process produced prioritized mitigation actions for implementation within the planning area. During the 2023 process

STAPLEE was again used as the basis for prioritizing new actions, or re-prioritizing existing actions.

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

Each mitigation action developed for this plan contains a brief description of the problem and proposed project, the entity with primary responsibility for implementation, a cost estimate, and a schedule for implementation; see the County Annexes for details. Development of these project details further informed the determination of a high, medium, or low priority for each.

For the mitigation actions carried forward from the 2018 Regional Hazard Mitigation Plan, priority levels were revisited and, in some cases, modified to reflect current priorities based on the STAPLEE principles.

5.4 Mitigation Action Plan

44 CFR Requirement §201.6(c)(3)(iii):

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

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

5.4.1 Progress on Previous Mitigation Actions

This Regional Plan represents a plan update for each of the counties involved in the plan. As part of the update process, the five counties reviewed the previously identified actions to assess progress on implementation. These reviews were completed using worksheets to capture information on each action, including if the action had been completed or was to be deferred for future implementation. Actions that had not been completed were discussed for continued relevance, and were either continued in the Plan or in some cases recommended for deletion. The following is a summary of the number of mitigation actions in each county and for the tribes, organized by hazards, which was identified in 2018 Plan, providing the baseline for the 2022 mitigation action strategy update. The counties and their participating jurisdictions have been successful in implementing actions identified in their respective plans' Mitigation Strategies, to work steadily towards meeting each plan's goals. Progress on mitigation actions previously identified in these planning mechanisms are detailed in the mitigation action strategy in the county annexes. These action plans were also shared among the regional plan participants to showcase progress and stimulate ideas among the respective county planning committees. Both Sheridan and Johnson counties have received mitigation grant funding from FEMA to implement projects identified in their mitigation plans. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources. Refer to the county annexes for more details on progress on implementation.

As of December 2023, each of the five counties has completed at least one mitigation action, with a total of 24 actions completed regionally. Twelve actions have been deleted as no longer relevant or feasible to the Region's needs and capabilities. A total of 131 actions will be continuing in the updated Region 1 Plan. During the 2023 process, 46 new actions were developed. In many cases the jurisdictions chose to focus on implementation of previously identified actions, as opposed to developing new ones. The table below summarizes progress implementing mitigation actions by county, inclusive of the participating jurisdictions. Further details on each mitigation action can be found in the jurisdictional annexes.

Table 5-1 Mitigation Action Progress Summary by County

County	Completed	Deleted	Continuing	New Actions in 2023	Total New/Continuing Actions
Campbell	4	0	58	6	**64**
Crook	3	3	19	8	**27**
Johnson	3	5	28	9	**37**
Sheridan	9	1	20	10	**30**
Weston	5	3	6	13	**19**
Total	**24**	**12**	**131**	**46**	**177**

5.4.2 Continued Compliance with NFIP

Given the significance of the flood hazard in the planning area and the importance of floodplain management and insurance as loss reduction measures, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP). Continued compliance with the NFIP is also required by the DMA. Counties and jurisdictions that participate in the NFIP will continue to make every effort to remain in good standing with the program. The table below summarizes the NFIP mapping and participation status for applicable jurisdictions in the Region.

Table 5-2 NFIP Participation Status Summary

Jurisdiction	Effective Map Status	Date Joined	Comments
Campbell County	01/02/08	05/15/84	
City of Gillette	01/02/08	05/15/78	
Town of Wright	01/2/08	01/2/08	Participation optional due to No Special Flood Hazard Area (NSFHA)
Crook County	Not mapped	Not mapped	Participation optional due to no mapping
Town of Hulett	09/28/07	04/01/99	
Town of Moorcroft	02/02/07	03/01/86	
Town of Pine Haven	Not mapped	Not mapped	Participation optional due to no mapping
Town of Sundance	02/02/07	08/19/86	
Johnson County	NSFHA	07/21/98	
City of Buffalo	04/03/84	05/15/78	
Town of Kaycee	02/20/08	10/01/86	
Sheridan County	01/16/14	08/01/86	
Town of Clearmont	01/16/14	02/10/14	

Jurisdiction	Effective Map Status	Date Joined	Comments
Town of Dayton	01/16/14	08/1/08	No elevation determined – all zone A, C, X
Town of Ranchester	01/16/14	04/15/88	
City of Sheridan	01/16/14	09/01/78	
Weston County	Not mapped	Not mapped	Participation optional due to no mapping
City of Newcastle	04/2/02	05/01/86	
Town of Upton	06/25/76		Sanctioned since 06/25/77

Source: NFIP Community Status Book

Weston County and Crook County are not mapped, and are therefore not required to participate in the NFIP, but they are exploring possible participation in the future. The Town of Upton in Weston County is mapped, but was sanctioned from the program in 1977 and does not currently participate NFIP; as a result, residents are unable to receive federal flood insurance. See the Weston County Annex for further discussion.

Continued compliance with the NFIP includes continuing to adopt floodplain maps when updated, and implementing, maintaining, and updating floodplain ordinances. Actions related to continued compliance include:

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

Also, to be considered are the flood mitigation actions contained in this Regional Plan that support the ongoing efforts by participating counties to minimize the risk and vulnerability of the community to the flood hazard, and to enhance their overall floodplain management program.

5.4.3 Mitigation Action Plan

The action plan presents the recommendations developed by the county planning teams, outlining how each county and the Region can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The mitigation actions developed by the counties are detailed Section 8 in the county annexes. These details include the action description, hazard(s) mitigated, lead and partner agencies responsible for initiating implementation, costs, and timeline. Many of the action items included in this plan are a collaborative effort among local, state, and federal agencies and stakeholders in the planning area.

The actions included in this mitigation strategy are subject to further review and refinement, alternatives analyses, and reprioritization due to changes in funding availability and/or other criteria. The counties are not obligated by this document to implement any or all of these projects. Rather, this mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards. The counties also realize that new needs

and priorities may arise because of a disaster or other circumstances, and reserve the right to support new actions, as necessary, as long as they conform to their overall goals as listed in this plan.

Where feasible it is recommended that mitigation be integrated and implemented through existing planning mechanisms. Specific related mechanisms such as Community Wildfire Protection Plans, are discussed in the county annexes. Chapter 6 also discusses incorporating the plan into existing planning mechanisms and how to ensure continued public involvement.

6 Adoption, Implementation, and Maintenance

Requirement §201.6(c)(4):

[The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

44 CFR Requirement §201.6(c)(3):

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the regional plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement. The system for implementation and maintenance was reviewed during the 2023 update and largely stays the same as the process detailed in the 2018 plan.

6.1 Formal Adoption

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

6.2 Implementation

Once adopted, the plan faces the truest test of its worth: continued implementation. While this plan contains many worthwhile actions, each county and jurisdiction will need to decide which action(s) to undertake or continue. Two factors will help with making that decision: the priority assigned the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

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

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match

or participation requirements. When funding does become available, the Region and its counties will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

6.2.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance

With adoption of this plan, the Region, its counties, and participating municipalities will be responsible for the plan implementation and maintenance. Each county, led by their Emergency Management Coordinators, will reconvene their HMPC for plan implementation and maintenance. These HMPCs will be the same committees (in form and function, if not actual individuals) that developed this plan, and will also be responsible for the next formal update to the plan in five years.

The county-level HMPCs will:

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

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

6.3 Plan Maintenance

The Plan maintenance process lays out a framework to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized. The regulation at 44 CFR§201.6(d)(3) requires that a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.

6.3.1 Maintenance Schedule

In order to maintain and update this regional HMP, the Emergency Management Coordinators of each county will now be responsible for initiating plan reviews and consulting with the heads of participating departments in their own counties. In order to monitor progress and update the mitigation strategies identified in the action plan, each county and their standing

HMPC will conduct an annual review of this plan and/or following a hazard event. An annual mitigation action progress report will be prepared by the Emergency Management Coordinators based on the HMPC input and kept on file to assist with for future updates. The annual review will be conducted by re-convening each HMPC in November of each year.

This plan will be updated, approved, and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000 unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. The Region and its counties will inquire with WOHS and FEMA for funds and/or technical assistance to assist with the update. The next plan update should be completed and reapproved by WOHS and FEMA Region VIII within five years of the FEMA final approval date. The planning process to prepare the update should begin no later than 12 months prior to that date or in late 2028

6.3.2 Maintenance Evaluation Process

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

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

Updates to this plan will:

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

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

- A representative from the responsible office identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the department lead on action status and provide input on whether the action, as implemented, meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the action does not meet identified objectives, the lead will determine what additional measures may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.

Changes will be made to the plan to accommodate for actions that were not successful or were not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan

will be by written changes and submissions, as each HMPC deems appropriate and necessary, and as approved by the respective participating agencies. In keeping with the five-year update process, the HMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the governing council of each participating jurisdiction.

6.3.3 Incorporation into Existing Planning Mechanisms

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

- County or community comprehensive plans
- County or community land development codes
- County or community emergency operations plans
- Threat and Hazard Identification and Risk Assessments (THIRA)
- Community Wildfire Protection Plans (CWPP)
- Transportation plans
- Capital improvement plans and budgets
- Recovery planning efforts
- Watershed planning efforts
- Wildfire planning efforts on adjacent public lands
- Master planning efforts
- River corridor or greenway planning efforts
- Office of State Lands and Investments Drinking Water or Clean Water Intended Use Plan
- Other plans, regulations, and practices with a mitigation aspect

The county annexes note, where applicable, how the previous versions of the hazard mitigation plan have been incorporated into existing planning mechanisms in the past 5 years. Each annex notes specific opportunities to integrate the mitigation plan into other mechanisms in the future.

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc., as appropriate. As described in Section 6.2 Implementation, incorporation into existing planning mechanisms will be done through the process of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes;

- Ensuring that the related planning process cross-references the hazard mitigation plan, where appropriate, and
- Monitoring community budget meetings for other community program opportunities.

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

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

6.3.4 Continued Public Involvement

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

Of particular importance to the goal of continued public involvement is the continued inclusion of socially vulnerable and traditionally underserved communities. Future plan updates will continue to engage these groups early in the planning process and bring representatives to the table. Building off of the efforts to work with organizations documented in Section 3.3.1 Planning Step 2: Involve the Public the respective county emergency managers in each county will continue to build or strengthen relationships with these agencies, and ensure that their needs are considered, and they are involved in the planning process going forward. Additional agencies working with these vulnerable and underserved communities in Region 1 will be identified and included in the next plan update. Documentation of this engagement effort, and feedback received, will be systematically gathered for the next plan update. Emergency managers will leverage existing coordination mechanisms with groups such as Voluntary Organizations Active in Disasters (VOAD) where applicable.

When each HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. Public notice will be posted, and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets, primarily newspapers. Per FEMA requirements the public will be provided an opportunity to provide input during the plan update process, and before the plan is finalized. This can be accomplished through public surveys or meetings. Public comments will be solicited on the plan update draft by posting the plan online and soliciting review and comment for a minimum of two weeks. The HMPC will thoroughly document the applicable processes utilized to solicit public involvement, as well as any input received from the public.

Wyoming Region 1
Regional Hazard Mitigation Plan
Campbell County Annex

1 Mitigation Planning and Campbell County Planning Team

This County Annex builds upon previous versions of the Campbell County Multi-Hazard Mitigation Plan that were incorporated into the regional hazard mitigation plan completed in 2018. Prior to the Region 1 Plan, Campbell County had a multi-jurisdictional Hazard Mitigation Plan approved in 2016. This updated plan is the result of a collaborative effort between County Government, municipal governments, citizens, public agencies, non-profit organizations, and the private sector. Campbell County Emergency Management was responsible for updating the plan in coordination with a multi-jurisdictional County Planning Team/Hazard Mitigation Planning Committee (HMPC) during the update of the 2023 Regional Plan. The following jurisdictions were provided the opportunity and fully participated in the planning process and were the same that participated in the prior update:

- Campbell County
- City of Gillette
- Town of Wright
- Campbell County Conservation District

More details on the planning process followed, titles of participants, and how the counties, municipalities and stakeholders participated can be found in Chapter 3 and Appendix A of the base plan, as well as how the public was involved during the 2023 update.

2 Geography and Climate

Campbell County, in northeastern Wyoming, encompasses 4,761 square miles of grassland over extensive coal deposits. It was historically a prized hunting ground for Native American tribes. The region's coal, low in sulfur, gained prominence after Clean Air Act amendments in 1990. Bordered by other counties and Montana, the Powder River parallels its western edge.

Established in 1911, Campbell County was named after either fur trader Robert Campbell or Governor John A. Campbell. The arrival of the railroad in 1891 spurred growth, leading to the incorporation of Gillette in 1892.

Coal mining began around 1909, with Wyodak mine becoming one of the oldest and largest surface mines. Oil discoveries in 1948 marked another economic upturn. The 1960s saw further growth, and by 1980, the population doubled to 24,367.

The 1970s and 1980s witnessed exponential growth due to coal and oil industries. Gillette, a boomtown incorporated in 1891, faced challenges termed "Gillette syndrome," including social and infrastructural strains. Wright, a planned community incorporated in 1985, was developed to accommodate workers.

Today, Campbell County remains a significant coal producer, though economic shifts have led to workforce reductions. Despite challenges, the county's energy resources continue to shape its economy and maintain its status as one of Wyoming's wealthiest counties (Wyoming Historical Society, 2014),

Much of the County can be characterized as rolling prairie. Elevations range from a low of 4,100 feet above sea level in the northwest corner of the County to 6,052 feet on the top of the north Pumpkin Butte. The elevation is 4,544 at Gillette and 5,010 at Wright (Campbell County Soil Survey, 2004).

The County is drained by three river basins. The southern and extreme eastern part of the County drains south to the Cheyenne River. The central portion of the County is drained by the Belle Fourche. The northwestern area of the County is drained by the Powder River which

crosses the northwest tip of the County flowing north and east. The Belle Fourche, Little Powder, and Powder Rivers are perennial. Mineral resources in the County include coal, oil, natural gas, uranium, and sand and gravel.

The first commercial open pit coal mine in Wyoming, Wyodak Resources' mine east of Gillette, opened in 1925. The coal reserves of Campbell County make a significant contribution to meeting the nation's energy needs and coal from the County is burned in generation facilities in approximately half of the states in the country. Commercial oil and gas activity in the County began in the late 1940s and continues today. Since the late 1980s coal bed methane gas exploration and production has occurred in the central areas of the County (Campbell County Soil Survey, 2004.)

Campbell County averages 34 days per year with temperatures above 90˚F; during summer months, the average maximum temperature is 83.4˚F, with a record high of 108˚F set on July 5, 1936. Growing season typically lasts 120-140 days a year. By contrast, the county averages 196 days a year with temperatures below 32˚F; during winter months, the average minimum temperature is 9.5˚F, with a record low of -45˚F set on December 12, 1990. The county averages 17.14 inches of precipitation per year, and 40.3 inches of snow. 71% of which falls in April through September. The average seasonal snowfall is 65 inches.

3 Population Trends

The following tables provide population and demographic information for Campbell County and its jurisdictions. Between 1970 and 2010, the county's population more than doubled, increasing from 12,957 to 46,253. As of 2020, the county has an estimated population of 46,676, which is essentially unchanged since the 2010 census. A closer look at the data shows that the county actually experienced a 7% population increase from 2010 to 2015, after which the population declined to its current level.

Table 3-1 Campbell County Population Distribution

Jurisdiction		2020 Estimated Population	% of County Total
City of Gillette		33,458	71.7%
Town of Wright		1,649	3.5%
Unincorporated		11,569	24.8%
Total		**46,676**	-

Source: US Census Bureau

Table 3-2 Campbell County Population Change, 2010-2020

	2010	2015	2016	2017	2018	2019	2020	% CHANGE
County Total	**46,253**	**49,336**	**48,900**	**46,445**	**46,349**	**46,420**	**46,676**	**0.91%**
City of Gillette	31,558	34,252	33,946	32,238	32,102	32,100	33,458	6.02%
Town of Wright	1,810	1,886	1,862	1,760	1,754	1,751	1,649	-8.90%
Unincorporated	12,885	13,198	13,092	12,447	12,493	12,569	11,569	-10.21%

Source: U.S. Census Bureau

Table 3-3 Campbell County Demographic Profile

Population	
Population estimate, 2020	46,676
Population Growth, 1970-2020 (US average was 63.1%)	2.6%
Age and Sex	

Population	
Median Age (US median age is)	34.6
Percent of population under 18	27.4%
Percent of population 18-34	23.2%
Percent of population 35-44	13.7%
Percent of population 45-64	25.7%
Percent of population 65 and over	10.0%
Percent of population male	51.5%
Percent of population female	48.5%
Race and Hispanic Origin	
White alone, 2020	96.4%
White alone, not Hispanic or Latino	87.3%
Hispanic or Latino	8.6%
Two or More Races	3.7%
American Indian and Alaska Native alone	1.2%
Black or African American alone	0.8%
Asian alone	0.1%
Native Hawaiian and Other Pacific Islander alone	0.1%
Education	
High school graduate or higher, age 25 years+	93.3%
Bachelor's degree or higher, age 25 years+	19.7%
Vulnerable Populations	
Percent of population under 5 years old	7.4%
Percent of population 85 years and older	0.5%
Percent of population that speak English "not well"	1.4%
Percent of population with disabilities	10.4%
Percent of population without health insurance	11.6%
Percent of population below poverty level	12.2%
Percent of population in deep poverty (<1/2 federal poverty level)	5.6%
Percent of population 65 and over and in poverty	14.30%

Source: U.S. Census Bureau

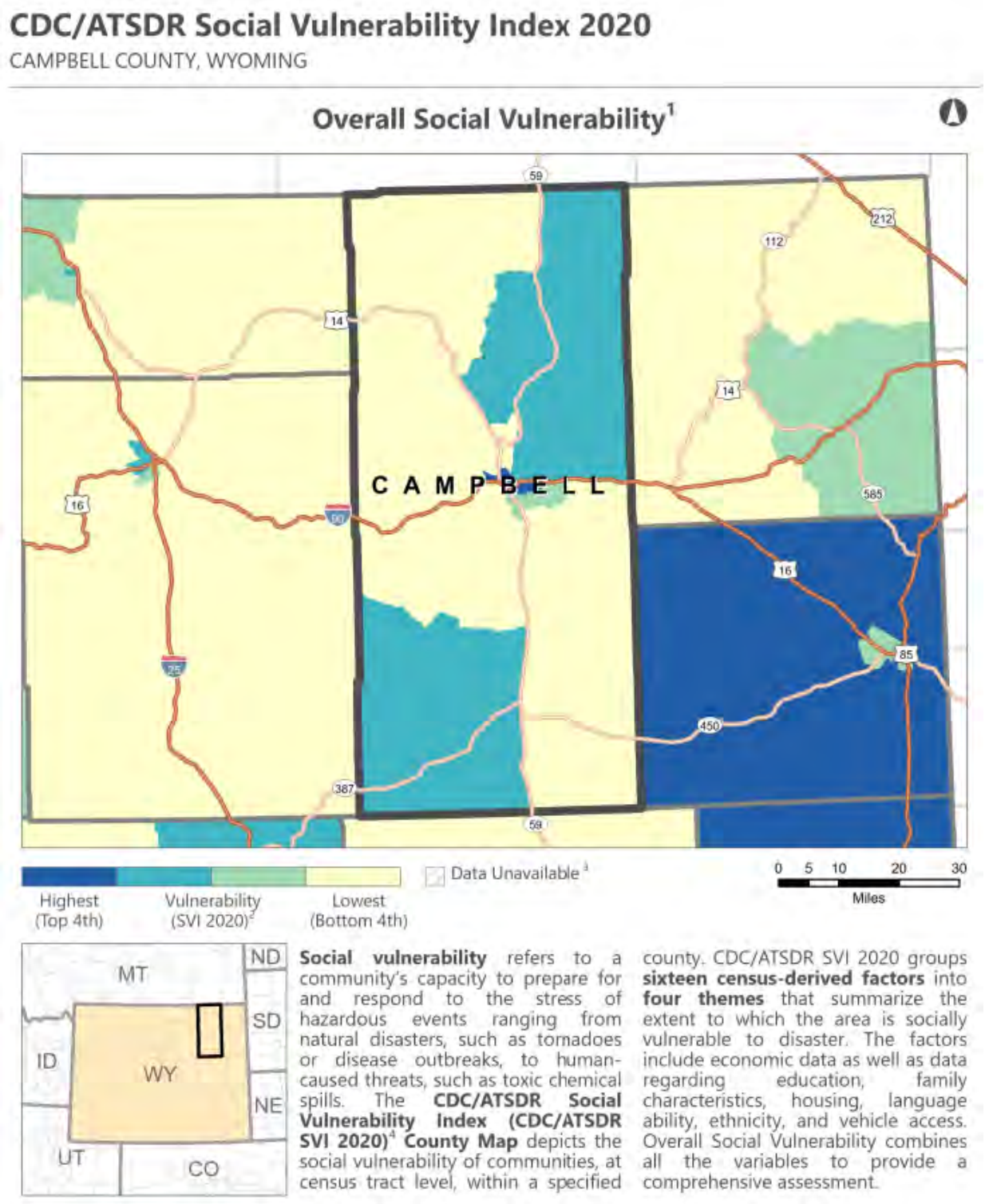
*Hispanic or Latino is considered an ethnicity, not a race. People who identify as Hispanic or Latino can belong to one or more races. Therefore, the total percentage can be greater than 100%.

3.1 Social Vulnerability

Social vulnerability is broadly defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards. Additional details on social vulnerability, the Centers for Disease Control and Prevention (CDC) social vulnerability index (SVI), and community resilience ratings can be found in Section 4.1.4 of the Base Plan.

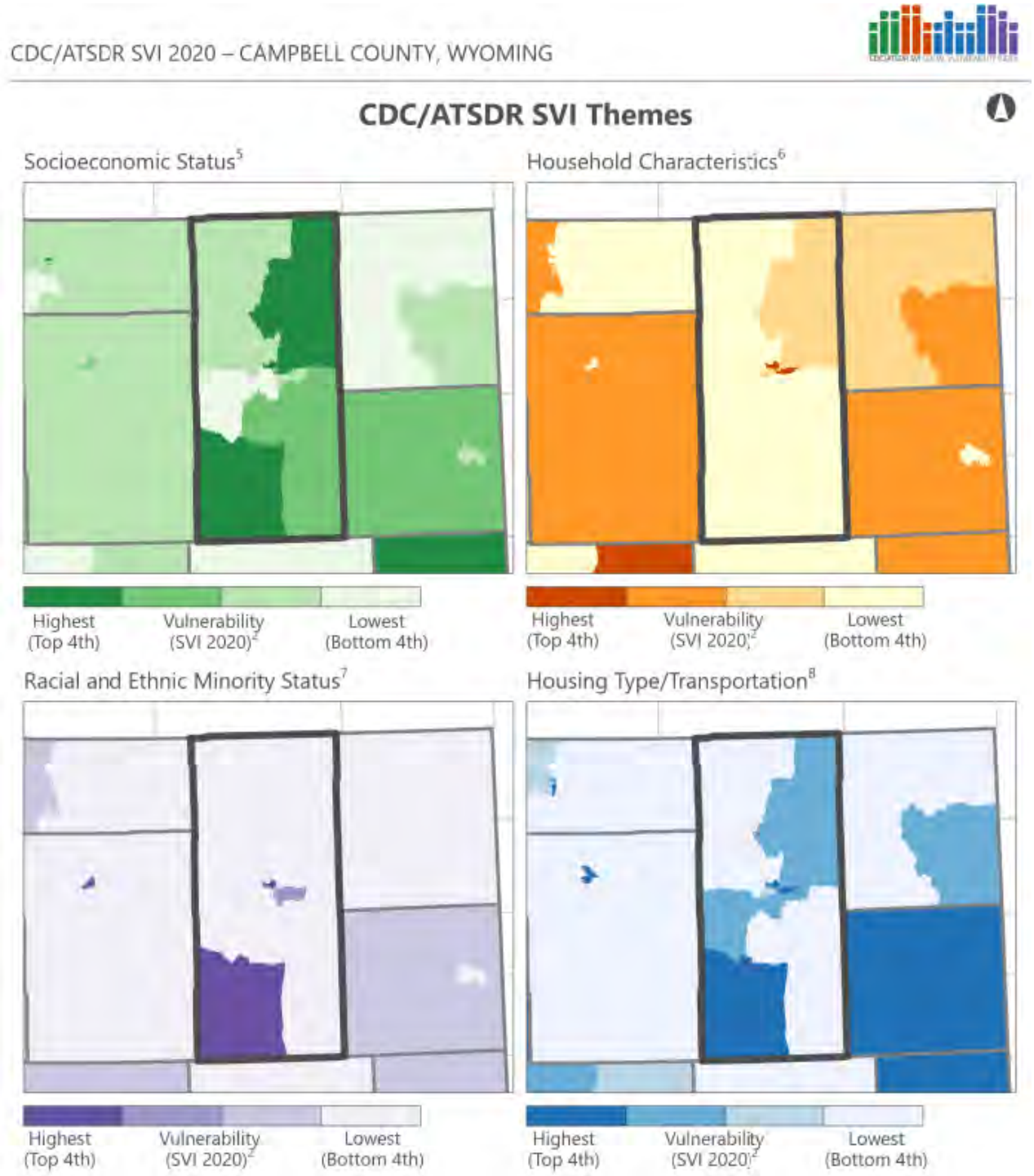
The SVI utilizes 16 demographic variables organized into four broader categories (Socioeconomic Status, Household Characteristics, Racial & Ethnic Minority Status, and Housing Type & Transportation) in order to determine the overall social vulnerability of a community at the census tract and county level. Figure 1 below displays the overall social vulnerability rating for Campbell County at the census tract level, while Figure 2 details each of the four SVI themes. As a whole, Campbell County has low-medium social vulnerability, however there is some broad variability in rating across the census tracts and different themes.

Figure 1 Campbell County Overall Social Vulnerability



Source: CDC Social Vulnerability Index

Figure 2 Campbell County SVI Themes



Source: CDC Social Vulnerability Index

4 Development Trends

County land ownership is a combination of private (individual and corporate), state and federal. State lands are generally arranged in a checkerboard pattern consisting of the full sections (640 acres) 16 and 36 of each township. Federal surface ownership accounts for 12.1% of the lands in Campbell County. Federal lands are managed by the Bureau of Land

Management (7.4% of the County) and the Forest Service, Thunder Basin National Grassland (4.7% of the County.) The Bureau of Land Management is responsible for 236,067 surface acres and 2,125,459 acres of mineral estate in the County. The Forest Service manages 14,804 surface acres. Where mineral rights are not split estate (split estate means subsurface or mineral rights belong to a different party than surface rights) the minerals found under Forest Service lands are considered to be federal mineral estate and are managed by the Bureau of Land Management. Federal minerals, managed by the Bureau of Land Management may also be found under some private lands.

Campbell County, the City of Gillette and the Town of Wright have been planning and constructing infrastructure for several years and these accomplishments provide important information that helps with land use planning. For example, the Coal Belt Transportation Plan, belt loop plans for Southern, Garner Lake and Northern Drives, and the Gillette Regional Water Supply Project are important considerations in future land use planning. These projects provide clear direction on where the community is heading with future development (2013 Comprehensive Plan).

Given the current and projected demand for energy, and the development trends of the past ten years, additional land use conversion from agriculture to mineral extraction is expected. Along with the increased energy production come more jobs and with these jobs, the need for more housing. Land use change to accommodate the growing population is occurring primarily in the vicinity of Gillette. However, both of the incorporated communities in Campbell County and the unincorporated areas of the County have experienced growth since this plan was last updated.

Campbell County amended their Natural Resource and Land Plan in 2014. The plan emphasizes city-county cooperation in managing anticipated growth. The City of Gillette’s Comprehensive Plan was last updated in 2013. Land development policies is one of eight core focus areas of the plan. The plan supports residential, industrial, and commercial infill development. According to the plan “In the past ten years, there has been $3.2 billion invested in public and private projects in the County.” The plan contains a stated goal of improving consistency between city and county policies, regulations, design standards, and review processes.

In Campbell County a surge in uranium solution mining and wind energy operations is reshaping the economic landscape. The uranium solution mining process, centered in Pumpkin Buttes, could introduce fresh employment opportunities. Additionally, a uranium mining venture in northwestern Crook County will channel products through Gillette and Wright, bolstering the processing capacity in southwest Campbell County.

Residential development is on an upward trajectory, both within and beyond Gillette's city limits. Collaborative efforts between the City and Campbell County are steering land use policies in a 39-square mile vicinity around Gillette. Wright, guided by its 2010 Municipal Code, is also experiencing controlled growth. Both communities have adopted standardized building codes and established inspection protocols.

Campbell County stands as a dominant force in energy production. Roughly 30% of the nation's coal supply originates from its surface mines. The Coal Bed Methane sector is a pivotal contributor to the county's economic prosperity. Abundant reserves of coal, oil, and natural gas have historically underpinned employment and revenue streams (Campbell County Administration Website).

The county's population, approaching 47,000, is surging due to robust growth in the coal, oil, and gas industries. A low unemployment rate and ample job prospects further solidify Campbell County's appeal as a thriving community.

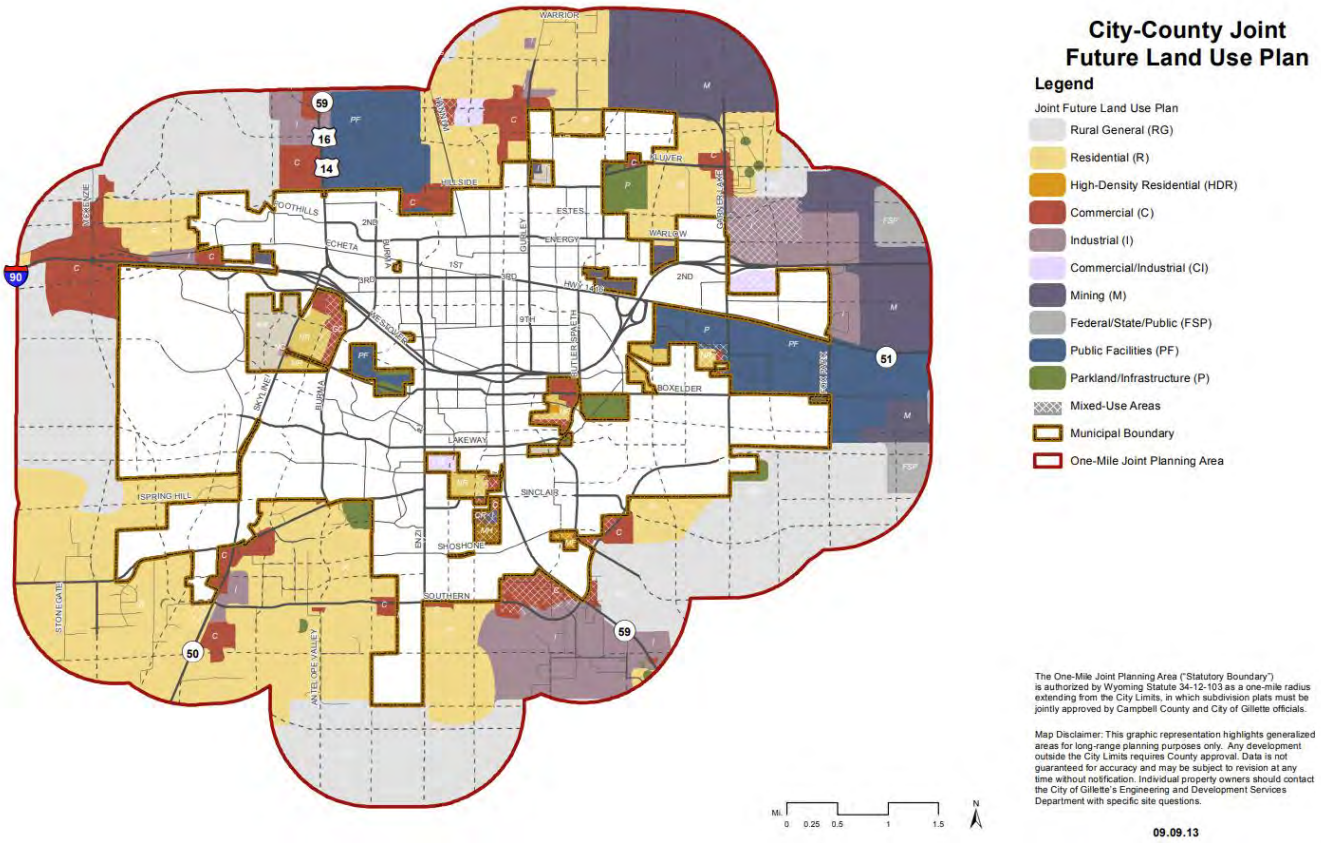
In 2021, the median property value in Campbell County, WY stood at $230,400, approximately 94.1% of the national average, which was $244,900. This marked a 2.67% increase from the 2020 median value of $224,400. The homeownership rate in Campbell County, WY is notably high at 77.9%, aligning closely with the national average of 64.6%.

Residents of Campbell County, WY experience a relatively short average commute time of 19.8 minutes, typically driving alone to their workplaces. Car ownership in the county mirrors the national average, with households possessing an average of two cars (U.S. Census).

Historically, most of the development in Campbell County has occurred naturally near the boundaries of the City of Gillette and the Town of Wright, which is a desirable land use pattern. Few major subdivisions have developed in the more remote areas of the county. However, this concentration of development near the common boundaries raises the need for the well-coordinated delivery of services.

Figure 3 below shows the future land use designations as per the County's most recent Comprehensive plan.

Figure 3 City-County Join Future Land Use Plan



Based on both anecdotal and quantifiable evidence all three jurisdictions have been growing both in population and development. Gillette as the County seat has seen the most rapid growth. Following the recent (as of 2023) downturn in energy prices, this trend will likely slow for the immediate timeframe because the County has a high reliance on the mining sector. Changes in the mining sector could affect development trends in Campbell County in the future.

5 Economy

Table below provides a brief overview of economic characters in Campbell County. The following information is provided by the U.S. Census Bureau American Community Survey (ACS) 5-year estimates from 2016-2020.

Table 5-1 Campbell County Economic Profile

Economic Characteristics	Campbell County
Families Below Poverty Level	10.4%
Individuals Below Poverty Level	19.1%
Median Home Value	$224,400
Median Household Income	$80,887
Per Capita Income	$33,522
Population > 16 Years Old in Labor Force	69.3%
Population Employed	66.5%

Source: U.S. Census Bureau ACS 5-year estimates, 2016-2020

Table below shows the breakdown of employment in Campbell County by the industry sector. According to the ACS, the leading employment sectors in the County are “agriculture, forestry, fishing and hunting, and mining,” which composes of nearly a quarter of the total employment in the County follows by “educational services, and health care and social assistance.”

Table 5-2 Campbell County Occupation by Industry Profile

Industry	Population Employed	Percent of Labor Force
Agriculture, forestry, fishing and hunting, and mining	5,912	25.1%
Construction	2,123	9.0%
Manufacturing	953	4.0%
Wholesale trade	551	2.3%
Retail trade	2,119	8.9%
Transportation and warehousing, and utilities	1,262	5.4%
Information	140	0.6%
Finance and insurance, and real estate and rental and leasing	1,148	4.9%
Professional, scientific, and management, and administrative and waste management services	979	4.2%
Educational services, and health care and social assistance	4,594	19.5%

Industry	Population Employed	Percent of Labor Force
Arts, entertainment, and recreation, and accommodation and food services	1,802	7.6%
Other services, except public administration	853	3.6%
Public administration	1,134	4.8%

Source: U.S. Census Bureau ACS 5-year estimates, 2016-2020

The economy of Campbell County is primarily based on energy extraction. Coal, oil, gas, and uranium are all produced in the County. Based on Data USA, nearly 21.2% of the population works in mining, quarrying, oil, and gas extraction. Approximately 66% of the population is employed and the per capita income is about $33,522. The average unemployment rate is approximately 2.8% which is less than the state average.

6 Hazard Identification and Risk Assessment

6.1 Identified Hazards

The HMPC reviewed the hazards from the 2018 Regional Hazard Mitigation Plan for inclusion in the 2023 update. The hazards list was also compared with the hazards list found in the State of Wyoming's hazard mitigation plan, updated and adopted in 2021. The following table notes the summary of significance for each jurisdiction in the County based on a combination of geographic extent, potential magnitude/severity and probability as defined below. Hazard significance is rated as High, Medium or Low.

Table 6-1 Overall Hazard Significance Summary Table

Hazard	Campbell County	Gillette	Wright	Campbell County Conservation District
Dam Failure	M	L	L	M
Drought	M	M	M	M
Earthquake	M	M	M	M
Expansive Soils	M	L	L	M
Flood	M	M	M	M
Hail	M	M	M	M
Hazardous Materials	M	M	M	M
High Winds & Downbursts	M	M	M	M
Landslide/Rockfall/Debris Flow	L	L	L	L
Lightning	M	M	M	M
Mine & Land Subsidence	L	L	L	L
Severe Winter Weather	H	H	H	H
Tornado	H	H	M	H
Wildfire	H	H	M	H
Coal Seam Fire	M	M	M	M

Geographic Extent

Negligible: Less than 10 percent of planning area or isolated single-point occurrences

Limited: 10 to 25 percent of the planning area or limited single-point occurrences

Significant: 25 to 75 percent of planning area or frequent single-point occurrences

Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Potential Magnitude/Severity

Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first

Probability of Future Occurrences

Unlikely: Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.

Occasional: Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.

Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years

Highly Likely: Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Overall Significance

aid or within the response capability of the jurisdiction.

Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.

Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.

Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.

Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.

High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

6.1.1 Hazards Considered but Not Profiled

Though noted in other relevant plans such as the Wyoming State Multi-Hazard Mitigation Plan from 2016, this plan does not further evaluate the following hazards:

- Avalanche
- Pandemic
- Space weather
- Volcanism

It is important to be aware of the probability of these events and the associated impacts for Campbell County. The hazard identification described in Chapter 4 of the Base Plan omits these hazards due to the limited relevance in the regional context of this plan, or the hazards being sufficiently addressed in other planning mechanisms. Some of the previously profiled hazards are acknowledged to some degree under other hazard profiles, such as windblown deposits carried by wind that could be associated with drought conditions.

6.2 Building Inventory and Assets

In addition to people, structures, critical facilities and infrastructure, and other important assets in Campbell County are potentially exposed to hazards identified in this plan. Table summarizes the property inventory for the county and each participating jurisdiction, based on improvement value (i.e., structures) and includes the building count and value grouped by parcel type and jurisdiction. This as an assessment of the overall property exposed within the county and by jurisdiction.

Assets inventoried to determine vulnerability include people, structures, critical facilities, and natural, historic, or cultural resources. Parcel and assessor data were obtained through sources such as the Wyoming Property Tax Division's Assessor's Portal in 2023. This information provided the basis for building exposure and property types. The focus of the analysis was on improved or developed parcels; these parcels were identified based on an improvement value greater than zero. Abstract Codes were used to identify occupancy type as shown in the following table, which includes summations of total improved value for the various property types.

As presented in Table , total building exposure within Campbell County is more than $5.5 billion, with $3.3 billion in improved value properties and $2.1 billion in estimated contents value. The City of Gillette has the greatest property exposure.

Table 6-2 Campbell County Building Inventory and Value by Jurisdiction and Property Type

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Gillette	Commercial	1,383	$738,601,232	$738,601,232	$1,477,202,464
	Industrial	14	$19,527,343	$29,291,015	$48,818,358
	Residential	8,998	$1,691,396,182	$845,698,091	$2,537,094,273
	Total	**10,395**	**$2,449,524,757**	**$1,613,590,338**	**$4,063,115,095**
Wright	Commercial	46	$18,797,962	$18,797,962	$37,595,924
	Industrial	1	$639,248	$958,872	$1,598,120
	Residential	398	$56,218,219	$28,109,110	$84,327,329
	Total	**445**	**$75,655,429**	**$47,865,944**	**$123,521,373**
Unincorporated	Commercial	278	$91,030,601	$91,030,601	$182,061,202
	Industrial	1	$170,383	$255,575	$425,958
	Residential	3,639	$764,713,791	$382,356,896	$1,147,070,687
	Total	**3,918**	**$855,914,775**	**$473,643,071**	**$1,329,557,846**
	Grand Total	**14,758**	**$3,381,094,961**	**$2,135,099,352**	**$5,516,194,313**

Source: Wyoming CAMA 2022, WSP GIS Analysis

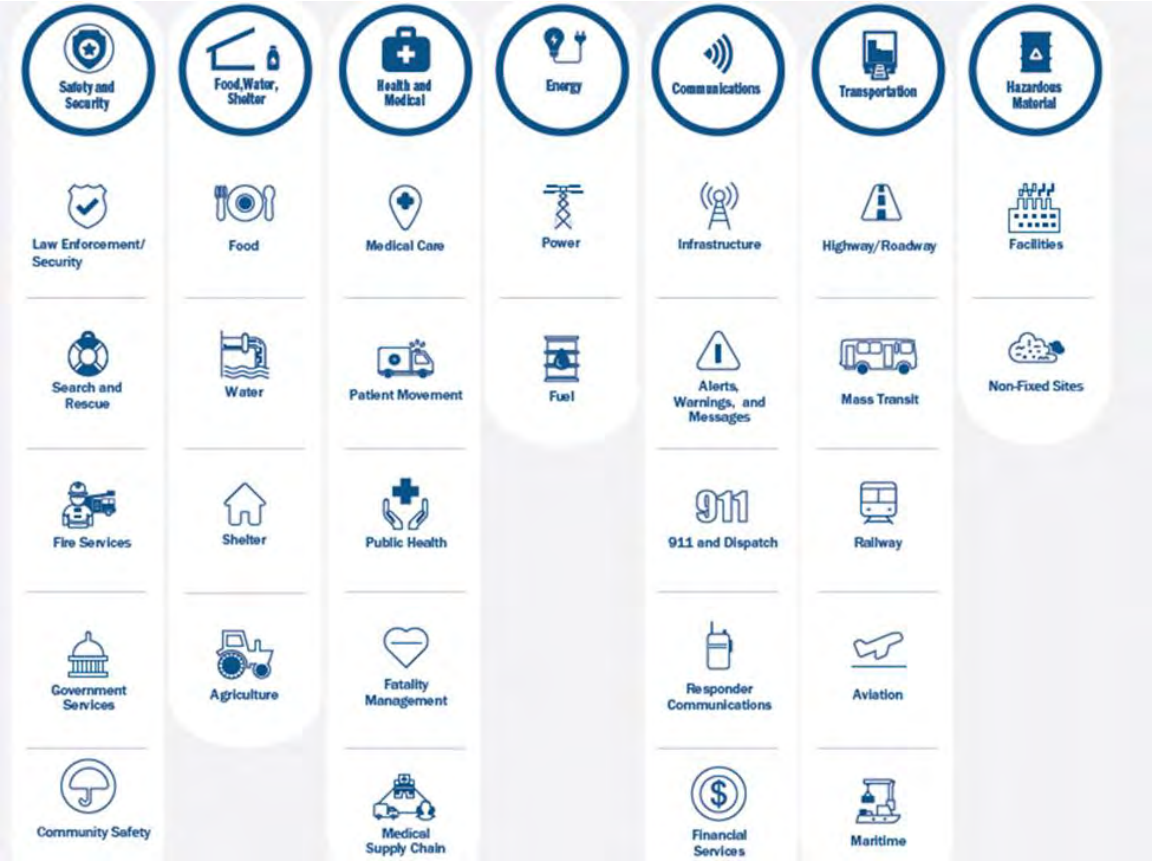
6.2.1 Critical Facilities, Infrastructure, and Other Important Community Assets

A critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Much of this data is based on GIS databases associated with the 2022 Homeland Infrastructure Foundation-Level Data (HIFLD) and the 2023 National Bridge Inventory (NBI). Where applicable, this information was used in an overlay analysis for hazards such as dam failure, expansive soil, flood, landslide, and wildfire.

FEMA organizes critical facilities into seven lifeline categories as shown in Figure 4. These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

Figure 4 FEMA Lifeline Categories



Source: FEMA

Table summarizes critical facility counts in Campbell County by jurisdiction and Lifeline. While the Campbell County Conservation district does not have specific facilities/infrastructure lifelines, the primary assets of note are the natural resources within the County, as stewards of promoting sustainability of soil, land and water conservation. Vulnerability of natural resources is discussed by hazard where applicable in Section 6.4.

Table 6-3 Campbell County Critical Facilities Summary

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Gillette	51	14	-	1	9	46	32	**153**
Wright	12	-	2	-	2	4	-	**20**
Unincorporated	258	146	4	7	9	15	120	**559**
Conservation District	0	0	0	0	0	0	0	0
Total	**321**	**160**	**6**	**8**	**20**	**65**	**152**	**732**

Source: HIFLD, National Bridge Inventory, WSP GIS Analysis

6.2.2 Natural, Historic, and Cultural Assets

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

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Historic and Cultural Resources

By definition, a historic property not only includes buildings of other types of structures, such as bridges and dams, but also includes prehistoric of Native American sites, roads, byways, historic landscapes, and many other features. Given the history of the County, these types of historic properties exist in the planning area.

Table lists the properties and districts in Campbell County that are on the National Register of Historic Places, which is the Nation's official list of cultural resources deemed worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.

Table 6-4 Campbell County Historic Properties

Jurisdiction	Site
Gillette	Gillette Post Office

Jurisdiction	Site
Pine Tree Junction	Nine Mile Segment, Bozeman Trail (48CA264)
Piney	Basin Oil Field Tipi Rings (48CA1667)
	Bishop Road Site (48CA1612)

Sources: National Register Information System, www.nps.gov/nr/

Natural Resources

Natural resources are important to include in benefit-cost analyses for future projects and may be used to leverage additional funding for projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as attenuates and stores floodwaters. The Campbell County Conservation District partners with citizens and private landowners as well as other organizations to promote the sustainability of the land, water, and other natural resources by encouraging the use of Best Management Practices.

Wetlands

Wetlands are a valuable natural resource for communities, due to their benefits to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital. While the Wyoming Game & Fish Department does not identify any protected wetlands areas in Campbell County, smaller wetland areas do exist in the County, such as riparian areas that are typically populated with willows. The presence of willows is often a good indicator of a floodplain within the County.

Endangered Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed. Species listed as in recovery are those whose population decline has stopped or reversed, but are not yet deemed secure enough to be removed from the endangered species list.

There are four federally-recognized threatened species in Campbell County according to the U.S. Fish and Wildlife Service. These species are listed in Table .

Table 6-5 Endangered and Threatened Species in Campbell County

Common Name	Scientific Name	Type of Species	Status
Bald eagle	Haliaeetus leucocephalus	Birds	Recovery
Ute ladies'-tresses	Spiranthes diluvialis	Flowering Plants	Threatened

Common Name	Scientific Name	Type of Species	Status
Gray wolf	Canis lupus	Mammals	Recovery
Northern Long-Eared Bat	Myotis septentrionalis	Mammals	Threatened*

*with 4(d) rule Source: http://www.fws.gov/endangered/

6.3 Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, only where it differs from that of the Region. For a discussion of the methodology used to develop the loss estimates refer to Chapter 4 of the base plan. In many cases Chapter 4 contains information that differentiates the risk by county, thus the information is not duplicated here. For most of the weather-related hazards the risk does not vary significantly enough from the rest of the Region and thus the reader should refer to Chapter 4. Only issues or vulnerabilities that are unique to the county are discussed, where applicable.

6.3.1 Dam Failure

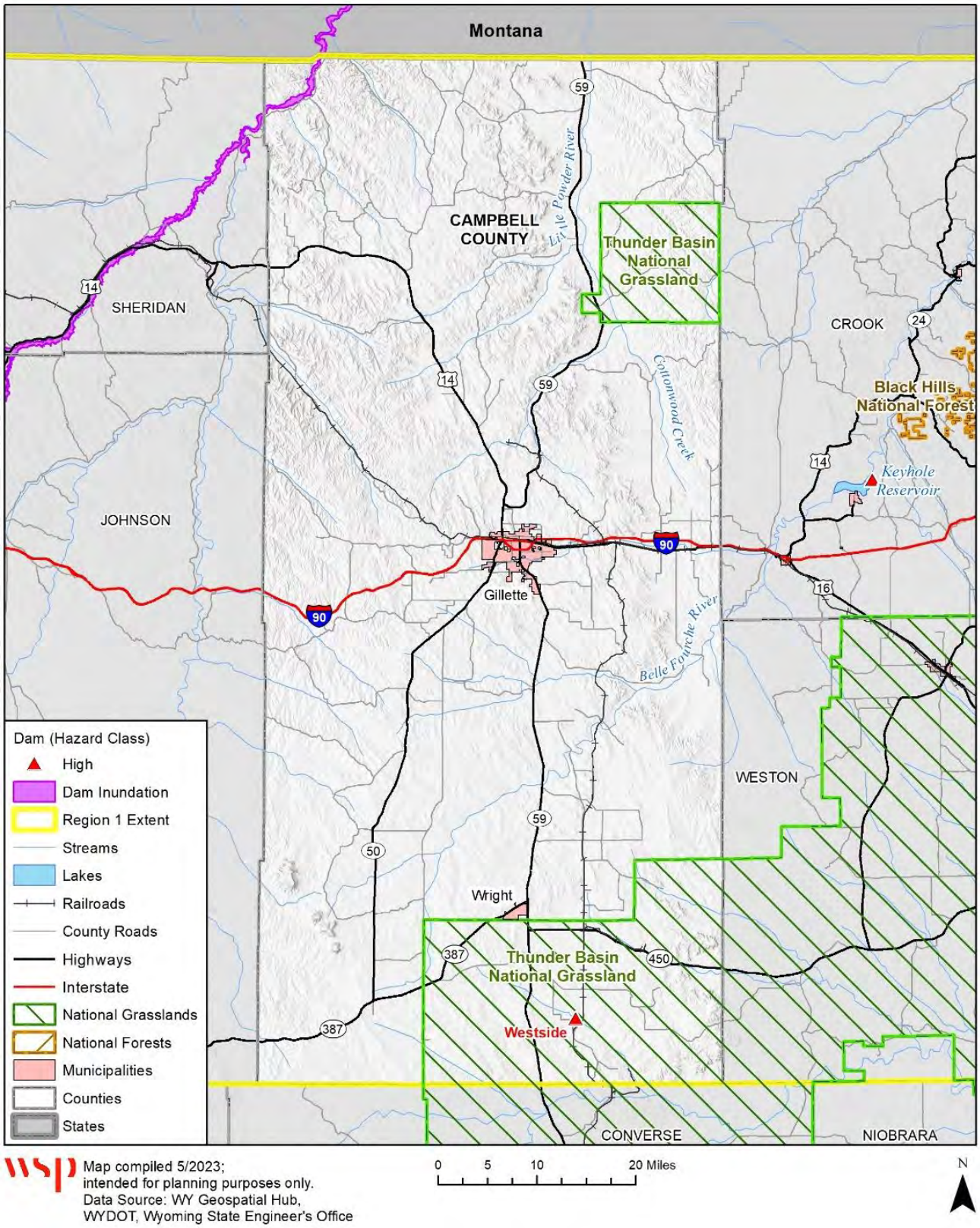
Campbell County has one high hazard dam and three significant hazard dams. These dams are shown in Table and Figure 5 below. The remaining dams in the county are all rated as low hazard.

Table 6-6 High and Significant Level Dams in Campbell County

Hazard Level	Dam Name	Normal Capacity (AF)	Nearby Jurisdiction/Populated Area
High	Westside	260	North Antelope Rochelle Mine
Significant	Cottonwood	2,043	Broadus, Mt
Significant	Lower Morgan	227	I-90
Significant	Railroad	28	Echeta Rd

Source: National Inventory of Dams

Figure 5 Campbell County High and Significant Hazard Dams



6.3.1.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The one High Hazard Dam in Campbell County (Westside Dam) is owned by and located on a coal mine, and the population at risk is completely within that same mine. Thus, mine workers are a potentially vulnerable population. There are no known critical facilities/lifelines within inundation areas or historic or natural resources. There is no risk to Gillette, Wright or the Campbell Conservation District.

There have been three recorded dam breaches in Campbell County since 1978, none of which have caused loss of life or significant property damage. Some of the smaller dams in the County have likely experienced breaches or flooding in the past but were not recorded.

- Spring 1978: Durham Dam 1 was an earthen dam with its base keyed into the foundation constructed in 1973. This dam was overtopped and erosion resulted in a complete failure of the structure with a peak discharge of 5,630 CFS. No damage was reported.
- May 19, 1978: The Caballo Dam, constructed in 1948, was built of earthen material, but its base was not keyed into the foundation. In the spring of 1978, the dam had saturated and started to overtop. The dam was voluntarily breached to save as much of the structure as possible. The peak discharge was 2,170 CFS.
- July 1, 1998, heavy rains caused a stock dam to breach on the Iberlin Ranch, flooding Wyoming Highway 387.

While it is not considered likely, there is a possibility of structure failure-based flooding in the future, though the impacts would likely not be very damaging. The overall risk of dam failure is **low** for the Town of Wright, Gillette Wright and the Campbell Conservation District. and **medium** for the rest of Campbell County.

6.3.1.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.2 Drought

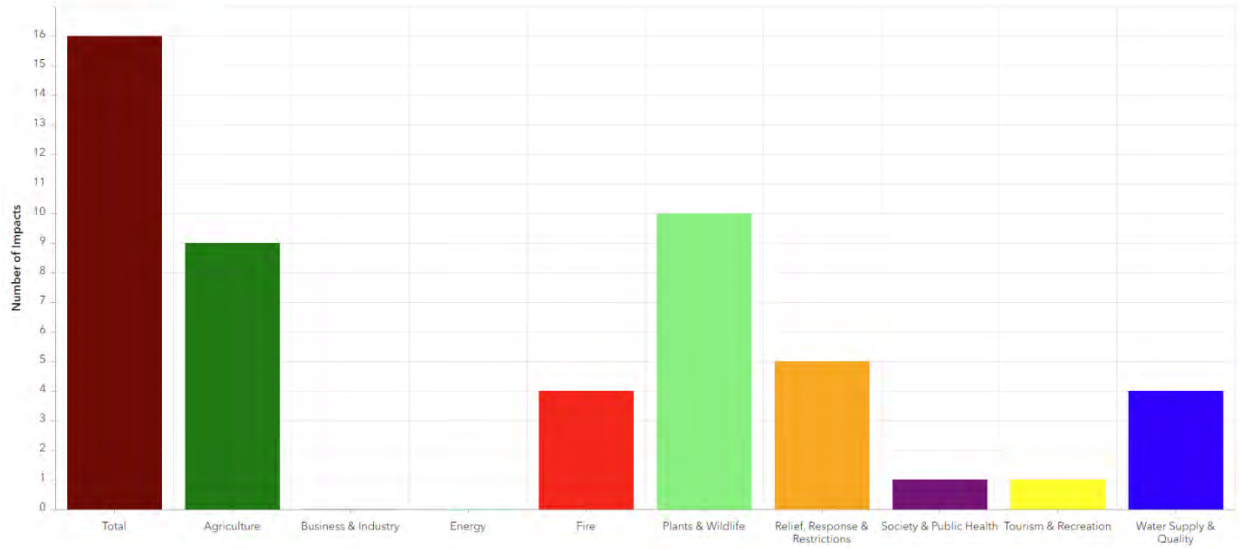
6.3.2.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Drought is a medium significance hazard across all jurisdictions in Campbell County. Drought-related impacts to the local economy can be extensive, affecting the water supply and quality, plants and wildlife, relief response efforts, and even the tourism and recreation industries (e.g., due to increased wildfire danger, forest closures, and fire bans). Plants and wildlife are one of the most affected sectors in Campbell County, as droughts can have far-reaching and detrimental effects on ecosystems, including loss of biodiversity, habitat degradation, and increased stress on wildlife and their environments. The other highly affected sector is agriculture, as crops, forage, and livestock cannot thrive during longer warmer seasons when there is a continued lack of precipitation, in turn causing farmers and growers to experience sales declines and increased management costs.

Since 2005, Campbell County has received sixteen reports of countywide impacts to the various sectors due to drought. The figure below summarizes the number and type of reports that have been made at the county level, from 2005 to the end of 2022. These reports were submitted to indicate negative effects to the economic sectors and local industries due to

drought events. Refer to Chapter 4 in the Base Plan for additional discussion of drought risk related to the region and the county.

Figure 6 County-Level Drought Reports in Campbell County, 2005-2022



Source: https://www.drought.gov/data-maps-tools/drought-impact-reporter-dir

Table takes the impacts of drought on crop production detailed in Table 4-17 of the base plan and breaks out the losses specific to Campbell County with forage production being the largest source of damages.

Table 6-7 Indemnities Paid for Commodities that Suffered from Drought in Campbell County, 2007-2021

Row Labels	Acres Damaged	Indemnity Amount
Barley	300.8	$5,879
Forage Production	99,219.3	$3,548,195
Forage Seeding	528.7	$51,262
Oats	716.7	$19,986
Wheat	8,125.4	$522,935
Grand Total	**108,890.9**	**$4,148,256**

Source: USDA – Risk Management Agency

Drought can stress water supply systems, including reservoirs, water treatment plants, and pipes. Specific water system vulnerability has not been identified during the planning process.

Vulnerable populations that may be affected by drought may include ranchers and farmers as well as those dependent on recreation and tourism. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a prolonged period of drought.

Natural resources include native grasslands, which could be more susceptible to wildfire impacts during droughts. No historic resources are expected to be vulnerable to drought.

6.3.2.2 Development Trends

Recent and future development in the County, District and municipalities is not anticipated to change vulnerability to drought in a significant way.

6.3.3 Earthquake

As discussed in Section 4.2.4 of the base plan, Campbell County does not contain any mapped active faults or areas susceptible to liquification. Campbell County has the highest number of reported earthquake events within Region 1. There have been eleven recorded earthquakes in Campbell County since 1967. These earthquakes are detailed in the table below and discussed in more detail in the following text. There have been no further recorded seismic events greater than a magnitude 3.0 in Campbell County since 2018. It should be noted that Campbell County has experienced over 700 events of greater than 3.0 magnitude recorded by the USGS and attributable to mining explosions and quarry blasts.

Table 6-8 Campbell County Seismic Events, 1976-2023

Location	Date	Magnitude/Intensity	Damage or Injuries
SW Campbell County	5/11/1976	4.8	No
18 Miles East of Gillette	2/18/1972	4.3	No
33 Miles NE of Kaycee	9/2/1976	4.8	No
24 Miles SW of Gillette	5/29/1984	5.0	No
25 Miles SW of Gillette	10/29/1984	2.5	No
27 Miles West of Gillette	9/7/1984	5.1	No
SE Campbell County	2/24/1993	3.6	No
10 Miles East of Weston	9/4/2004	2.8	No
40 Miles West of Gillette	12/6/2008	2.5	No
North Campbell County	3/31/2009	2.6	No
7 Miles NE of Wright	1/20/2011	3.2	No

Source: http://earthquake.usgs.gov and Wyoming Geological Survey

The first earthquake recorded in the County occurred on May 11, 1967. This magnitude 4.8 earthquake was centered in southwestern Campbell County approximately 7 miles west-northwest of Pine Tree Junction. The second event took place on February 18,1972, when a magnitude 4.3 earthquake occurred approximately 18 miles east of Gillette. No damage was reported for either event (Case, Toner, Kirkwood WGS 2002).

Two earthquakes were recorded in Campbell County during the 1980s. On May 29, 1984, a magnitude 5.0, intensity V earthquake occurred approximately 24 miles west-southwest of Gillette. The earthquake was felt in Gillette, Sheridan, Buffalo, Casper, Douglas, Thermopolis, 2 and Sundance. A rancher, living 35 miles west of Gillette, reported that he could see the ground shaking, and he heard a loud noise similar to a sonic boom. Pictures were shaken from the walls of the ranch house, but no other damage occurred at the ranch (Casper Star-Tribune, May 30, 1984). Surprisingly, all other reports only indicated that dishes rattled. On October 29, 1984, a magnitude 2.5 earthquake occurred approximately 25 miles west-northwest of Gillette. No damage was reported.

On February 24, 1993, a magnitude 3.6 earthquake occurred in southeastern Campbell County approximately 10 miles east-southeast of Reno Junction. No damage was reported.

Earthquakes have also occurred near the Campbell County-Johnson County border. On September 2, 1976, a magnitude 4.8, intensity IV-V earthquake occurred approximately 33 miles northeast of Kaycee and 38 miles west-southwest of Gillette. Although the event was felt in Kaycee, no damage was reported. A magnitude 5.1, intensity V earthquake was reported on

September 7, 1984, approximately 27 miles west of Gillette. The earthquake was felt throughout northeastern Wyoming, including Buffalo, Casper, Kaycee, Linch, and Midwest, and parts of southeastern Montana. No significant damage was reported (Laramie Daily Boomerang, September 8, 1984).

6.3.3.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Based on the Level 1 HAZUS-MH analysis conducted for the State of Wyoming in 2020, Campbell County had the second highest projected losses in Region 1 under a 2,500-Year Probabilistic event scenario, with $70 million in projected damages and 41 casualties, one of which is fatal. There are not earthquake-vulnerable populations or natural resources within the County and jurisdictions of note. Damage to the transportation system and utility lifelines is possible; specific loss numbers were not available at county levels from the Hazus analysis done for the Wyoming State Hazard Mitigation Plan. The overall significance of earthquakes for Campbell County and all jurisdictions is considered **Medium**.

6.3.3.2 Development Trends

Recent and future development in the County, District and municipalities is not anticipated to change vulnerability to earthquake in a significant way.

6.3.4 Expansive Soils

Campbell County has classified expansive soils as a medium risk to the County and County Conservation District, and a low risk to the City of Gillette and Town of Wright.

6.3.4.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The primary concern for development outside municipalities is that expansive soil with damage septic systems and subsequently contaminate groundwater.

Though the County has raised concerns for expansive soils, the State of Wyoming Geological Survey hazard map data does not show any identified expansive soils area within Campbell County. The County has experienced expansive soil problems in the past, and the HMPC observed that expansive soils are a continuous issue. Campbell County has invested in soil remediation in the past for the City of Gillette and Town of Wright. The school district has also dealt with expansive soils issues at great cost for years, and similar concerns have occurred all over the county. The Natural Resources Conservation Service (NRCS) has been doing ongoing research to identify expansive soils in Campbell County.

6.3.4.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Modern construction techniques typically account for and mitigate this hazard.

6.3.5 Flood

Campbell County has a historical record of flood-related incidents, leading to significant financial losses and property damage. The county faces flooding risks from various sources, including Cottonwood Creek, Little Powder River, and Belle Fourche River. In the event of a dam failure from the numerous high hazard dams in Johnson County along Clear Creek and mapped inundation going through the northwest corner of Campbell County, please refer to Section 4.2.2, Dam Failure, in Chapter 4.

6.3.5.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

As of 2023, Campbell County has partial coverage for digital floodplains mapped by FEMA's National Flood Insurance Program and a Hazus flood model was utilized for mapping and analysis to create a comprehensive flood risk assessment. Figure 7 through Figure 9 show the FEMA and Hazus modeled floodplains. The jurisdiction maps below depict FEMA and HAZUS designated floodplains overlaid by the parcels/infrastructure at risk of flooding (displayed as parcel centroid points). Campbell County is shown first, then its jurisdictions.

Table 6-9 summarizes the building counts and improved value of parcels in the County, broken out by jurisdiction, which are within the 1% chance floodplains. Additionally, the table also summarizes loss estimate values, which are calculated based upon the improved value and estimated contents value and assumes a two-foot deep flood which usually results in 25% of the total value, based on FEMA depth-damage curves. Table 6-10 summarizes improved properties at risk to the 0.2% flood hazards where mapped within Campbell County.

Table 6-9 also indicates the estimated flood losses in each applicable jurisdiction in Campbell County. The unincorporated areas of the County have the largest number of properties at risk to the 1% annual chance flood. The majority of the properties are residential with a total value of $20 million in improved values and $5 million in total estimated losses. An estimated 201 people would be at risk of displacement during these floods. General trends with populations vulnerable to flooding can be referenced in Section 4.2.6 in the base plan. More specifics are not known, but the slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts and recovery from a significant flood.

Table 6-9 Campbell County Parcels at Risk to 1% Flood Hazard (FEMA & Hazus) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Gillette	Commercial	4	$2,611,915	$2,611,915	$5,223,830	$1,305,958	
	Residential	27	$4,239,962	$2,119,981	$6,359,943	$1,589,986	72
	Total	**31**	**$6,851,877**	**$4,731,896**	**$11,583,773**	**$2,895,943**	**72**
Unincorporated	Commercial	2	$248,518	$248,518	$497,036	$124,259	
	Residential	49	$13,112,456	$6,556,228	$19,668,684	$4,917,171	130
	Total	**51**	**$13,360,974**	**$6,804,746**	**$20,165,720**	**$5,041,430**	**130**
	Grand Total	**82**	**$20,212,851**	**$11,536,642**	**$31,749,493**	**$7,937,373**	**201**

Source: Campbell FEMA NFHL 1/2/2008 & Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-10 Campbell County Parcels at Risk to 0.2% Flood Hazard (FEMA) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Gillette	Commercial	6	$6,551,623	$6,551,623	$13,103,246	$3,275,812	
	Residential	12	$2,142,860	$2,142,860	$4,285,720	$1,071,430	32
	Total	**18**	**$8,694,483**	**$8,694,483**	**$17,388,966**	**$4,347,242**	**32**
Unincorporated	Residential	3	$850,279	$850,279	$1,700,558	$425,140	8

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
	Total	**3**	**$850,279**	**$850,279**	**$1,700,558**	**$425,140**	**8**
	Grand Total	**21**	**$9,544,762**	**$9,544,762**	**$19,089,524**	**$4,772,381**	**40**

Source: Campbell FEMA NFHL 1/2/2008, Wyoming CAMA 2022, WSP GIS Analysis

Campbell County has a total of 72 critical facilities located in the 1% annual chance floodplain and 1 within the 0.2% floodplain. Fifty-two (52) of the 72 facilities are transportation lifelines and these consist of non-scour bridges in varying degrees of condition ranging from poor, fair, or good condition. This is shown in Table 6-11 and Table 6-12. No specific facilities for the Conservation District are known to be at risk. No natural or historic resources are known to be at-risk.

Table 6-11 Campbell County Critical Facilities at Risk to 1% (FEMA & Hazus) Flood Hazards Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Gillette	-	-	-	-	-	-	6	**6**
Unincorporated	3	15	-	1	1	-	46	**66**
Total	**3**	**15**	**0**	**1**	**1**	**0**	**52**	**72**

Source: Campbell FEMA NFHL 1/2/2008 & Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-12 Campbell County Critical Facilities at Risk to 0.2% (FEMA) Flood Hazards Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Gillette	1	-	-	-	-	-	-	**1**
Unincorporated	-	-	-	-	-	-	-	**0**
Total	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

Figure 7 Campbell County FEMA and Hazus Flood Hazards

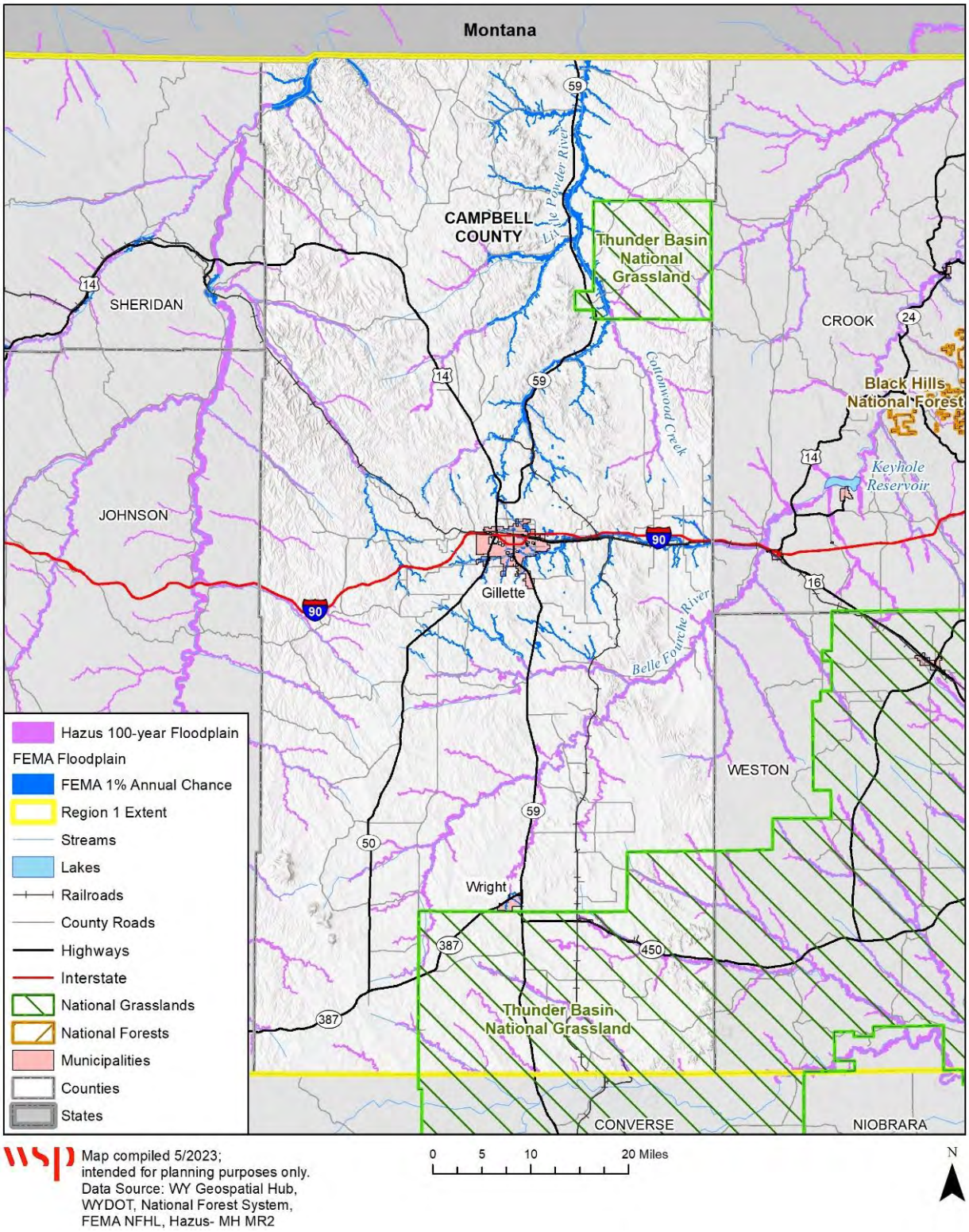


Figure 8 City of Gillette FEMA and Hazus Flood Hazards

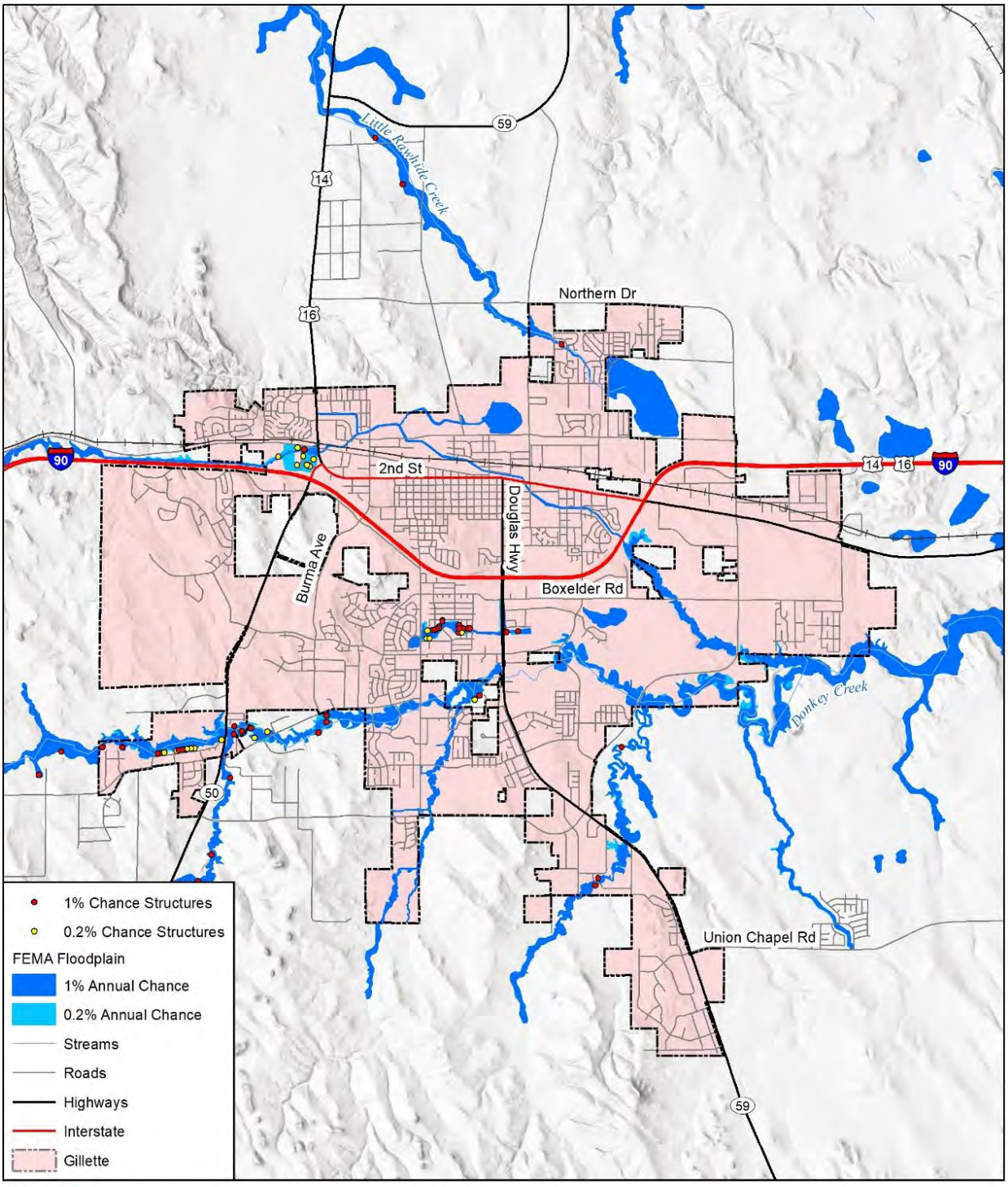
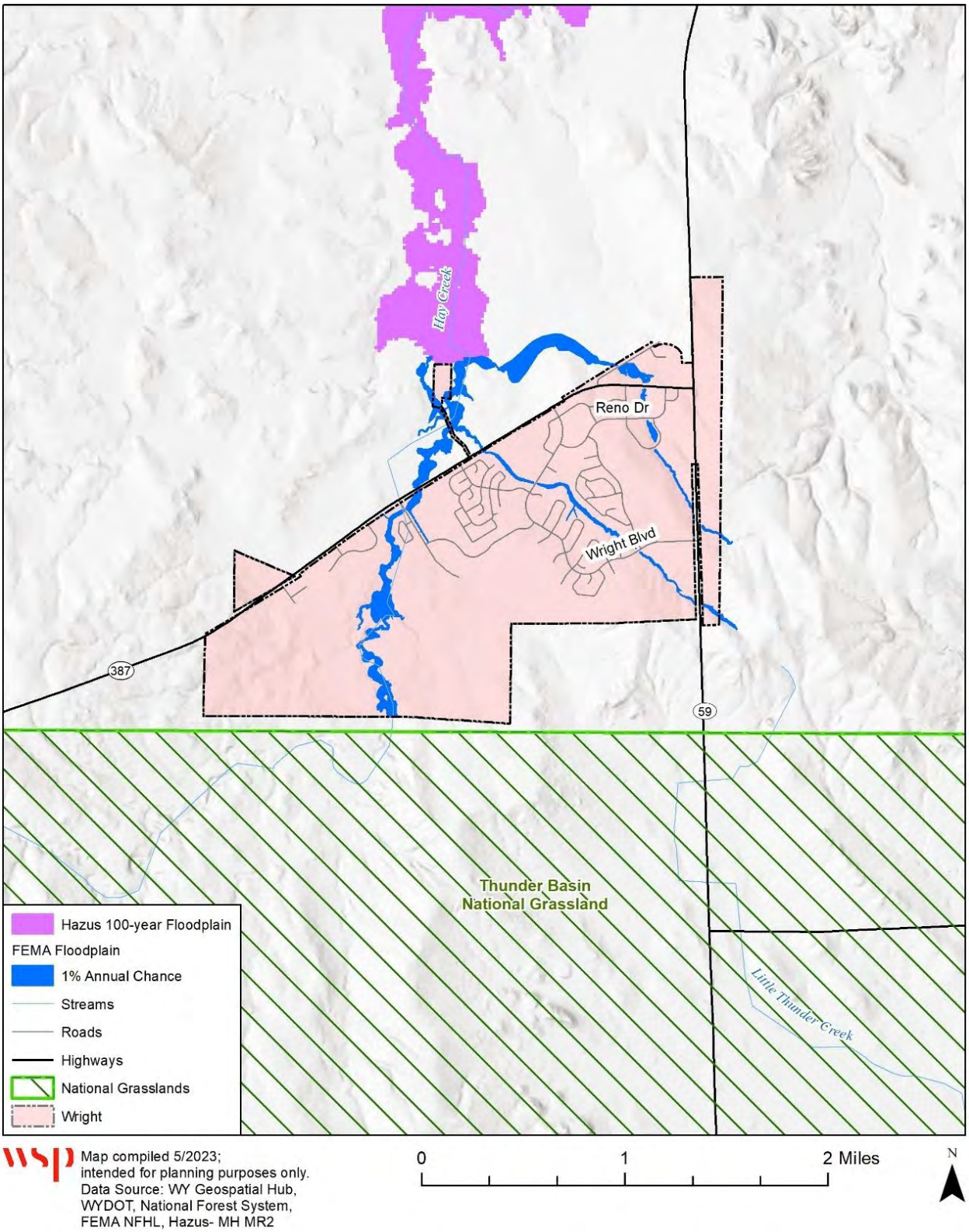


Figure 9 Town of Wright FEMA and Hazus Flood Hazards



Notable Flood Events

The principal flooding sources in the county are heavy rains and rapid snowmelt, which turn into flash flooding often in a matter of just hours. Some river flooding is also common, particularly overflowing of the Belle Fourche River.

The costliest flood related event in the recent history of Campbell County (in terms of human injuries and deaths) occurred July 22 of 2008, when heavy rains from a severe thunderstorm caused flash flooding east of Highway 59. A pickup truck drove into a washed-out culvert and small section of Trail Creek Road, resulting in one fatality and three human injuries. Three to six inches of water had accrued in a short period of time that day, and golf ball size hail fallen during this event.

The flooding event with the highest property damage accrued began May 28 of 2001, when heavy rain fell over the Donkey Creek drainage, pouring over 2 inches per hour. Donkey Creek flooded, tearing up paved golf cart paths and a service bridge in the Gillette County Club. Many businesses reported flooding of 1-2 feet, and one man needed rescue from a stalled vehicle in chest-deep water. The event only lasted about three hours total, but caused around $400,000 in property damages.

Wright had its costliest flooding event, in terms of property damages, on the 1st of August 2013. A thunderstorm producing large hail and wind gusts affected many vehicles in Wright, also impacting homes and other low-lying areas and properties. Heavy rain flooded roads, yards, and basements after drainage systems clogged with hail. A dam on Panther Pond was overtopped, and Wright Golf Course inundated. This event caused around $150,000 in damages.

The other five floods causing property damages in the County occurred from 2007 to 2015, accruing a total of $95,000. Inundation took place, primarily, because of water ponding, heavy rainwater runoff, and general flash flooding about roads and railroads.

Table 6-13 summarizes significant flood events that occurred between 1955 and 2023 in Campbell County, as reported to the NCEI National Centers for Environmental Information system. The principal flooding sources in the county are heavy rains and rapid snowmelt, which turn into flash flooding often in a matter of just hours. Some river flooding is also common, particularly overflowing of the Belle Fourche River.

Table 6-13 Flood Events in Campbell County, 1955-2023

County	Type	Location	Date	Property Damage	Crop Damage
Campbell County	Flood	Gillette	6/14/1996	0	0
Campbell County	Flood	Recluse	7/18/1997	0	0
Campbell County	Flash flood	Weston	6/22/1998	0	0
Campbell County	Flash flood	Wright	7/1/1998	0	0
Campbell County	Flash flood	Wright	7/1/1998	0	0
Campbell County	Flash flood	Gillette	7/2/1998	0	0
Campbell County	Flash flood	Gillette	5/28/2001	$400,000	0
Campbell County	Flash flood	Wright	7/13/2004	0	0
Campbell County	Flash flood	Wright	7/13/2004	0	0
Campbell County	Flood	Northern Campbell	6/24/2005	0	0
Campbell County	Flood	Gillette	5/5/2007	$58,000	0
Campbell County	Flood	Weston	5/5/2007	0	0

County	Type	Location	Date	Property Damage	Crop Damage
Campbell County	Flood	Gillette	6/7/2007	0	0
Campbell County	Flood	Weston	6/7/2007	0	0
Campbell County	Flood	Rockypoint	5/23/2008	0	0
Campbell County	Flash flood	Recluse	7/22/2008	0	0
Campbell County	Flash flood	Echeta	5/26/2013	$25,000	0
Campbell County	Flash flood	Wright	8/1/2013	$150,000	0
Campbell County	Flash flood	Wright	8/9/2013	0	0
Campbell County	Flash flood	(GCC) Gillette Airport	5/24/2014	$10,000	0
Campbell County	Flood	Recluse	5/27/2015	0	0
Campbell County	Flash flood	Savageton	6/3/2015	$1,000	0
Campbell County	Flood	Savageton	6/3/2015	$,1000	0
Campbell County	Flood	Rockypoint	6/4/2015	0	0
Campbell County	Flood	Recluse	5/30/2019	0	0
Campbell County	Flash flood	Gillette	8/8/2019	0	0
Total				**$645,000**	**$0**

Source: NOAA NCEI

According to the statistics from the National Flood Insurance Program, there have been a total of 23 flood insurance claims. The total payments made on these claims in the County is $38,090, mostly from claims within the City of Gilette.

Table 6-14 NFIP Policy and Insurance Claim Data

Campbell County	Policies	Coverage "Insurance in Force"	# of Claims "Closed Paid Losses"	Paid Losses "$ of closed paid losses"	# of Policies in A Zones
Campbell County	3	$1,023,000	3	$5,959	0
Gilette, City of	15	$7,051,000	19	$30,780	6
Wright, Town of	0	$0	1	$1,351	0
Total	**18**	**$8,074,000**	**23**	**$38,090**	**6**

Source: FEMA Policy and Claim Statistics http://www.fema.gov/policy-claim-statistics-flood-insurance and State of Wyoming Department of Homeland Security, NFIP Coordinator as of 2/07/2018

6.3.5.2 Development Trends

For NFIP participating communities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. The lack of comprehensive flood hazard mapping in large portions of unincorporated areas of Campbell County makes floodplain management challenging. No major growth or development in the County or jurisdictions is expected to significantly alter the general area flood risk, but good planning, zoning, and general hazard mitigation practices are always necessary to prevent future development from being heavily impacted by flooding.

6.3.6 Hail

Since 1950, NCEI has recorded 553 hail events in Campbell County with hail over 1" in diameter, causing over $73 million in reported damage. Hail less than two inches is most common, but hail over 4" has been reported in the county.

6.3.6.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Hailstorms occur sporadically throughout Region 1 and are often associated with severe summer storms; these events primarily impact buildings and agriculture. Most of the damages affect crops, though there is potential for significant structural destruction from particularly large hailstones. The probability of future occurrence for this event in Campbell County is likely, but the magnitude of these events could vary from negligible to significant. Overall, hail poses a moderate threat across the County and that ranking does not vary between the jurisdictions. Though it should be noted that property damages will be higher in the municipalities (due to exposed infrastructure, cars, etc.), potential crop and livestock damages would be concentrated in the more rural and unincorporated areas. See Section 4.2.7 of the Base Plan for more information on the previously recorded hail events and associated damages, and to revisit the hail map for Region 1.

No specific natural, cultural, or historical resources are at risk.

Vulnerable populations that may be affected by drought may include mine workers, ranchers and farmers that work outdoors. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a major hail event.

6.3.6.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.7 Hazardous Materials Release

As further discussed at a regional level in the Base Plan, since 2007 Campbell County has been exposed to at least 83 hazardous materials incidents that were significant enough to be recorded in the U.S. Coast Guard's National Response Center (NRC) database and Risk Management Plans (RMP) network; more information can be obtained at http://www.rtk.net/#rmp.

Table 6-15 NRC-Reported Incidents in Campbell County: 2007-2022

Year	Campbell
2007	7
2008	4
2009	7
2010	10
2011	13
2012	5

Year	Campbell
2013	3
2014	2
2015	1
2016	3
2017	18
2018	2
2019	1
2020	1
2021	2
2022	4
Yearly Average	**9.0**

Source: http://www.rtk.net/#rmp

Hazardous materials in Campbell County are a topic of concern and management within the region. The County is known for its significant energy production and industrial activities, various hazardous materials are utilized and transported throughout the area. The management of hazardous materials in the County is a collaborative effort involving various local, state, and federal agencies. In Campbell County, the predominant category of hazardous materials transported through the region comprises flammable substances. Crude oil and other flammable materials are likewise the most prevalent types found at fixed facilities. Campbell County leads the state annually in the number of Tier II hazardous materials storage reports filed as a result of the Emergency Planning and Community Right to Know Act (EPCRA), with over 1,000 reporting facilities.

6.3.8 High Winds and Downbursts

Wind is a persistent force in Wyoming, and high winds consistently pose a challenge for the County.

6.3.8.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Assessing vulnerability based on location is challenging since damaging winds have occurred throughout the entire region. The primary risk associated with high winds include damage to inadequately constructed buildings, the potential for flying debris, car accidents, and harm to electrical and power infrastructure. High winds are typically unpredictable, and the resulting damages are often discussed in a regional context, even though downbursts can affect smaller areas.

Wind damage report in Wyoming Region 1 has totaled approximately of $165,163 indemnity payments for a total 1,814.1 acres lost to wind events. Additionally, the NCEI reported a total of $2,416,700 in property damages between both types of wind events since 1950 in Campbell County.

The probability of future occurrence for this event is likely, but the magnitude of these events is negligible. Overall, high winds pose a medium threat across the County and do not vary

between the jurisdictions. See Chapter 4 of the base plan for more information on wind zones, events, and impacts.

Overall, high winds pose a medium threat across the County and do not vary between the jurisdictions. There is not anticipated variation or specific vulnearbilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to wind damage leading to periodic power outages. See Chapter 4 of the base plan for more information on wind zones, events, and impacts.

6.3.8.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.9 Landslide/Debris Flow/Rockfall

The geologic history and unique conditions of Wyoming make landslides one of the most common hazards. Landslide risk in Campbell County is primarily, is generally isolated to less populated areas. The area around Highway 59 and Highway 14 in the northern parts of the county is of particular concern; the HMPC noted regular damage to fences in this area. Areas of complex slope movement and slump are particularly noticeable, though some debris and/or earth flow may occur as well in the Highway 59. West of Highway 50 and north of Highway 387, closer to the boundary with Johnson County, are some cases of complex slope movement, debris/earth flow, and slump, about 15 miles from the Town of Wright.

6.3.9.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The major impacts from landslides are to transportation facilities such as roads, highways, bridges and railroad infrastructure, rather than life and property. The most significant impact tends to be when no alternative route exists between populated areas and access is blocked by a landslide; for example, a blockage of Highway 59 would cause significant disruption of mobility between Gillette and Weston County.

While the overall hazard significance is low in the county, GIS analysis of properties reveals the following potential exposure to the hazard. Based on the GIS analysis conducted, there is approximately $849 million in improved property value potentially exposed to landslide hazards throughout Campbell County, the highest amount in Region 1. The majority of this risk is located in the City of Gillette. The results of the GIS analysis are summarized in Table 6-16 below, and the critical facilities at risk are shown in Table 6-17. This is considered a planning level estimate and more site-specific investigations would be needed to further define risk.

Based on the GIS analysis approximately 9,688 persons may reside on landslide susceptible areas, mostly in Gillette and the unincorporated areas. Risk to populations is generally considered low as the landslides are commonly slow moving events in this part of the Region and there are not any distinct social vulnerability aspects. No specific natural or cultural resources have been identified as at risk.

Table 6-16 Landslide Hazard Exposure by Jurisdiction in Campbell County

Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value
Gillette	1	203	2,363	**2,567**	$563,282,485
Wright	-	-	52	**52**	$12,633,213
Unincorporated	35	21	1,122	**1,178**	$273,450,318
Total	36	224	3,537	**3,797**	**$849,366,016**

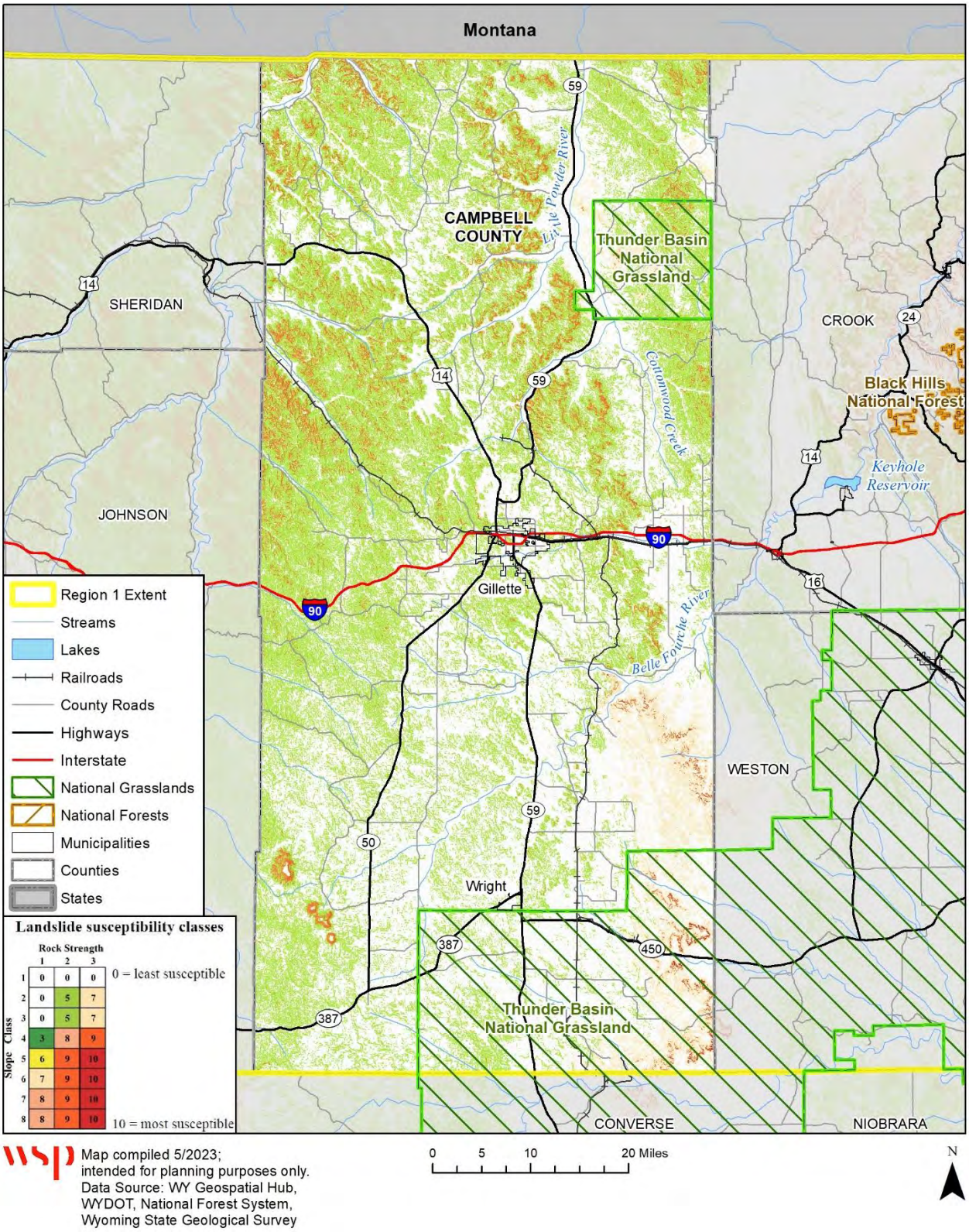
Source: WYGS Landslide Susceptibility data, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-17 Campbell County Critical Facilities Exposure to Landslide

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Moderate Risk								
Gillette	7	4	-	-	1	5	-	**17**
Wright	2	-	-	-	-	-	-	**2**
Unincorporated	89	35	-	-	-	1	13	**138**
Moderate Total	**98**	**39**	**0**	**0**	**1**	**6**	**13**	**157**
Moderately High Risk								
Gillette	-	-	-	-	-	1	-	**1**
Wright	-	-	-	-	-	-	-	**0**
Unincorporated	6	6	-	-	-	-	-	**12**
High Total	**6**	**6**	**0**	**0**	**0**	**1**	**0**	**13**
Highest Risk								
Gillette	-	-	-	-	-	-	-	**0**
Wright	-	-	-	-	-	-	-	**0**
Unincorporated	-	-	-	-	-	-	11	**11**
Highest Total	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**11**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

Figure 10 Campbell County Landslide Susceptibility



6.3.9.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Future planning in areas of steep slopes should consider the potential for slope failure/landslide hazards,

6.3.10 Lightning

6.3.10.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Lightning strikes pose a potential risk in all regions of western Wyoming. The effects on individuals and property are expected to be relatively isolated. Those who work outdoors, outdoor enthusiasts, and livestock are at a continued risk of lightning strikes. The average flash density across the county varies significantly, ranging from 1.5 to 3 flashes per square mile annually in the southeastern corner, while the northeastern corner experiences a high frequency, with 6-12 flashes per square mile per year. Campbell County experienced 4 reported damaging lightning strikes, causing one injuries, and no fatalities.

Table 6-18 Lightning Events in Campbell County, 1950-2015

County	Number of Events	Injuries	Fatalities	Property Damage	Crop Damage	Total Damage
Campbell	4	1	0	0	$ 0	$0

Source: 2016 Wyoming State Multi-Hazard Mitigation Plan

These number greatly understate the frequency of lightning strikes in the county, as most strikes go unreported. Lightning-induced wildfires are the most significant impact from this hazard which could impact local natural resources. No specific cultural resources have been identified as at risk.

Sometimes, communications and infrastructure are interrupted by lightning strikes. These events raise the vulnerability of the essential functions by delaying response times, hindering interagency communication efforts, or endangering or damaging communication networks.

6.3.10.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.11 Mine and Land Subsidence

6.3.11.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Campbell County has relatively few abandoned underground mine sites compared to other counties in the Region. Land subsidence events have taken place in the county, particularly near Gillette, and are expected to continue to occur.

Campbell County has also experienced subsidence incidents involving the voids created by coal seam fires, which can be hazardous to humans, livestock and animals in limited areas. See Section 0 for more information on coal seam fires. Refer to Section 4.2.12 from the Base Plan for additional specifics on the regional vulnerability assessment and maps with the location of abandoned mine sites, mine reclamation and abandonment programs, land subsidence information, and other details relevant to Campbell County and Region 1. The overall threat of

this hazard in the County is low and not anticipated to have substantial effects on structures, populations, natural or cultural resources or variability across jurisdictions. Linear infrastructure in the unincorporated areas could be potentially vulnerable.

6.3.11.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Campbell County should continue to make efforts to study geologic hazards as they relate to future industry and development to avoid future problems. Linear pipeline development initiatives shouldn't be undertaken without a thorough geologic hazard study.

6.3.12 Severe Winter Weather

Winter storms are a yearly feature of the Wyoming climate and may occur anywhere in the state. Blizzard conditions bring the triple threat of heavy snowfall, strong winds and low temperatures. Poor visibility and huge snowdrifts are major hazards caused by blowing snow.

6.3.12.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

These storms disrupt work, make travel difficult or impossible, isolate communities, kill livestock by the hundreds or thousands and sometimes leave human fatalities in their wake. Heavy snow can temporarily affect transportation infrastructure, making access to rural homes difficult. Medically fragile persons and seniors can also be more vulnerable, especially during prolonged storms; residents are encouraged to keep a 3-day supply of food, medication, and oxygen.

As noted in Section 4.2.13 of the base plan, one of the most notable of these events occurred in Campbell County recently. In late April 2022, a strong spring storm system brought heavy snow to much of northeastern Wyoming, with blizzard conditions across a good portion of the plains. Heavy snow of ten to 20 inches of snow fell over much of Campbell County and portions of extreme northeastern Wyoming, with snowfall amounts of five to ten inches common elsewhere. Strong winds produced considerable blowing and drifting snow, with drifts of six to ten feet in areas that saw the heaviest snow. Interstate 90 was closed for over 24 hours across northeastern Wyoming. The HMPC reports that multiple local businesses and schools also closed for multiple days.

While most winter storms are not isolated to one county, NCEI records 101 winter storms (including events labelled as blizzards, heavy snow, winter storm or winter weather) impacting Campbell County from 1996 to 2023; total reported damages from these events are $980,000 with no reported injuries or fatalities. The county averages 196 days a year with temperatures below 32˚F, and approximately 6.5 severe winter weather events per year. The average winter minimum temperature for the county is 9.5˚F, with a record low temperature of -45˚F recorded in 1990.

The overall significance of this hazard is **high** across the County and does not largely vary between the jurisdictions. Winter storms do not have substantial impacts to natural or cultural resources. Impacts on livestock are a concern that can have socioeconomic impacts. Refer to Section 4.2.13 of the Base Plan for more details since winter storms and related weather are easier to describe regionally than on a county by county basis.

6.3.12.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.13 Tornado

Most tornado events in Region 1 tend to be small in terms of magnitude, with limited associated impacts. Of the 90 tornadoes recorded in Campbell County since 1950, 61 were rated F0/EF0, 20 were rated F1/EF1, eight were rated F2/EF2, and only one was rated F3/EF2. Many of these may have been rated F0 or F1 simply because these tornadoes are often formed over open land and result in little or no damage. NCEI records 92 damaging tornado events in Campbell County since 1950, collectively causing $8,931,580 in reported property damage, 26 injuries, and two fatalities. The two fatalities were from the 2005 Wright tornado which was an F2 that also injured 13 people and caused $5 million in property damage, resulting in Presidential Disaster Declaration DR-1599.

Table 6-19 Tornado History in Campbell County, 1950-2016

County	Total Incidents	Magnitude	Damage-Causing Incidents	Fatalities	Injuries	Property Damage
Campbell	92	F2	34	2	26	$ 8,931,580

Source: NOAA's NCEI

6.3.13.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The overall significance of tornado events in Campbell County is high for all jurisdictions due to the history of events that have led to a disaster declaration and damages in the millions of dollars. There is not anticipated variation or specific vulnerabilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to tornado damage leading to periodic power outages. Refer to the map within the base plan for geospatially locations of NCEI-reported tornadoes across Wyoming Region 1.

6.3.13.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Fluctuations in energy development may cause increased exposure to extractive industry workers and equipment during boom times.

6.3.14 Wildfire

Wildfire is considered **high** significance for Campbell County. Campbell County has a long history of wildfire. The Federal Wildland Fire Occurrence Data records 209 total fire events from 1980-2023. However, 84,841 acres have burned in Campbell County just from fires of 1,000 acres or more in size (though many more occurred throughout those years). The largest fire in Campbell County, the Rochelle Hills #2 Fire, occurred in 1988 and burned 20,000 acres about 11 miles northwest of Wright. Table below describes those Campbell County wildfires that burned 1,000 or more acres between 1980 and 2023, sorted by acres burned.

Table 6-20 Wildfires over 1,000 acres in Campbell County: 1980-2023

Name	Year	Acres Burned
Rochelle Hills #2	1988	8,711
Horse Creek 2	2006	8,349
Pownell Fire	2002	6,949
Daley Complex	2002	6,687

Name	Year	Acres Burned
Little Powder	2006	4,708
Duck Creek	2007	4,325
Rourke	2011	4,215
Buffalo creek	2003	4,081
Dry Fork	2021	3,384
Horse Creek Butte	2021	3,360
Buffalo	2017	3,013
Ponderosa	2000	2,925
Collins	2012	2,444
Short	2016	2,302
Bacon Creek	2006	2,066
Cedar Draw 2	2016	2,037
Deer Creek	2016	2,028
Collins 1	2011	1,908
Pronghorn	2016	1,890
Watt Fire	2002	1,526
South Fork 3 Bar	2010	1,466
Turner	1999	1,459
Hairy Fire	2002	1,371
Wildcat Creek	2012	1,317
South Edwards	2010	1,215
Stallions	2017	1,105
TOTAL		**84,841**

Source: National Incident Feature Service (NIFS)

It is important to note, however, that many other fires which burned thousands of additional acres took place in Campbell County throughout the years. About 31% of those were estimated to be human-caused, with another 1% with an unknown cause, and all others being natural-caused. Over 282 total fires have taken place in the county since 1980. (Source: Campbell County's WRDS, HSIP Freedom).

6.3.14.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

There have been no catastrophic urban fires documented in Campbell County although large wildland fires become increasingly damaging as the population expands into the more rural areas. The method utilized for estimating potential future impact is to determine the value of structures that are located within Wildfire Risk Areas, or wildland fire building exposure values. Wildland fire building exposure value is the value of buildings that can be potentially damaged by wildland fire in an area. Building exposure values are based on county assessor data. The methodology utilized is like that used to model flood exposure described in the flood chapter.

The table below summarizes the building counts, property value, and estimated population exposed to medium, high, or highest wildfire risk areas throughout Campbell County. Total exposure is estimated at $2.2 billion in property value, with approximately $1.5 billion of this total located in the City of Gillette. An estimated 12,813 people in Campbell County reside in

areas of medium wildfire risk or higher. Campbell County has the highest number of vulnerable residents and total exposed property value in Region 1. Vulnerable populations may include school-aged children and elderly populations, or those that may not have resources to evacuate.

Refer to Section 4.2.15 of the HIRA for details on vulnerable critical facilities in Campbell County. The lifelines in areas of medium to high risk include communications (104), energy (25) and transportation (53) facilities. Food/water/shelter (2), hazardous materials (2), health and medical (5) and safety/security (15) are also potentially vulnerable based on the GIS overlay analysis. A more site-specific analysis would be needed to further refine risk.

Natural and cultural resources impacts could be significant to national protected areas such as the Thunder Basin National Grassland.

Figure 11, Figure 14, and Figure 15 below display the areas of greatest wildfire risk, according to WYWRAP data, for the county, City of Gillette, and Town of Wright, respectively. Generally, the areas of highest risk are concentrated in and around the municipalities of Campbell County, with areas of medium to high risk dotted throughout the county.

Table 6-21 Campbell County General Building and Population Exposure within Medium, High, and Highest Wildfire Risk Areas

Jurisdiction	Parcel Count Highest	Parcel Count High	Parcel Count Medium	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Gillette	1,726	1,181	391	**3,298**	$941,578,722	$607,363,249	**$1,548,941,971**	7,865
Wright	263	8	-	**271**	$49,748,426	$31,865,357	**$81,613,783**	649
Unincorporated	619	718	434	**1,771**	$387,992,699	$219,161,354	**$607,154,053**	4,298
Total	**2,608**	**1,907**	**825**	**5,340**	**$1,379,319,847**	**$858,389,959**	**$2,237,709,806**	**12,813**

Source: WYWRAP, Wyoming CAMA2022, WSP GIS Analysis

Figure 11 Campbell County Wildfire Risk

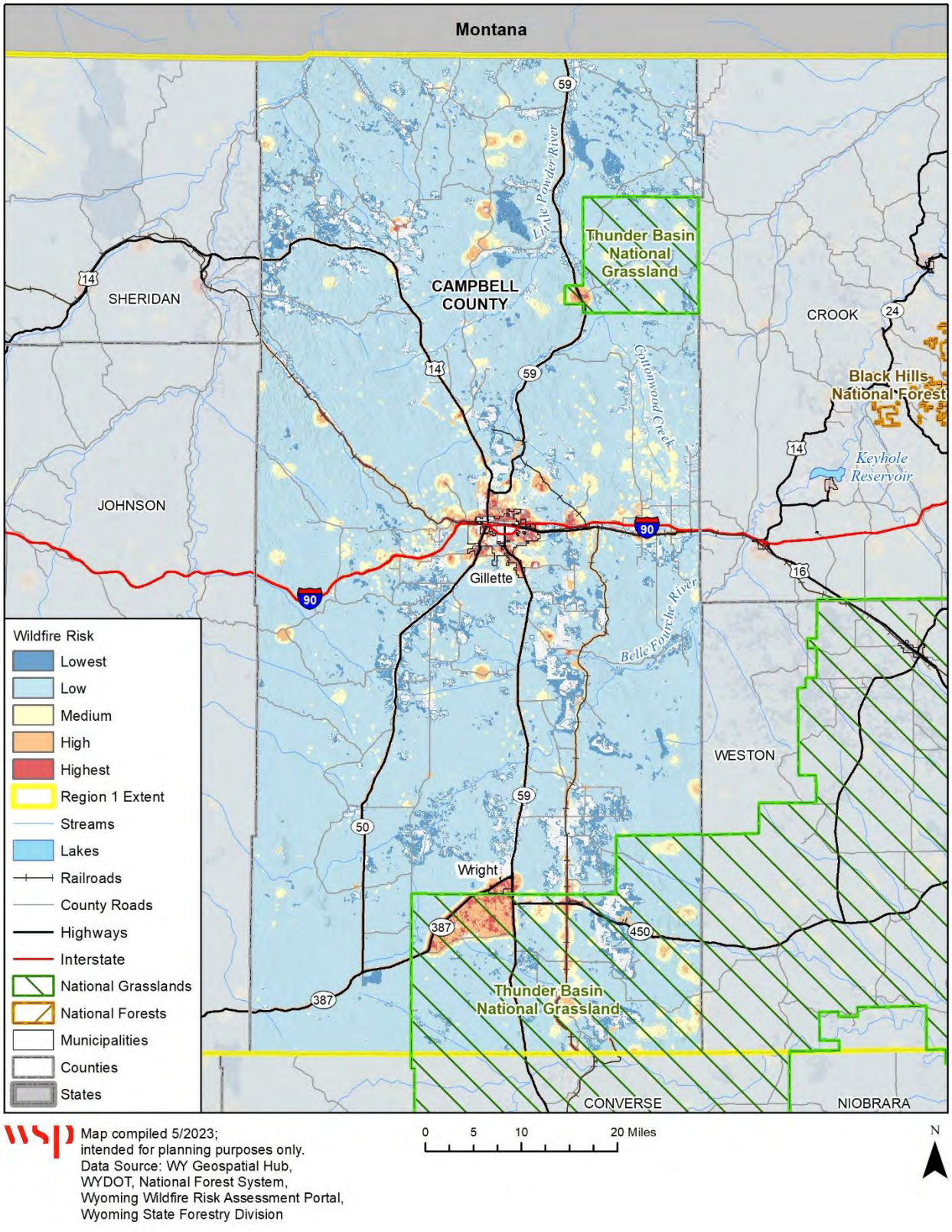
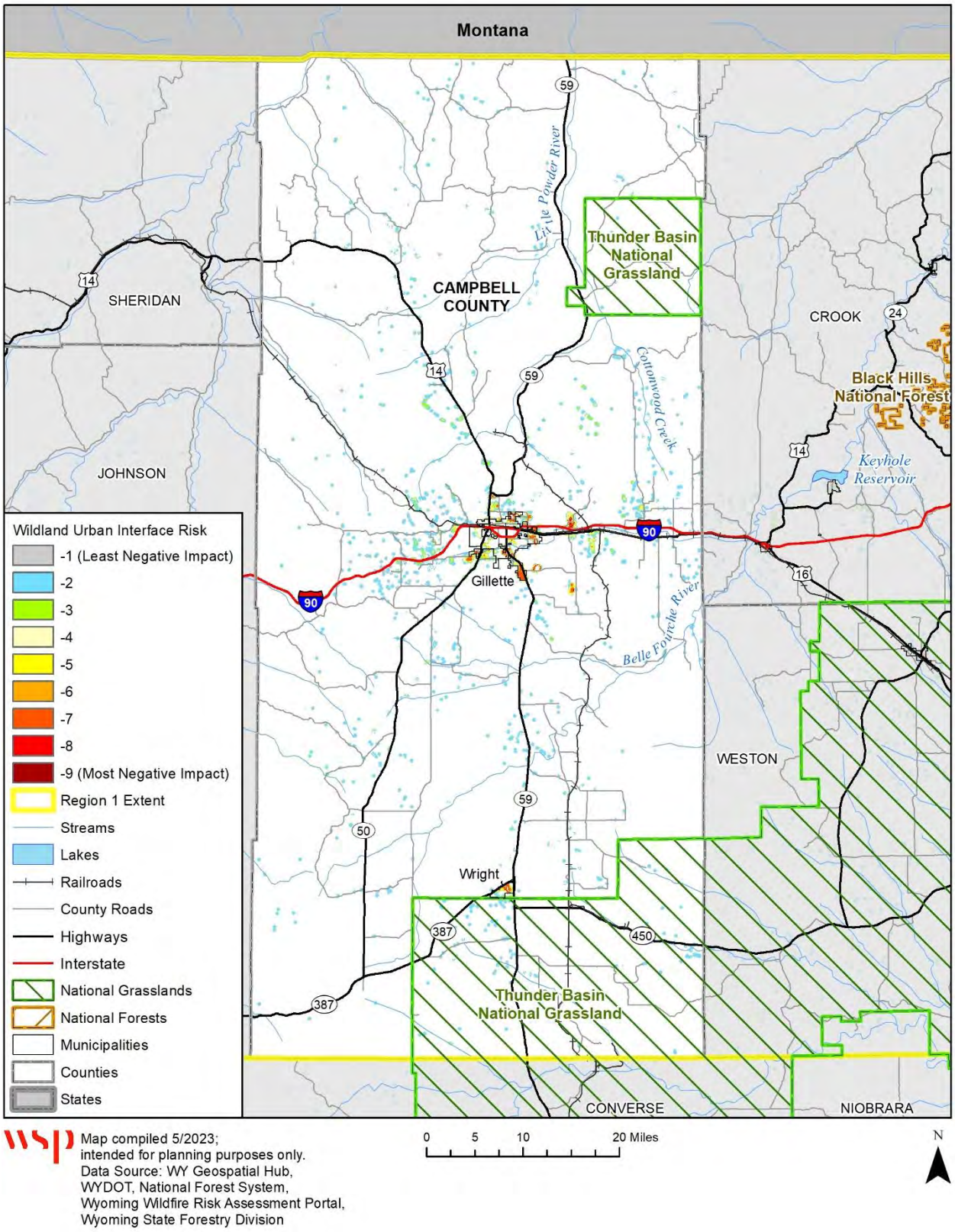


Figure 12 Campbell County WUI Risk



Map compiled 5/2023;
intended for planning purposes only.
Data Source: WY Geospatial Hub,
WYDOT, National Forest System,
Wyoming Wildfire Risk Assessment Portal,
Wyoming State Forestry Division

Figure 13 Wildfire Occurrences in Campbell County from 1980-2023

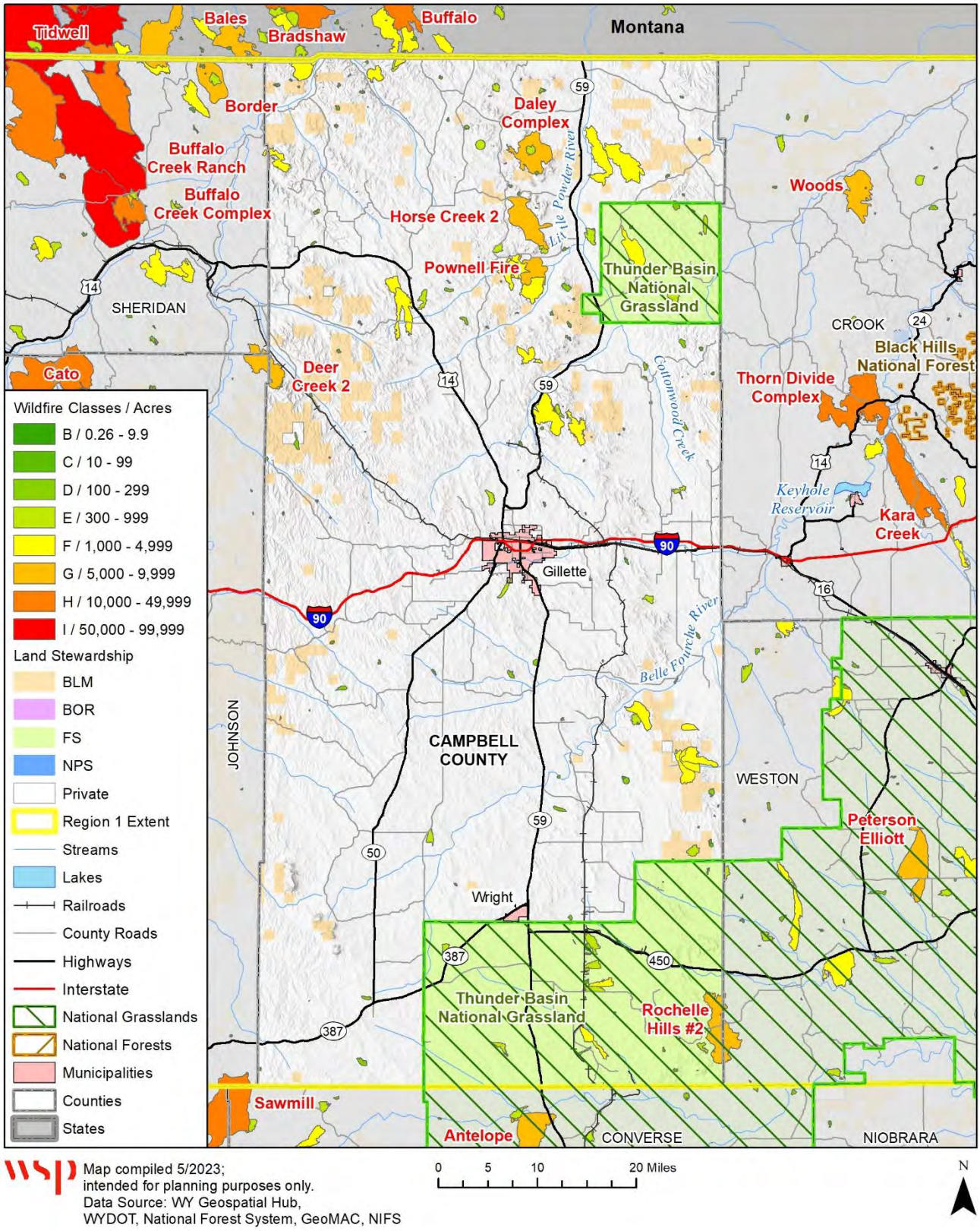
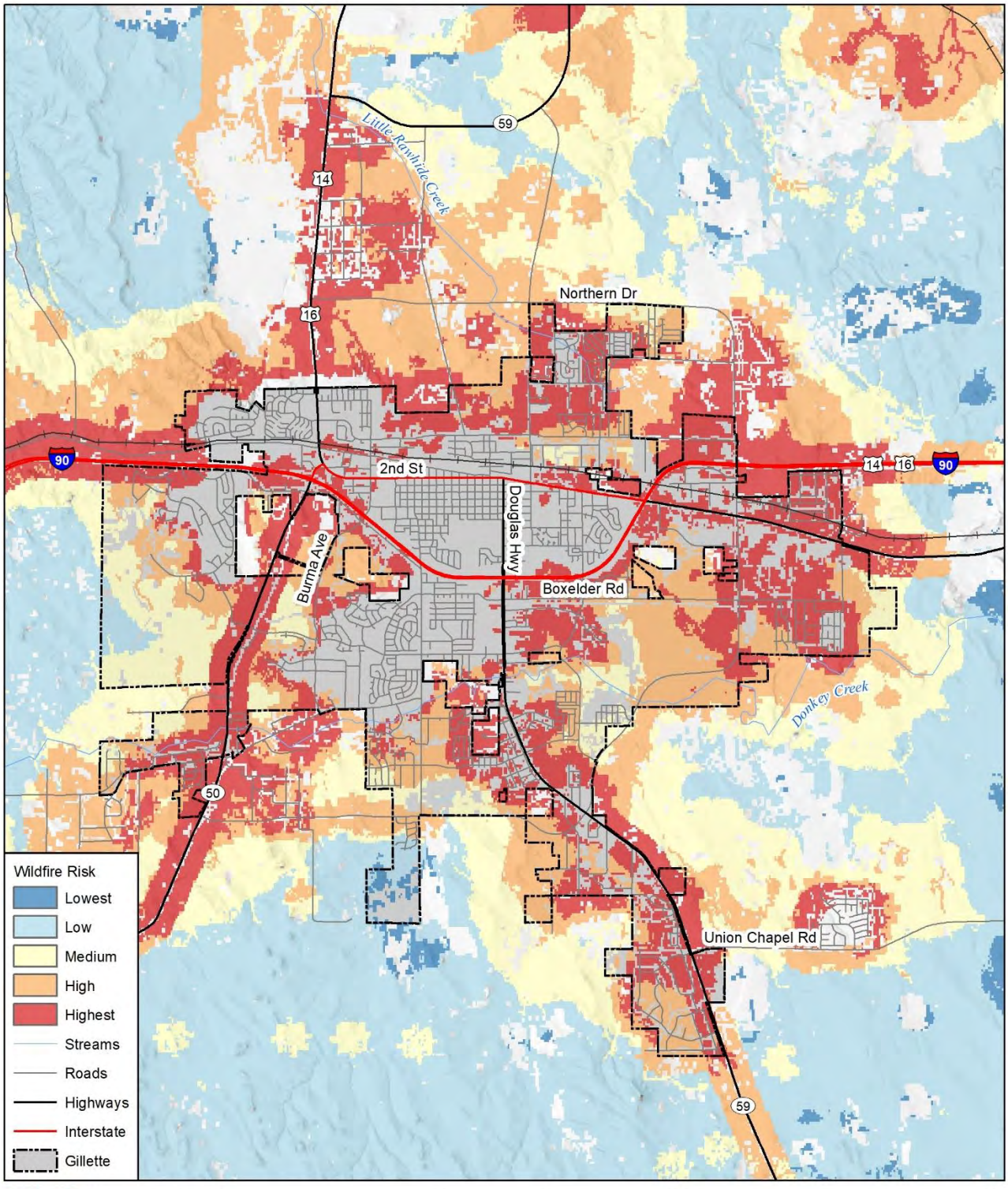
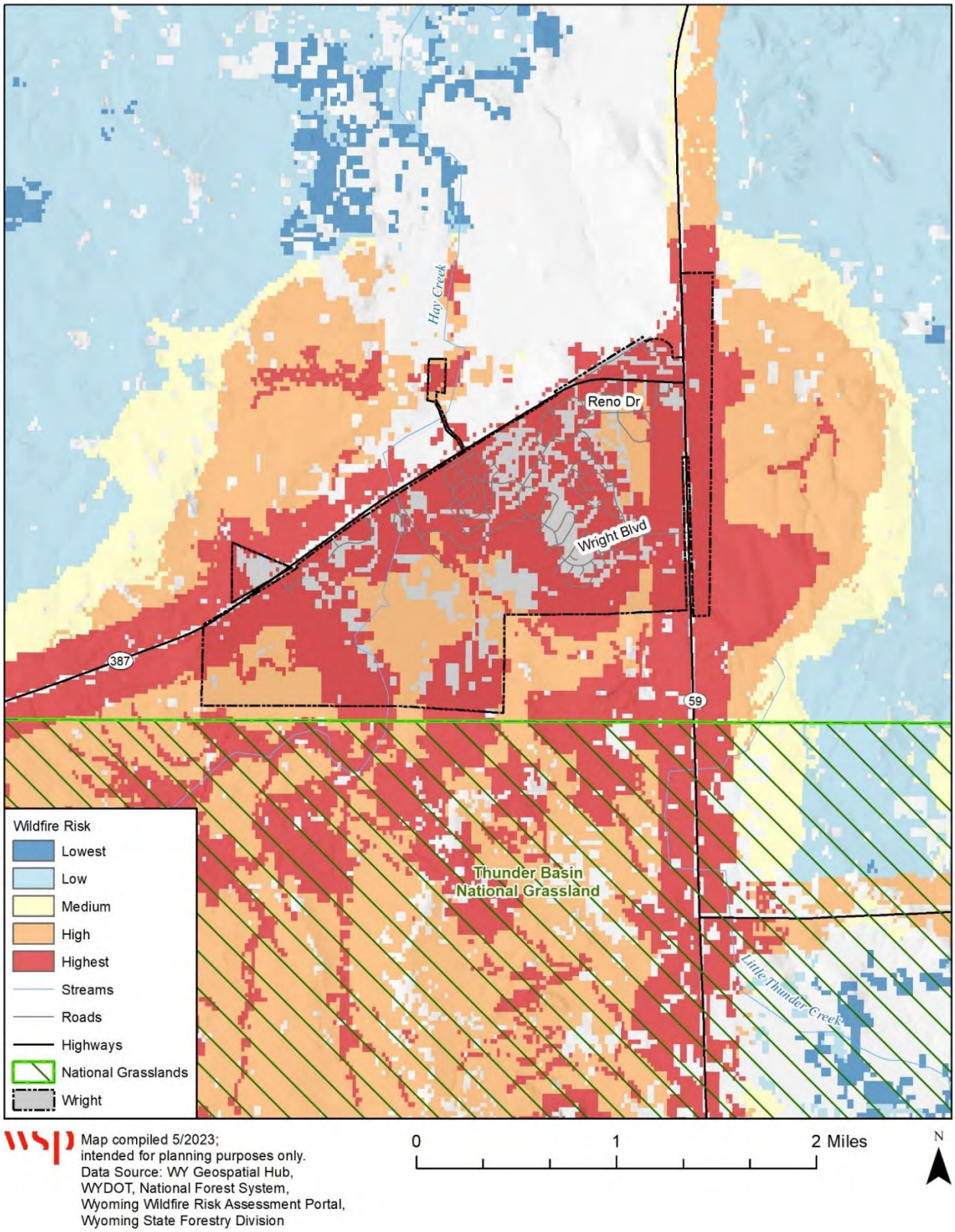


Figure 14 City of Gillette Wildfire Risk



Map compiled 5/2023;
intended for planning purposes only.
Data Source: WY Geospatial Hub,
WYDOT, National Forest System,
Wyoming Wildfire Risk Assessment Portal,
Wyoming State Forestry Division

Figure 15 Town of Wright Wildfire Risk



6.3.14.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. The County and jurisdictions have less traditional wildland/urban interface (WUI) than other areas of the Region.

6.3.15 Coal Seam Fire

Campbell County has experienced numerous incidents involving coal seam fires. These slow-burning underground fires can be caused by numerous ignition sources, including the pyrophoric properties of coal (spontaneous ignition after prolonged exposure to oxygen), wildfires, and lightning; they are particularly prevalent during periods of drought.

Numerous efforts have been made to extinguish these fires, including efforts in 2003 to extinguish 56 coal seam fires in northern parts of Campbell County, most of which were caused by a large wildland fire which occurred in that area in 2002. Some were doused by snowstorms the following winter, and others were dug out and buried using heavy equipment. Many of the fires are on mixtures of private and federally owned land, and many involve mineral rights owned by the Bureau of Land Management, complicating the efforts to extinguish them.

During the Great Depression, the Civilian Conservation Corps came to Campbell County, digging up dozens of coal seams and putting out fires. In the decades since, ranchers and firefighters have fought timber and grass fires sparked by coal seams and have discovered new seams as they start burning. In 2010, the *Gillette News-Record Newspaper* listed the results of research they had done into records of old coal seam fires in the County, summarized in the following Table .

Table 6-22 *Gillette News-Record Newspaper* Record of Coal Seam Fires in the County

Name	Record
Snearley Fire	Mine fire near what now is the Campbell County Landfill. It was put out by the CCC in 1934. It involved closing more than 15 mine shaft openings.
Perry Fire	Thought possibly to be the same fire as the Snearley fire just north of what is now the Sage Valley subdivision. It was put out by the CCC in 1935.
Shippey Fire	Exposed coal seam fire in what is now the area of Highway 50 and Force Road. It was put out by the CCC in 1934 by moving some 4,000 cubic yards of dirt entirely by wheelbarrow.
Laur Fire	Now the center of the Southern Drive Industrial Park. It was a mine fire burning since 1939 or earlier.
Moyer Gulch Fire	Just north of Rawhide mine, it was a coal outcrop fire burning since the 1870s or earlier, supposedly started by a horse thief. It was put out in 1935 by the CCC and again in 1950 by the U.S. Bureau of Mines.
Canfield Fire	Still smoldering just south of North Antelope-Rochelle mine. It's a fire burning since 1925 or earlier.
Little Thunder Basin Fire	Just east of what is now Black Thunder mine. The mine fire was put out by the CCC in 1939 and again in 1951, saving an estimated 20 million tons of coal.
Felix Fire	Just north of Gillette on Echeta Road. The mine fire started burning in 1911. It was first put out in 1934 by the CCC, then again in the 1950s by the BLM with Abandoned Mine Lands money and most recently in the 1990s

Source: http://www.gillettenewsrecord.com/news/article_e77b9903-a864-571e-8a5a-156c98c4bcf2.html

6.3.15.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Campbell County and the participating jurisdictions ranked this hazard as medium significance due to the close proximity of coal seams and historic burn areas. The primary concern is the potential to spark wildfires/grass fires. The combustion of coal produces toxic gases which can contribute to poor air quality and pose health risks to nearby communities. The smoke and particulate matter emitted by the fires can also cause respiratory issues and exacerbate existing respiratory conditions. Those with respiratory issues could be more vulnerable. The runoff from coal seam fires can contaminate nearby water sources with pollutants and harmful substances. The leaching of chemicals from the burning coal and the ash can enter streams, rivers, and groundwater, potentially affecting aquatic life and human water supplies. No issues with cultural resources have been identified.

6.3.15.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

7 Mitigation Capabilities Assessment

As part of the regional plan development, the Region and participating jurisdictions developed a mitigation capability assessment. Capabilities are those plans, policies and procedures that are currently in place and contribute to reducing hazard losses. Capabilities also include staffing and financial considerations, including the ability to leverage funding for mitigation projects. Combining the risk assessment with the mitigation capability assessment results in "net vulnerability" to disasters and more accurately focuses the goals, objectives, and proposed actions of this plan. The purpose of this effort was to identify policies and programs that were either in place or could be undertaken, if appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, projects, and programs to determine if they contribute to reducing hazard related losses.

7.1 Capability Summary

Table provides an assessment of Campbell County's mitigation capabilities, based on input collected from the HMPC via data collection guides and information contained on county and municipal websites.

Table 7-1 Campbell County Capability Assessment

Element	County	Gillette	Wright	CCCD
Planning Capabilities				
Comprehensive Plan	Yes - 2013	Yes – 2014	Yes - 2013	2021-2025 Long Range Plan
Capital Improvement Plan	Yes - Annually	No	No	Yes
Emergency Operations Plan	Yes	No	No	No
Recovery Plan	No	No	No	No
Mitigation Plan	Yes - 2016	Yes – 2016	Yes-2016	No
Debris Management Plan	No	No	No	No
Economic Development Plan	No	No	No	No
Transportation Plan	Yes- May 2006	Yes	No	No
Land-use Plan	Yes - 2013	Zoning Map	No	No
Flood Mitigation	No	No	No	No

Element	County	Gillette	Wright	CCCD
Assistance (FMA) Plan				
Watershed Plan	Little Powder River, 2006; Donkey Creek, 2016	Yes	No	Little Powder River, 2006; Donkey Creek, 2016
Community Wildfire Protection Plan or other fire mitigation plan	Yes – May 2007	Yes – May 2007	Yes – May 2007	No
Critical Facilities Plan (Mitigation/ Response/ Recovery)	Forestry Strategy, 2017	No	No	No
Floodplain Management Plan	No	No	No	No
Stormwater Program/ Plan/Ordinance	No	No	No	No
Erosion / Sediment Control Program	No	No	No	Yes
Policies and Ordinances				
Zoning Ordinance	Yes – 2011	Yes – 1978	Yes	N/A
Building Code	Yes – 2018 IBC	Yes 2018 IBC	Yes 2018 IBC	N/A
Floodplain Ordinance	Yes – 2008	Yes	Yes	N/A
Subdivision Ordinance	Yes – 2016	Yes – 2011	Yes	N/A
Tree Trimming Ordinance	No	No	Yes	N/A
Nuisance Ordinance	Yes – 2011	Yes	Yes	N/A
Storm Water Ordinance	No	Yes	Yes	N/A
Drainage Ordinance	No	Yes	Yes	N/A
Site Plan Review Requirements	Yes	Yes	No	N/A
Historic Preservation Ordinance	No	No	No	N/A
Landscape Ordinance	No	Yes	No	N/A
Growth Management Ordinance	No	No	No	N/A
Elevation Certificates for Floodplain Development	No	No	No	N/A
Other Hazard Ordinance (Steep slope, wildfire, snow loads, etc.)	No	No	No	N/A
Programs				
Zoning/Land-use Restrictions	Yes	Yes	Yes	N/A
Codes Building Site/Design	Yes	Yes	Yes	N/A
Hazard Awareness Program	No	No	No	N/A
National Flood Insurance Program	Yes - 5/15/1984 1/2008	Yes - 5/15/1978	Yes - 1/2/2008	N/A
Community Rating System (CRS)	No	No	No	N/A
National Weather Service (NWS) Storm Ready Certification	No	No	No	N/A
Firewise Community Certification	No	No	No	No

Element	County	Gillette	Wright	CCCD
Building Code Effectiveness Grading (BCEGs)	No	No	No	N/A
ISO Fire Rating	No	Yes ISO 4	No	N/A
Economic Development Program	No	No	No	N/A
Land-use Program	No	No	No	Yes
Public Education/Awareness	No	No	No	Yes
Property Acquisition	No	No	No	N/A
Planning/Zoning Boards	No	Yes	No	N/A
Stream Maintenance Program	No		No	Yes
Tree Trimming Program	No	Yes	No	Yes
Engineering Studies for Streams (Local/ County/Regional)	No	Yes (City)	No	N/A
Mutual Aid Agreements	No	No	No	No
Studies, Reports, and Maps				
Hazard Analysis/Risk Assessment	No	No	No	N/A
Evacuation Route Map	No	No	No	N/A
Critical Facilities Inventory	No	Yes	No	N/A
Vulnerable Population Inventory	No	No	No	N/A
Land-use Map	Zoning Map 2015	Zoning Map	Zoning Map-2018	N/A

Source: Data provided by jurisdictions

7.1.1 Land Use and Development Policies

Campbell County does have zoning and building codes. Of note, Campbell County does not have a planning department. Building permits for residential construction are optional in the County. Septic permits are issued, but the County's records lump septic permits for new construction with permits for septic system replacements. Wright and Gillette have building codes, zoning, and comprehensive plans.

7.1.2 Campbell County Conservation District

The Campbell County Conservation District's is made up of a five-member volunteer Board of Supervisors; 3 supervisors reside in rural areas, 1 must reside in a municipality, and the 5th is at-large. Each board member serves a staggered four-year term. The only additional staffing capabilities include a full time District Manager and an Education Coordinator. The District receives funding from the City of Gillette, Campbell County, grant funding, and support from private sponsors.

The mission of the Campbell County Conservation District (CCCD) is to:

- provide leadership for the conservation of Campbell County's soil and water,
- protect the agriculture resource base,
- promote the control of soil erosion,
- promotes and protects the quality and quantity of Campbell County's water and all other natural resources,
- preserve and enhance wildlife habitat,
- protect the tax base, and

- promote the health, safety, and general welfare of the citizens of the county through a responsible conservation ethic.

CCCD has significant mitigation capabilities and programs. They conduct dozens of conservation and education programs, such as:

- Hosting Ag and Natural Resources Expo
- Tree selling/giveaways
- Natural Resources Youth Camps
- Tree thinning projects
- Watershed studies
- Restoration studies
- Subdivision reviews
- Water monitoring
- Conservation workshops and field tours
- Monthly meetings of the Campbell County Forestry Working Group
- Monthly meetings of the Little Powder River Watershed Steering Committee
- Monthly meetings of the Donkey Creek Watershed Steering Committee
- Numerous public outreach events

They also help facilitate the Natural Resources Conservation Service's (NRCS) Emergency Watershed Protection; a federal emergency recovery program that helps local communities recover after a natural disaster strikes. The program offers technical and financial assistance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms and other natural disasters that impair a watershed.

7.1.3 NFIP Participation and Continued Compliance

Campbell County has been a participant in the NFIP since 1984; the City of Gillette and the Town of Wright both participate in the NFIP as well, since 1978 and 2008, respectively.

Table 7-2 NFIP Status in Campbell County

Jurisdiction	Effective Map Status	Date Joined	Comments
Campbell County	01/02/08	05/15/84	
City of Gillette	01/02/08	05/15/78	
Town of Wright	01/2/08	01/2/08	Participation optional due to No Special Flood Hazard Area (NSFHA)

Source: NFIP Community Status Book

The County and its municipalities will continue to comply with the NFIP to reduce flood losses and increase flood resiliency. Continued compliance with the NFIP includes continuing to adopt floodplain maps when updated and implementing, maintaining and updating floodplain ordinances. Actions related to continued compliance include:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- **Implementation of substantial improvement/substantial damage provisions.** After a flood event, or any event that may cause loss of a structure such as a fire or tornado, it is the role of the floodplain administrator to review and assess damaged structures located within the Special Flood Hazard Area. Substantial improvement/substantial damage occurs

when the cost of restoring a structure exceeds 50 percent of its market value before damage occurred. Property owners are advised that structures experiencing substantial damage or undergoing substantial improvements must go through the floodplain application and permit process. Additionally, these structures must be upgraded during the repair or reconstruction process to meet the minimum building standards stipulated in the regulations. If it is determined substantial improvement/substantial damage has occurred, those structures must be brought up to current floodplain management standards. This ensures compliance with floodplain management measures and contributes to the overall safety and resilience of the affected structures. These provisions are common to the County's, City of Gillette, and Town of Wright floodplain management ordinances. Additional items specific to these jurisdictions include:

- **County –** County Engineer as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/ substantial damage provisions.
- Prohibits substantial improvements in floodways
- **Gillette –** City engineer will verify actual elevation of lowest floor for all new or substantially improved structures
- **Wright –** Town Engineer as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions.

- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

Also, to be considered are the flood mitigation actions contained in this Regional Plan that support the ongoing efforts by participating counties to minimize the risk and vulnerability of the community to the flood hazard, and to enhance their overall floodplain management program.

7.2 Administrative/Technical Resources

Table identifies the administrative and technical resources that the County and jurisdictions have access to.

Table 7-3 Administrative and Technical Resources

Administrative/ Technical Resources	County	Gillette	Wright	CCCD
Staffing				
Building Code Official	Yes	Yes	No	No
Building Inspector	Yes	Yes	Yes (contractor)	No
Mapping Specialist (GIS)	Yes	Yes	No	No
Engineer	Yes	Yes	Yes (contractor)	No
Community/ Development Planner	No	Yes	No	No
Public Works Official	Yes	Yes	No	No
Emergency Management Coordinator	Yes	Yes	Yes	No
NFIP Floodplain Administrator	Yes	Yes	N/A	No
Bomb and/or Arson Squad	Yes	No	No	No
Emergency Response Team	Yes	Yes	No	No
Hazardous Materials Expert	Yes	No	No	No

Administrative/ Technical Resources	County	Gillette	Wright	CCCD
Local Emergency Planning Committee	Yes	No	No	No
Emergency Manager	Yes	No	No	No
Sanitation Department	No	Yes	No	No
Transportation Department	No	No	No	No
Economic Development Department	Yes	Yes	Yes	No
Housing Department	No	No	No	No
Historic Preservation	No	No	No	No
Planning Board / Commission	No	No	No	No
Warning Systems / Services (Flood)	No	No	No	No
Warning Systems / Services (Other/multi hazard)	No	No	No	No
Grant Writing/ Management	No	No	No	No
Other?	No	No	No	No
Non-Governmental Organizations (NGOs)				
American Red Cross	Yes	Yes	Yes	No
Salvation Army	Yes	Yes	Yes	No
Veterans Groups	Yes	Yes	Yes	No
Local Environmental Organization	No	No	No	No
Homeowner Associations	Yes	Yes	Yes	No
Neighborhood Associations	No	No	No	No
Chamber of Commerce	Yes	Yes	Yes	No
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	Yes	No

Source: Data provided by jurisdictions

7.3 Financial capabilities

Table 7-4 identifies the County and Town financial tools or resources that the jurisdictions have access to or are eligible to use and could potentially be used to help fund mitigation activities.

Table 7-4 Financial Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)			Has This Been Used for Mitigation in the Past?
	County	Gillette	Wright	
Apply for Community Development Block Grants	Yes	Yes	No	No
Fund projects through Capital Improvements funding	Yes	Yes	No	No
Authority to levy taxes for specific purposes	Yes	Yes	Yes	No
Fees for water, sewer, gas, or electric services	No	No	No	No
Impact fees for new development	No	No	No	No
Incur debt through general obligation bonds	Yes	Yes	Yes	No
Incur debt through special tax bonds	Yes	Yes	Yes	No
Incur debt through private activities	No	No	No	No
Withhold spending in hazard prone areas	No	No	No	No

Financial Resources	Accessible/Eligible to Use (Yes/No)			Has This Been Used for Mitigation in the Past?
	County	Gillette	Wright	
FEMA Hazard Mitigation Assistance grants	No	No	No	No

Source: Data provided by jurisdictions

7.4 Education and Outreach Capabilities

Table 7-5 shows the mitigation education and outreach capabilities the County and jurisdictions have in place now. It was noted by the HMPC that there is a need for the improvement of outreach and education.

Table 7-5 Education and Outreach Capabilities

Education & Outreach	Yes/No (And Briefly Describe)		
	Campbell County	Gillette	Wright
Public Education /Outreach Program	No	No	No
Citizen Groups That Communicate Hazard Risks	No	No	No
Firewise	No	No	No
StormReady	Yes	No	No
Other?	No	No	No

Source: Data provided by jurisdictions

7.5 Opportunities for Enhancement

Based on the capabilities assessment, Campbell County and the municipalities have several existing mechanisms in place that already help to mitigate hazards. There are also opportunities for the jurisdictions to expand or improve on their policies, programs and fiscal capabilities and further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and Conservation District. Additional training opportunities will help to inform County and municipal staff members on how best to integrate hazard information and mitigation projects into their departments. Continuing to train staff on mitigation and the hazards that pose a risk to the County will lead to more informed staff members who can better communicate this information to the public.

Campbell County:

- Promote opting-in to Everbridge Notification System and utilize to keep citizens informed of developing hazards such as wildfires or transportation disruptions due to severe weather.
- Conduct an inventory of roads used for emergency evacuations and services to assist with future upgrades and resiliency improvements. Develop a monitoring program to assess the impact of hazard events on these roads.
- Update the County Community Wildfire Protection Plan in coordination with incorporated jurisdictions to align with evolving environmental conditions.

City of Gillette:

- Consider implementing a community outreach program to educate residents about winter storm safety, weather-resistant building materials, wildfire risk mitigation strategies, and other emergency or disaster information.

Town of Wright:

- Explore updating building code regulations that would increase the resiliency of structures to damage from high wind, hail, and heavy snow loads.

Conservation District.

- Training for staff members related to hazards or hazard mitigation grant funding

8 Mitigation Strategy

This section describes the mitigation strategy and mitigation action plan for Campbell County. See Chapter 5 of the base plan for more details on the collaborative process used to develop and update the mitigation strategy.

8.1 Mitigation Goals

As part of the 2023 planning process, the HMPC reviewed the six goals and a number of objectives which were developed in prior iterations of the regional plan. The goals and objectives provide a guide to help protect people and property in Campbell County from natural and human-caused disasters. During the 2023 planning process the HMPC retained these goals for the 2023 plan. The goals and objectives are as follows:

Goal 1: Reduce the impact of severe weather on people, property or natural resources.

- Objective 1.1: Improve severe weather detection and tracking capabilities.
- Objective 1.2: Improve warning and communication capabilities.
- Objective 1.3: Provide public education on personal preparation and appropriate response to severe weather events.
- Objective 1.4: Promote appropriate shelter during severe weather.
- Objective 1.5: Increase the local capacity to deal with psychological effects of emergency and disaster events.
- Objective 1.6: Reduce Flood Damage.

Goal 2: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

- Objective 2.1: Determine the need for volunteers and training.
- Objective 2.2: Provide training and public educational opportunities.

Goal 3: Maintain the reliability and resilience of critical infrastructure.

- Objective 3.1: Work to harden critical public infrastructure.
- Objective 3.2: Provide for continuity of both governmental and private sector functions.
- Objective 3.3: Provide for continuity of public sector GIS data/information functions.

Goal 4: Reduce the impact of human-caused incidents, emergencies or disasters.

- Objective 4.1: Prepare the public to minimize the impact of hazardous material incidents.
- Objective 4.2: Reduce the impact of terrorism within the jurisdictions.

- Objective 4.3: Reduce the impact of incidents, emergencies and disasters on our Special Needs populations.

Goal 5: Reduce loss of life and property from fire.

- Objective 5.1: Reduce the potential for fire in future developments.

Goal 6: Increase resilience through coordination of governmental policies, procedures, codes and regulations.

- Objective 6.1: Review current planning documents and their ability to protect the public from natural and human-caused incidents, emergencies and disasters.
- Objective 6.2: Educate the public and contractors about the relationship between construction techniques and potential for disasters.

8.2 Mitigation Actions

This section provides updates on the actions identified in the 2018 Wyoming Region 1 Hazard Mitigation Plan, along with new actions identified during the 2023 Regional Plan update.

8.2.1 Progress on 2018 Actions

During the 2023 planning process the Campbell County Planning Team reviewed all the mitigation actions from the 2018 plan. Of their 64 mitigation actions from 2018, 60 of the county actions are continuing or are implemented annually, demonstrating ongoing progress towards building the community's resiliency to disasters. These continuing actions are detailed in Section 8.2.2.

Four (4) actions have been completed since 2018, which are detailed in Table below.

Table 8-1 Completed Mitigation Actions

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
1.2.2	Update the local warning plan	Severe Weather	Campbell County	Medium	Completed. Will look at updating again in near future
1.4.2	make information (technical specifications) available to people interested in creation of a "safe room" for private and public structures.	Severe Weather	Gillette, Wright, County	High	Completed.

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
4.3.1	Identify and plan for all Special Needs populations, including Unable to Self-Evacuate (UTSE), those in day care facilities, youth and adult care facilities, group homes, assisted living, nursing and retirement centers, as well as individuals within the community which are not included in any of those grouping but qualify as Special Needs in times of emergency or disasters	Building Resilience	Gillette, Wright, County	High	Completed.
3.1.4	City Water Supply Vulnerability Assessment and Enhancement - Identify vulnerability of city water infrastructure, solutions and alternative water sources	Drought, Flooding, Hazardous Materials	City of Gillette	High	Completed.

8.2.2 Identification and Implementation of Mitigation Measures

During the 2023 Regional Plan development, existing mitigation projects for Campbell County were assessed to determine whether the action was completed, deleted, or ongoing/continued. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources. The action plans were also shared amongst the regional plan participants to showcase progress and stimulate ideas amongst the respective planning committees in each county. The HMPC's evaluation of action items and goals also lead to the development of new strategies.

Table details all continuing and new mitigation actions for the 2023 regional plan. Campbell County has developed five (5) new mitigation actions in 2023 to accompany the 60 continuing mitigation actions from 2018, for a total of 65 mitigation actions.

Background information as well as information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and timeline also are described. Per the DMA requirement, actions have been identified that address reducing losses to existing development as well as future development.

The Cost Estimate column describes the estimated project costs using the following categories:

- Little to no cost
- Low: Less than $10,000
- Moderate: $10,000-$100,000
- High: $100,000-$1,000,000
- Very High: More than $1,000,000

The Timeline column describes the estimated time of completion for each project using the following categories:

- Short Term: 1-2 years
- Medium Term: 3-5 years
- Long Term: 5+ years
- Ongoing: action is implemented every year

The Status/Implementation Notes column describes the progress made on the actions so far using the following categories:

- Not Started: project is carried over from the previous Campbell County Plan; little to no work has been completed.
- In Progress: project is carried over from the previous Campbell County Plan; work has begun on the project and is proceeding.
- Annual Implementation: project is carried over from the previous Campbell County Plan and is implemented every year on an ongoing basis.
- New in 2023: The action is new to this plan update; little to no work has been completed.

Table 8-2 Campbell County Mitigation Action Plan

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-1	Enhance local weather spotter capabilities. NWS conducts Wx Class in Gillette each May, CCEMA provides other trainings. April/May 2018 NWS did training for 1500 employees of Black Thunder Mine.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	**CCEMA,** City Administration, Town Administration Conservation District Administration	Ongoing	Little to no cost; Staff Time, NWS partnership	Low	In Progress. Ongoing
Ca-2	Develop additional real-time atmospheric sensors to provide weather data sources.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	Campbell County	**CCEMA**	Ongoing	Moderate; County General Funds, NOAA-NWS Partnership	Medium	In Progress. Maintaining equipment, updating equipment, and possible new locations
Ca-3	Obtain additional weather cameras - develop observational real-time video capabilities for severe weather	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County	**CCEMA**	Short Term	Moderate ; County General Funds, NOAA-NWS Partnership	Medium	In Progress.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-4	Continue to seek improvements in technology for weather coverage and forecasting	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County	**CCEMA**	Ongoing	Moderate County General Funds, NOAA-NWS Partnership	Low	In Progress. Continue to seek improvements in technology for weather coverage and forecasting
Ca-5	Identify and utilize appropriate new technology (i.e.: social media) which can enhance local warning capabilities.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**County;** CCEMA, County IT, County Public Information Officer, School Districts, Hospitals	Short Term	Low; EMPG ARPA Grant, County General Funds, School District Partnerships, NOAA-NWS Partnership	Low	In Progress. Installing new software that will allow CCEMA to set of sirens from mobile devices. CCEMA will always continue to look for improving technology to increase our warning capabilities. Since 2018, CCEMA/Co PIO actively working on Social Media information distribution capabilities. Co PIO developing Strategic Communications Plan. Code Red CCSDF# Lightning Strike. County developed App for public to report if they heard nearby sirens when sounded.
Ca-6	Coordinate with local broadcast media on distribution of warnings.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**CCEMA**	Ongoing	Little to no cost; County General Funds, Local Broadcast Media, NOAA-NWS Partnership	Medium	In Progress. Ongoing

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-7	Develop a coordinated public facilities severe weather closure plan	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**CCEMA**, County Road and Bridge	Medium Term	Moderate ; County General Funds, Staff Time	Medium	In Progress. Built, used, ongoing adjustments
Ca-8	Provide on-going public education on how to recognize, prepare for, and actions to take during severe weather events. Seek opportunities to provide outreach in multiple languages and leverage agencies that work with underserved communities, such as area religious groups and Council of Community Services.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County	**CCEMA**, NWS	Ongoing	Low; CCEMA Operating Budget, NWS Partnership, Volunteer/Staff Time, partnerships with area agencies	High	Annual Implementation. Ongoing annually. Weather class EM speaks to groups Red Cross training
Ca-9	Develop on-going education on where to obtain information about the weather.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, Town of Wright	**CCEMA**, Wright Administration, NWS	Ongoing	Low; CCEMA Operating Budget, NWS Partnership, Volunteer/Staff Time, partnerships with area agencies	Medium	Annual Implementation. CCEMA Brochure updated annually, distributed. Handed out at public meetings, post-office (Wright)

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-10	Distribute appropriate printed educational materials on severe weather, with printed materials provided in multiple languages.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**CCEMA**, City administration, Town administration, NWS	Ongoing	Low; CCEMA Operating Budget, NWS Partnership, Volunteer/Staff Time, partnerships with area agencies	Medium	Annual Implementation. Ongoing
Ca-11	Develop and utilize a traveling educational display	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**CCEMA,** City administration, Town administration, NWS	Medium Term	Low; CCEMA Operating Budget, Staff Time	Low	In Progress. No progress
Ca-12	Promote public education on sheltering. Included in weather talks, GIS, Red Cross	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County	**CCEMA**, Red Cross	Medium Term	Low; CCEMA Operating Budget, Staff Time, Red Cross	High	In Progress.
Ca-13	Develop a hazard education program for day care and adult care providers in development of "safe zones" and appropriate shelter options for vulnerable populations.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**CCEMA,**	Medium Term	Low; CCEMA Operating Budget, Staff Time	Medium	Not Started. No progress, previously coordinated with other ongoing plans.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-14	Encourage development of new codes and zoning to require "safe zones" for new construction of congregate facilities such as day care facilities, adult care facilities, apartments, group homes, assisted living, and retirement centers, etc.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**City of Gillette and Town of Wright Building Depts.**	Long Term	Low; Gillette and Wright Planning/Building Departments, staff time	Low	Not Started.
Ca-15	Provide public education and training on the effects of stress and the psychological impact caused by emergency and disaster events. CCEMA sponsors Campbell Co Critical Incident Stress Management (CISM) Team which provides at least one ICISF Sanctioned class per year	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County	**CCEMA**, Public Health, Red Cross	Ongoing	Moderate ; CCEMA, CISM Team, Red Cross, Staff Time	Medium	Annual Implementation. no change

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-16	Provide for appropriate critical incident stress management capacity	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County	**CCEMA**, Public Health	Ongoing	Moderate; CCEMA, CISM Team, Red Cross, Staff Time	Medium	Annual Implementation. no change ongoing
Ca-17	Continue to participate in the National Flood Insurance Program (NFIP)	Flooding	Campbell County, City of Gillette, Town of Wright	Commissioners, Mayors, **County, City and Town Floodplain Administrators**	Ongoing	Low; County General Fund; Municipal General Funds; NFIP, Risk MAP	High	Annual Implementation. All three entities are in the NFIP program. Continuing – new development
Ca-18	Conduct public education on the need for flood insurance.	Flooding	Campbell County, City of Gillette, Town of Wright	CCEMA, **County, City and Town Floodplain Administrators**	Ongoing	Low; County General Fund; Municipal General Funds; NFIP, Risk MAP	High	Annual Implementation. No change
Ca-19	Identify and create projects which contribute to eliminating or reducing flood damage or loss	Flooding	Campbell County, City of Gillette, Town of Wright	**CCEMA, County, City** and Town Floodplain Administrators, NWS	Medium Term	Moderate; County General Fund; Municipal General Funds; FMA Grants, CAP Grants	Medium	In Progress. No change
Ca-20	Identify and map any potentially hazardous dams within the County	Flooding	Campbell County	**CCEMA**	Medium Term	Moderate ; HHPD	Medium	In Progress. No change

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	and ensure appropriate notification systems are in place and functioning							
Ca-21	Prevent/mitigate flash flooding in Lower Foothills Subdivision through drainage improvements	Flooding	City of Gillette	**Gillette Public Works**, Floodplain Administrator	Long Term	Moderate ; Gillette Public Works Budget, FEMA CAP Grants (NFIP)	Medium	Annual Implementation.
Ca-22	Address flooding by Donkey Creek through implementation of the Watershed Plan	Flooding	City of Gillette	**Gillette Public Works**, Floodplain Administrator Donkey Creek Watershed Steering Committee	Long Term	Moderate; Local budget/general funds, FEMA CAP Grants (NFIP)	Medium	In Progress. No change
Ca-23	Conduct a needs assessment to identify where volunteers are needed, in support of Goal 2, to increase the resilience of citizens through education and volunteering	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	**CCEMA**, VOAD, City administration, Town administration, CCD administration	Short Term	Low; CCEMA, Volunteer/Staff Time	High	In Progress. CCEMA will work with the VOAD to determine where targeted outreach is needed on hazards. CCEMA is revitalizing CERT; Team Rubicon should be explored as an option to assist with drainage clearing and defensible space.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-24	In support of action Ca-23, identify training opportunities to involve volunteers and VOAD organizations in hazard mitigation activities.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	**CCEMA**, VOAD, CERT, City administration, Town administration, CCD administration	Short Term	Low; CCEMA, Volunteer/Staff Time	Medium	In Progress. CCEMA is revitalizing CERT. Training may include weather spotter by NOAA to address the atmospheric hazards. This may include training volunteer sawyers to assist vulnerable populations with creating defensible space of their property. (such as those with Team Rubicon). Training from NFIP to let property owners know how they can protect their buildings from flood hazards.
Ca-25	Strengthen existing Citizen Corps and Volunteer Organizations Active in Disaster programs to include outreach on hazards to underserved and access and functional needs populations	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	**CCEMA**, VOAD, CERT, City administration, Town administration, CCD administration	Short Term	Low; CCEMA, Volunteer/Staff Time	High	In Progress. CCEMA is revitalizing CERT. CCEMA will discuss at a CERT and VOAD utilize relationships and networks associated with the VOADs to best connect with underserved and access and functional needs populations. This may include outreach to specific populations in areas that may be prone to hazards such as flooding, if applicable.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-26	Work cooperatively to best utilize the available pool of volunteers by developing a training and educational program	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	**CCEMA**, VOAD, CERT, City administration, Town administration, CCD administration	Short Term	Low; CCEMA, Volunteer/Staff Time	Medium	In Progress. CCEMA is revitalizing CERT and will be using CERT-related training materials and weather spotter training from NWS.
Ca-27	Actively market and recruit volunteers for the training.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	**CCEMA**, VOAD, CERT	Ongoing	Low; CCEMA, Volunteer/Staff Time	Medium	In Progress. CCEMA is revitalizing CERT

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-28	Identify priorities for critical public infrastructure (tie into Continuity of Operations Plan.) Identification/ Mapping is in progress	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	**CCEMA**, GIS	Medium Term	Low; CCEMA, GIS Department Budgets and Staff Time	Low	In Progress.
Ca-29	Provide for emergency power in Wright for the Clinic, Town Hall, and Water Plant.	Earthquake, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Town of Wright	**Town of Wright Administration**	Medium Term	High; EMPG ARPA Grant	High	In Progress. Generator installation at Town Hall in progress
Ca-30	Provide for emergency power in Gillette for critical public facilities	Earthquake, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire,	City of Gillette	**Gillette Public Works**	Medium Term	High; EMPG ARPA Grant	Medium	In Progress.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
		Coal Seam Fire						
Ca-31	Assess the impacts of short and long-term loss of power on the ability of government to continue to function.	Earthquake, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County	**CCEMA**, LEPC	Medium Term	Low; CCEMA, Staff Time	High	In Progress.
Ca-32	Develop COOP/COG Plans for Gillette, Wright, and the County.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	Gillette, Wright, **CCEMA**	Medium Term	Low; CCEMA, Gillette & Wright Planning Department operating budgets, Staff Time	Low	Not Started.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-33	Governmental agencies should identify alternate locations appropriate to their needs.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	Gillette, Wright, **CCEMA**	Medium Term	Low; CCEMA, Staff Time	Low	In Progress.
Ca-34	Encourage planning or continuity of operations by the private sector.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	**CCEMA**	Ongoing	Low; CCEMA, Staff Time	Low	Not Started.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-35	Create a system for public sector GIS data which will allow contributions from a variety of sources with a high level of GIS data and completeness	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	CCEMA, Town of Wright, City of Gillette, **Co GIS/ Public Works**	Medium Term	Moderate; County General Fund; Municipal General Funds; Staff Time	Medium	In Progress.
Ca-36	Build a security layer for public sector GIS data which will allow access at a variety of levels while protecting the integrity of the information	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	CCEMA, Town of Wright, City of Gillette, **Co GIS/ Public Works**	Medium Term	Moderate; County General Fund; Municipal General Funds; Staff Time	Medium	Not Started.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-37	Develop a system to share approved public-sector GIS data at all levels of emergency response	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County	CCEMA, Town of Wright, City of Gillette, **Co GIS/ Public Works**	Medium Term	High; County General Fund; Municipal General Funds; Staff Time	Medium	Not Started.
Ca-38	Identify the proximity of hazardous materials to special needs (day care, assisted living, schools, resident care, etc.) and critical facilities and examine the need for any additional methods for minimizing the impact upon the occupants of these facilities.	Hazmat	Campbell County, City of Gillette, Town of Wright	**CCEMA**, Town, City, and County IT, LEPC	Short Term	Low; County General Fund; Municipal General Funds; Staff Time	Low	In Progress.
Ca-39	Map locations of existing reported Hazardous Materials to	Hazmat	County	**CCEMA**, Town, City, and County IT, LEPC	Short Term	Moderate; County General Fund; Municipal	Medium	Annual Implementation.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	enhance emergency response. Make this information available to responders.					General Funds; Staff Time		
Ca-40	Develop evacuation plans for Gillette, Wright, and rural subdivisions in the event of a hazardous materials spill	Hazmat	Campbell County, City of Gillette, Town of Wright	**CCEMA**, LEPC, Co GIS, Town of Wright Administration, City of Gillette Administration	Short Term	Moderate; Emergency Mgmt. Performance Grant (EMPG), Campbell County EM Operating Budget, Staff Time	Medium	Not Started.
Ca-41	Provide education for the public on what to do in event of hazardous material spills.	Hazmat	Campbell County, City of Gillette, Town of Wright	**CCEMA**, Fire Department, LEPC	Short Term	Low; CCEMA Operating Budget, Staff Time, Fire Department/First Responder Operating Budgets for County and Municipalities	Low	Not Started.
Ca-42	Conduct training for first responders	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather,	Campbell County, City of Gillette, Town of Wright	**CCEMA**, County Sheriff, Gillette PD, Public Health, Fire Departments	Ongoing	Moderate ; CCEMA, Operating Budgets of First Responder Agencies, Staff Time	Medium	Annual Implementation.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
		Tornado, Wildfire, Coal Seam Fire						
Ca-43	Conduct planning for appropriate response to acts of terrorism	terrorism	Campbell County, City of Gillette, Town of Wright	**CCEMA**, County Sheriff, GDP, Public Health, Fire Department	Medium Term	Low; CCEMA, Operating Budgets of First Responder Agencies, Staff Time	Low	In Progress.
Ca-44	Encourage public vigilance and reporting of suspicious persons or activities. "See Something, Say Something".	terrorism	Campbell County, City of Gillette, Town of Wright	**County Sheriff**, Wright, Gillette PD, CCEMA	Ongoing	Low; CCEMA, Operating Budgets of First Responder Agencies, Staff Time	Low	Annual Implementation.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-45	To reduce the impact of incidents on vunerable populations, work with emergency responders, these facilities, and the public on education about access and functional needs populations	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	**CCEMA**, LEPC, Public Health	Ongoing	Low; CCEMA, Operating Budgets of First Responder Agencies, Staff Time	Low	In Progress.
Ca-46	Identify and address the notification, warning, and similar technological needs of access and functional populations.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	**CCEMA**, County Sheriff/Dispatch, Public Health, County PIO	Medium Term	Moderate; CCEMA, Operating Budgets of First Responder Agencies, Staff Time	Medium	In Progress.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-47	Plan for future fire station sites to meet the needs created by new residential and commercial growth	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	**GIS**, City, Town, and County Planning, **Fire Departments**	Medium Term	Moderate ; GIS, Planning Dept., and Fire Department Budgets, Staff Time	Low	In Progress. ESCI Master Plan is nearly complete, believe they will have station location recommendations.
Ca-48	Implement the Community Wildfire Protection Plan recommendations to build wildfire resiliency	Wildfire	Campbell County, City of Gillette, Town of Wright	**County Fire Warden**, Gillette and Wright Fire Chiefs, CCEMA, GIS	Short Term	Moderate ; Community Wildfire Defense Grants	Medium	In Progress. Another effort is to update this (see Ca – 60). A 2023 Grant request was not funded, CWPP remains a priority.
Ca-49	Actively recruit volunteer firefighters within the community	Wildfire	Campbell County, City of Gillette, Town of Wright	**Fire Departments**	Ongoing	Low; Staff Time	Medium	Annual Implementation. Ongoing, currently in 2023 recruitment phase. Have begun targeting job fairs, signage and other media.
Ca-50	Increase firefighting water supplies in rural areas through placement of tanks, development of existing wells,	Wildfire	Campbell County	**County Fire Warden**, Fire Departments	Ongoing	Moderate ; Fire Prevention & Safety (FP&S) Grants, FMAG	Low	Annual Implementation. A 10,000 + gallon tank was placed on Bitter Creek Road. We also have worked with CC Public Works to ensure large tanks in

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	cooperative agreements, etc.							subdivisions have our fittings.
Ca-51	Work with both the private and public sectors to identify available resources. (Equipment, supplies, etc.)	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright	**County Fire Warden**, Fire Departments	Ongoing	Low; Staff Time, Fire Prevention & Safety (FP&S) Grants, FMAG	Low	Annual Implementation. WOHS keeps a list of statewide of special equipment, which we participate in. We keep lists of commonly used FD equipment such as loaders, snowmobiles, etc.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-52	Inventory existing plans, regulations, and policies to identify and eliminate deficiencies as related to disaster resilience	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	**CCEMA**, Gillette, Wright, County Planning	Short Term	Low; Staff Time	Low	Not Started
Ca-53	Provide contractor education concerning construction for severe weather events.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**CCEMA**, County Planning, Gillette, Wright Building Departments	Short Term	Low; County Planning Department General Funds, Gillette and Wright Building Department Funds, Staff Time	Low	Not Started
Ca-54	Provide public education addressing measures which can minimize loss during severe wind events	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright	**CCEMA**, County Planning, Gillette, Wright Building Departments	Ongoing	Low; CCEMA Operating Budget, NWS Partnership, Volunteer/Staff Time,	Low	Annual Implementation.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-55	Work to fill radar gap to enhance advanced detection and warning of severe weather events– work with private and public-sector for installation of gap-filling radar. Search for alternative technological solutions.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	County	**CCEMA**, NWS	Short Term	High; Local budget/general funds, State Engineer, Staff Time, NWS	Medium	In Progress. State engineers' office has started looking in too this again.
Ca-56	Snow removal and public education on winter storm driving safety – education and awareness on driving in storms through radio spots, public service announcements, newspaper, County17, social media updates, reader information signs with reminders	Severe winter storm	County, City of Gillette, WyDOT, School District	**County Road and Bridge**, County PIO, Public Works, Sheriff's Office, CCEMA	Ongoing	Low; CCEMA Operating Budget, NWS Partnership, Volunteer/Staff Time, Road and Bridge Operating Budget	Medium	Annual Implementation. In 2022/2023 winter, the County and Town of Wright updated their snow policies to use Snow Emergency Levels which more algin with the City of Gillette's policy so there is more uniformity for the general public.
Ca-57	Educate and train volunteers to enhance emergency preparedness– Local education for needs of volunteers. How	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	City of Gillette	**City**, individual agencies	Ongoing	Low; Gillette General Fund, NWS, Staff Time	High	Annual Implementation. Reimplementing programs like CERT and continuing hosting sever weather class conducted by the National Weather Service.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	your current occupation qualifies you for several positions, need to communicate on Social media. Communicate at the level of district. Establish the necessity of training beforehand. What is hierarchy of their thought process?							
Ca-58	Surface water and groundwater supply and protection – Contamination is affecting rural water wells (multiple private wells). Contamination could be from industry or natural causes and is often aggravated by drought when supply is more critical.	Drought, Hazmat	Campbell County Conservation District, Wyoming Department of Environmental Quality/Water Quality Division	Landowners, **Conservation District**, DEQ cooperation, State Engineers Office	Ongoing	High; WDEQ-319; WDA Water Quality Program; Campbell County; City of Gillette; CCCD; Landowners; NRCS	High	Annual Implementation. Funding for BMPs to improve aquifer protection has been secured from WDEQ-319 and WDA Water Quality Program sources. CCCD is also beginning its own cost-share program to implement further projects, as well as pursuing additional funding sources. Projects including riparian exclusion fencing, livestock pipeline development (upland water sources), and low water crossings have been completed to assist in the protection of local aquifers. Action updated in 2023 to

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
								include surface water protections.
Ca-59	Hazardous Materials Spill Mitigation Plan. Hazard mitigated – unexpected hazardous material releases. Planning and training for mitigation actions	Hazmat	County	**Fire Department**, industry partners (RR, CST, N/G), LEPC	Medium Term	High; Fire Department Budgets, HSGP Grant, FEMA EMPG Grant	High	In Progress.
Ca-60	Update/Develop a CWPP. Mitigate loss of property and life from wildfire. Develop a CWPP to include: - defensible space recommendations; - fuels reductions projects; - fire resistive constructions; -	Wildfire, Coal Seam Fire	Campbell County, City of Gillette, Town of Wright, Campbell County Conservation District	Fire Department, Planning, Federal Partners	Medium Term	Moderate; Community Wildfire Defense Grants	Medium	In Progress. The CCFD was not funded for the first round of CWPP applications, we have not heard about 2nd round awards. We will keep applying for this project. We expect it to cost $100,000 due to the technical nature of Campbell Co.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	access/driveway width; - fire safety education materials. - Identify high risk areas, - identify fuels reductions areas and priorities, - active public education programs, - benefits of the CWPP to landowners							
Ca-61	Campbell County Weather Awareness Education (Annual Action Plan). Overall goal to increase safety, education, awareness, and public usage of alert and warning systems such as: Networking Thorguard Lightning Detection System with explanation posters at sensor location and public facilities nearby. Tornado Sirens with an explanation video showing Thor and Whalen and	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	Campbell County, City of Gillette, Town of Wright	**CCEMA**, Wright EMA, Gillette EMA	Short Term	Moderate; FEMA Grants, Donations, Existing Local budget/general funds	Medium	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	explaining the usage and difference. Promote Everbridge at fairs, public functions, schools, etc. Utilize COG, TOW, CC Facebook and GPA for alerts and education opportunities and NWS Spotter Class in May. Educate County employees on severe weather policies and sheltering practices. Build a county wide 3rd & 4th grade program. Networking with WYDOT #4, other agencies to help cast a wider net of information over social media. Integrate CERT into both municipalities as forms and tools in education and awareness. Siren south of Wright in areas south of new water tower. Explain and continue to							

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	educate the severe weather sheltering protocols							

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Ca-62	City of Gillette Headworks Improvement Project, Phase 1. Replace existing headworks facility and scale house as per 2019 Facility Assessment. Designed to UBC Seismic Zone 0 standards. Based on field exploration and knowledge of the upper 40 ft of the soil profile, recommend Site Class C be utilized as a basis for structural seismic design. Built on reinforced concrete drilled pier foundation to a zone of relatively stable moisture content and bedrock to resist uplift. Project includes increased treatment capacity (5.2 MGD to 15 MGD), natural gas backup power generation capable of providing 100% power demand for	Earthquake, Expansive Soils, Flood, Lightning, Severe Winter Weather, Tornado	City of Gillette	**City of Gillette Wastewater and Engineering Divisions**, HDR Engineering	Short Term	Very High; SLIB Loan, ARPA Grant	High	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	headworks and scale house, facility security enhancements. to include card access control at all points of entry, occupied scale house/security (10 hrs per day) and 10 additional remote access security cameras.							
Ca-63	Wastewater Treatment Plant Upgrades. Upgrade aging critical infrastructure at the facility. To include redundancy, reliability, and emergency power considerations. To meet WYDEQ Water Quality NPDES limits.	Flood, Lightning, Severe Winter Weather, Tornado	City of Gillette	**City of Gillette Wastewater**	Long Term	Very High; Existing Gillette Wastewater budget/general funds, SLIB Loan, ARPA Grant	High	New in 2023
Ca-64	Backup generator for Town Hall. Town Hall houses the Town of Wright Emergency Operations Center.	High Wind, Hail, Lightning, Earthquake Severe Winter	Town of Wright	**Wright EMA**	Short Term	High; EMPG ARPA Grant	Medium	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency (bold) and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	Town Hall could also be used as a shelter in case of prolonged power outages around the Town of Wright.	Weather, Tornado, Wildfire						
Ca-65	Work with other counties in the region to show support for addressing weather radar shadow/ gap with mobile radar units; project is being advocated by State Engineers Office (SEO); this would enhance visibility of storms tracking from the west	Dam Failure, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Campbell County, City of Gillette, Town of Wright, CC Conservation District	**County EM** and other EM coordinators in Region 1; WY SEO; NOAA	Short Term	Moderate; SEO, NOAA	High	New in 2023
Ca-66	Coal seam fire identification and mapping to inform risk and potential mitigation solutions	Coal Seam Fire	Campbell County, CC Conservation District	**County EM**, GIS, BLM, WYGS, State Abandoned Mine Land Program	Short Term	Moderate, State Abandoned Mine Land Program	Low	New in 2023

9 Implementation

Moving forward, the County HMPC will use the mitigation action table in the previous section to track progress on implementation of each project. Implementation of the plan overall is discussed in Chapter 6 in the Regional Plan.

The Campbell County HMPC formed during the 2023 Regional Plan update will be responsible for implementing and reviewing the plan action items. The HMPC will meet no less than semi-annually, or as time permits.

The Campbell County Commissioners and the Mayor of all cities and towns (except where noted in Section 1) in Campbell County will adopt the Region 1 Hazard Mitigation Plan and each jurisdiction will take responsibility for plan implementation of mitigation issues arising in their jurisdictions. Plan implementation and evaluation will be a shared responsibility among the HMPC. The Campbell County EM Coordinator will serve as a convener to facilitate the HMPC meetings and will assign tasks such as updating and presenting the Plan to the members of the group.

9.1 Incorporation into Existing Planning Mechanisms

Also, discussed in Chapter 6 of the base plan is the importance of implementation and incorporation of the principles of this plan into other planning mechanisms.

9.1.1 General Process

To determine if this plan is consistent with goals identified in other community plans, the members of the Campbell County Emergency Management Agency, along with the Hazard Mitigation Planning Team and LEPC, will meet with other agencies who have plans that address such issues as transportation, land use, subdivision resolutions/ordinances, capital improvement, or building permits. The process will provide an opportunity to integrate and/or correlate plans for the purpose of:

- Determining if the mitigation plan is compatible with goals stated in other plans.
- Identifying mitigation initiatives or proposed projects which serve multiple objectives for the communities and could be included in multiple plans.
- Identifying needs for revision or updating to the mitigation plan, or other plans, to provide a more comprehensive approach to hazard mitigation (including addition of new mitigation measures).

During the 2023 planning process the HMPC discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. To date the plan has been integrated with other County planning efforts that include:

- Cross referenced in update of Emergency Operations Plan
- Risk Assessment informed Threat and Hazard Identification and Risk Assessments (THIRA)

Gillette, Wright and the Conservation District have not yet integrated the previous mitigation plan with other planning mechanisms, efforts, but opportunities to do so more effectively moving forward are noted in the next sub-section.

9.1.2 Individual Process

The group discussed opportunities to cross reference the hazard mitigation plan in other upcoming planning efforts. As described in the capability assessment and Table 7-1, the County

and municipalities already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. The list below show plans that are both common and/or unique to the participating jurisdictions that may have applicable goals, projects or actions related to mitigation and resilience. When these plans are updated identifying relevant cross-references to the hazard mitigation plan will foster resilience by factoring in hazard considerations into multiple planning mechanisms:

- County
  - County Comprehensive Plan
  - Emergency Operations Plan
  - Capital improvement plans and budgets including County Road/Bridge projects
  - Community Wildfire Protection Plan (CWPP)
  - Watershed planning efforts
  - Wildfire planning efforts on adjacent public lands
  - Firewise planning
  - Transportation plan
  - Office of State Lands and Investments Drinking Water or Clean Water Intended Use Plan

- Municipalities (Gilette and Wright)
  - Master planning efforts
  - Transportation Plan (Gillette)
  - Watershed Plan
- Campbell County Conservation District
  - Capital Improvement Plan
  - Watershed Plan

9.2 Funding Sources

Funding for mitigation projects may come from a variety of sources. Below is a partial list of possible sources of funding that could help fund the actions identified in Section 8.

Local Government

- General revenues in the form of matches.
- One Percent Sales Tax
- County and Municipal Utility Authorities

State of Wyoming

- Community Development Block Grant Program
- Federal Mineral Royalty Capital Construction Account
- Wyoming Water Development Program

- State and Community Highway Safety, Department of Transportation
- State Lands and Investments Board (SLIB) Grants and Loans
- Transportation Enhancement Activities Local (TEAL)
- Wildfire Mitigation Grant (State Forestry Division)

Federal Government Programs

- Federal Emergency Management Agency Hazard Mitigation Assistance Grants including:
  - Building Resilient Infrastructure and Communities (BRIC)
  - Pre-Disaster Mitigation (PDM)
  - Flood Mitigation Assistance Program (FMA)
  - Hazard Mitigation Grant Program (HMGP)
  - Notice of funding availability typically released in June with applications due in October/November of each year.
  - HMGP is dependent on federally declared disasters within the state and funding amount is based on a percentage of disaster relief costs.
  - FEMA Fire Management Assistance Grants - As of June 8, 2018 FEMA is making HMPG funds available for states, territories, and federally-recognized tribes that have a Fire Management Assistance Grant (FMAG) declaration
- USDA Environmental Quality Incentive Program
- USDA Conservation Reserve and Conservation Reserve Enhancement Program
- USDA Small Watersheds (NRCS)

There are many more potential funding opportunities available to the municipalities and county.

Funding research will be done during the scoping process for each project to determine what funding mechanisms are available and appropriate for that project. Funding cycles will be monitored to ensure there is adequate time to prepare grant applications.

9.3 Monitoring, Evaluating and Updating the Plan

Campbell County will follow the procedures to review and update this plan in accordance with Region 1 as outlined in Chapter 6 of the Regional Plan. Campbell County realizes it is important to review and update this plan regularly. This is especially important as the County receives additional information, which might change the risk analysis and resulting mitigation projects list.

Continued public involvement is imperative to the overall success of the plan's implementation. Campbell County will continue to solicit participation from the public in the following ways:

- Hard copies of the updated HMP will be available at the County Emergency Management office, with an electronic version available on the County website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions Ca-8, Ca-9, Ca-10, Ca-11, and Ca-12.

- The public will be invited to LEPC meetings where the HMP is discussed. The meetings will provide the public a forum for which they can express concerns, opinions, or ideas about the plan.
- The County will leverage existing coordination mechanisms with groups such as Voluntary Organizations Active in Disasters (VOAD) to implement mitigation actions related to public where applicable (see action Ca-25).
- The DES Coordinator will publicize meetings through public information channels including social media and web posting.

The City of Gillette will:

- Post a link to the plan from the City's website;
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions Ca-23, Ca-24, Ca-25, and Ca-26.

The Town of Wright will:

- Post a link to the plan from the Town's website;
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions Ca-23, Ca-24, Ca-25, and Ca-26.

The County Conservation District will:

- Post a link to the plan from the District's website;
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions Ca-23, Ca-24, Ca-25, and Ca-26.

Wyoming Region 1
Regional Hazard Mitigation Plan
Crook County Annex

1 Mitigation Planning and Crook County Planning Team

This County Annex builds upon previous versions of the Crook County Multi-Hazard Mitigation Plan that were incorporated into the regional hazard mitigation plan completed in 2018. Prior to the Region 1 Plan, Crook County had a multi-jurisdictional Hazard Mitigation Plan approved in 2013. This updated plan is the result of a collaborative effort between Crook County Government, municipal governments, citizens, public agencies, non-profit organizations, and the private sector. Crook County Emergency Management was responsible for updating the plan in coordination with a multi-jurisdictional County Planning Team/Hazard Mitigation Planning Committee (HMPC) during the update of the 2023 Regional Plan. The following jurisdictions were provided the opportunity to participate in the planning process:

- Crook County
- Town of Hulett
- Town of Moorcroft
- Town of Pine Haven
- City of Sundance

More details on the planning process followed and how the counties, municipalities and stakeholders participated can be referenced in Chapter 3 of the base plan, as well as how the public was involved during the 2023 update.

2 Geography and Climate

Located in the northeastern corner of Wyoming, Crook County shares its borders with Montana to the north and South Dakota to the east. Settlement in this region took root in the 1880s, culminating in its formal establishment in 1885, with Sundance serving as the county seat.

Encompassing approximately 2,854 square miles, Crook County spans the northeast quadrant of Wyoming, adjacent to the states of South Dakota and Montana. The county is characterized by the Belle Fourche and Little Missouri Rivers, along with their numerous tributaries. Its topography ranges from the towering peaks of the Bear Lodge Mountain Range in the Black Hills National Forest, reaching heights of around 6,600 feet, to the lower points in the northeast corner, which dip slightly over 3,400 feet.

Interstate 90 cuts through the heart of the county, running in a central-east to southwest direction, connecting Sundance, Moorcroft, and unincorporated areas like Beulah. State Highway 14 extends from I-90, creating a vital link between Moorcroft and Sundance, forming a half loop through the county's center. Additional thoroughfares such as Highways 24, 112, 116, 585, and 212 traverse Crook County, branching out in various directions towards the northeast, southeast, and central regions. (Wyoming Historical Society 2014)

The climate of Crook County is semi-arid in some parts, and continental in others. Precipitation is about 20 inches per year. Summer high temperatures are about 84 degrees Fahrenheit. Winters average an annual low of 12 degrees. Crook County gets a mean of 51 inches of snow per year, which is higher than the national average.

3 Population Trends

As of the July 2020 United States Census Bureau estimates, there were a total of 7,593 people living in Crook County. The population has grown about 6.6%, as in 2010 there were 7,119 people. The county seat is the City of Sundance.

Table 3-1 Crook County Population Distribution

JURISDICTION	2020 ESTIMATED POPULATION	% OF COUNTY TOTAL
Total	**7,593**	**---**
Hulett	311	4.1%
Moorcroft	949	12.5%
Pine Haven	499	6.6%
Sundance	1020	13.4%
Unincorporated	4,814	63.4%

Source: US Census Bureau

Table 3-2 Crook County Population Change, 2010-2020

COMMUNITY	2010 CENSUS	2015	2016	2017	2018	2019	2020	% CHANGE
Total	**7,119**	**7,441**	**7,497**	**7,393**	**7,452**	**7,573**	**7,593**	**6.6%**
Hulett	383	407	409	410	418	424	311	-18.8%
Moorcroft	1,013	1,065	1,072	1,056	1,066	1,083	949	-6.3%
Pine Haven	492	520	529	521	528	547	499	1.4%
Sundance	1,191	1,266	1,278	1,260	1,272	1,292	1,020	-14.3%
Unincorporated	4,040	4,183	4,209	4,146	4,168	4,227	4,814	19.1%

Source: U.S. Census Bureau - www.census.gov

Select Census demographic and social characteristics for Crook County are shown in the table below. The county's average age is 42 years old, about 5 years older than the state average, 37.7. The table also indicates some populations that may have special needs or prove vulnerable, including 10.6% of people with disabilities and 14% of people 65 and over and in poverty.

Table 3-3 Crook County Demographic Profile

POPULATION	
Population estimate, 2020	7,593
Population Growth, 1970-2020 (US average was 63.1%)	0.7%
Age and Sex	
Median Age (US median age is 38.8)	42
Percent of population under 18	24.5%
Percent of population 18-34	16.7%
Percent of population 35-44	10.1%
Percent of population 45-64	28.7%
Percent of population 65 and over	20.0%
Percent of population male	49.9%
Percent of population female	50.1%
Race and Hispanic Origin	
White alone, 2020	98.5%
White alone, not Hispanic or Latino	94%
Hispanic or Latino	2.4%
Two or More Races	2.2%

POPULATION	
American Indian and Alaska Native alone	1.1%
Black or African American alone	0%
Asian alone	0.2%
Native Hawaiian and Other Pacific Islander alone	0%
Education	
High school graduate or higher, age 25 years+	93.1%
Bachelor's degree or higher, age 25 years+	24.1%
Vulnerable Populations	
Percent of population under 5 years old	6.7%
Percent of population 85 years and older	2.6%
Percent of population that speak English "not well"	1.8%
Percent of population with disabilities	10.6%
Percent of population without health insurance	8.3%
Percent of population below poverty level	8.4%
Percent of population in deep poverty (<1/2 federal poverty level)	7.0%
Percent of population 65 and over and in poverty	14.0%

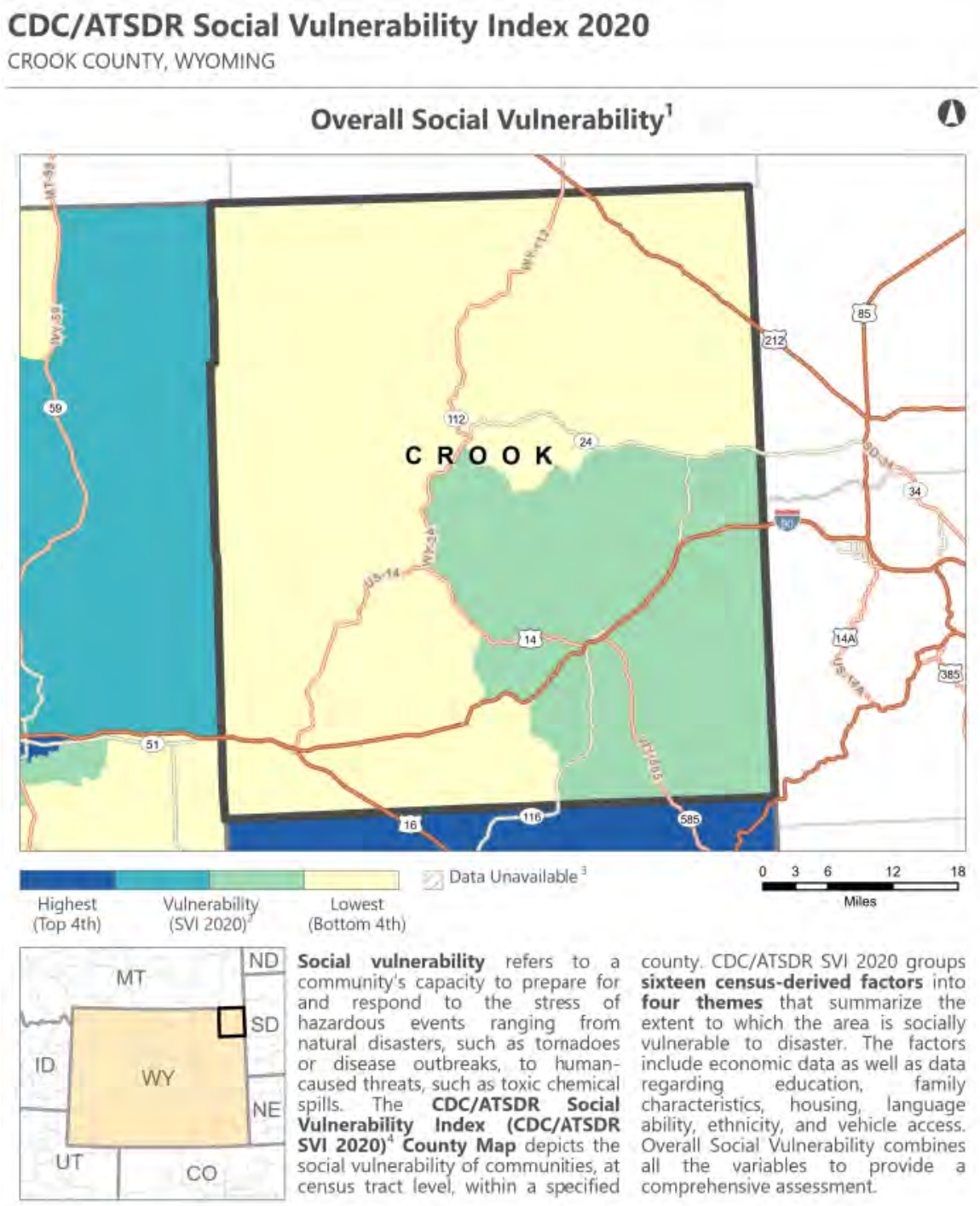
Source: U.S. Census Bureau www.census.gov/
*Hispanic or Latino is considered to be an ethnicity and not a race. People who identify themselves as Hispanic or Latino can belong to one or more races. Therefore, the total percentage can be greater than 100%.

3.1 Social Vulnerability

Social vulnerability is broadly defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards. Additional details on social vulnerability, the CDC SVI, and the NRI can be found in Section 4.1.4 of the Base Plan.

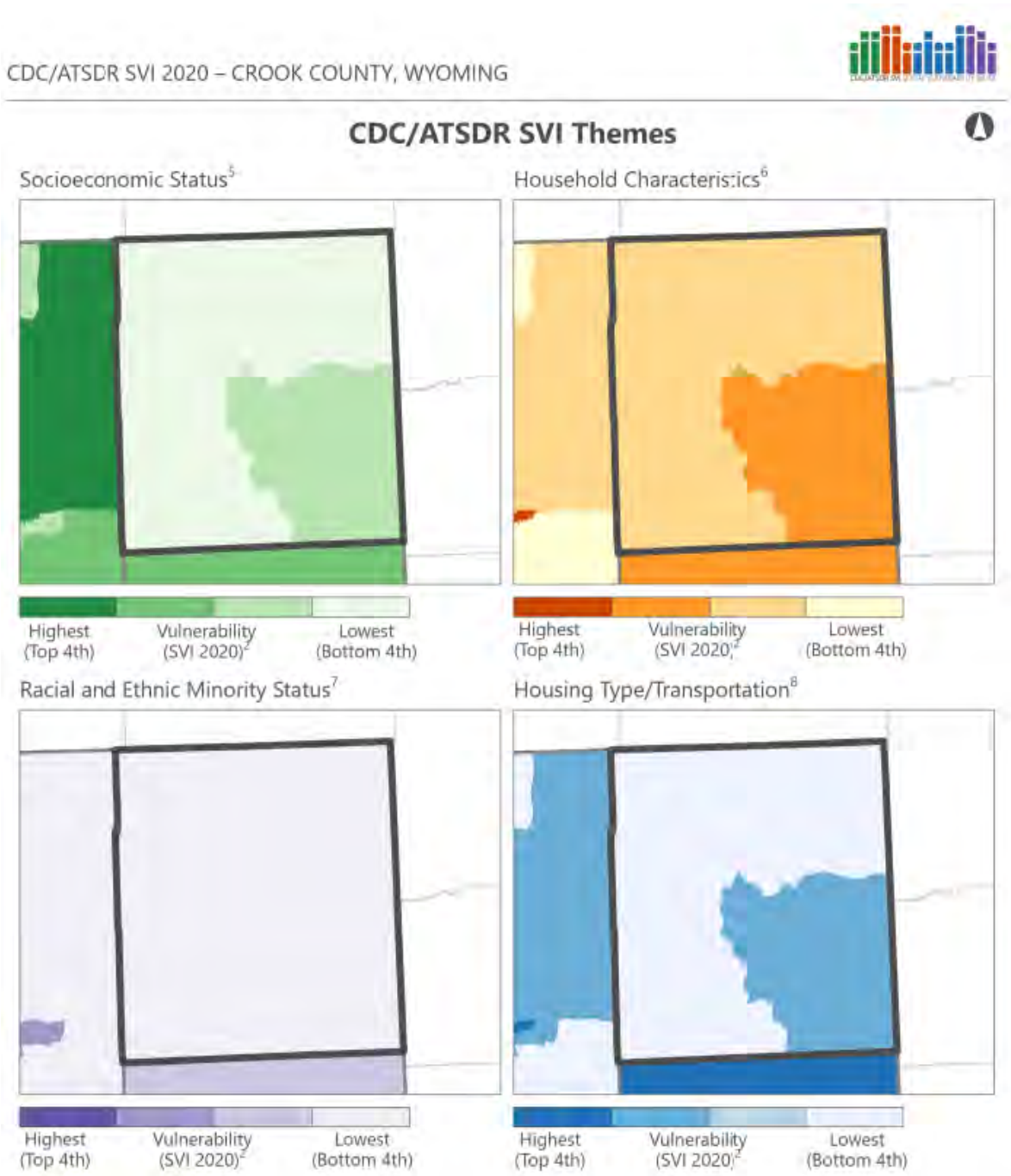
The SVI utilizes 16 demographic variables organized into four broader categories (Socioeconomic Status, Household Characteristics, Racial & Ethnic Minority Status, and Housing Type & Transportation) in order to determine the overall social vulnerability of a community at the census tract and county level. Figure 1 below displays the overall social vulnerability rating for Crook County at the census tract level, while Figure 2 details each of the four SVI themes. As a whole, Crook County has low to moderate social vulnerability. There is some variability across the census tracts and different themes, with factors under the Household Characteristics theme generally having the highest vulnerability.

Figure 1 Crook County Overall Social Vulnerability



Source: CDC Social Vulnerability Index

Figure 2 Crook County SVI Themes



Source: CDC Social Vulnerability Index

4 Development Trends

In terms of area, Crook County encompasses approximately 1.8 million acres, equivalent to 2,865 square miles, making it the 14th largest county in Wyoming. Of this total, fifteen percent is under federal ownership, with the U.S. Forest Service (USFS) holding the majority at 9% (168,978 acres), followed by the Bureau of Land Management (BLM) at 5% (88,663 acres). The Bureau of Reclamation (BOR) possesses less than 1% (12,745 acres), while both the National Park Service (NPS) and the U.S. Army Corps of Engineers (USACE) each have less than 1% (1,334 acres and 1,000 acres, respectively) (Crook County, 2020).

In 2021, the median property value in Crook County, WY stood at $256,000, surpassing the national average of $244,900 by 1.05 times. This marked a notable increase from $239,300 in 2020, reflecting a growth of 6.98%. Moreover, the homeownership rate in the county stands at 78.6%, closely mirroring the national average of 64.6%.

Residents of Crook County, WY typically spend an average of 25.6 minutes commuting to work, predominantly using personal vehicles for their journeys. The county's car ownership rate aligns with the national average, averaging around 2 cars per household.

A notable trend in Crook County has been the deliberate push for economic diversification. Traditionally dependent on natural resource-based industries like agriculture, timber harvesting, and mining, the county has actively sought to broaden its economic base. Initiatives have been launched to stimulate sectors like tourism, recreation, and manufacturing, creating fresh opportunities for both businesses and residents.

The tourism and recreation sectors have experienced substantial growth. The county's natural wonders, including the iconic Devil's Tower, have attracted a rising number of visitors. This surge has spurred the development of related industries such as hospitality, outdoor retail, and guiding services. As these sectors flourish, they contribute not only to the local economy but also enhance the overall allure of the region.

While historically characterized by a predominantly rural population, Crook County has seen a significant influx of new residents. Factors like the allure of natural amenities and improved connectivity to urban areas have played a pivotal role in this demographic shift. The overall trend in population between 2020 and 2020 has been a modest increase (6.6%), with most of this within the unincorporated areas; all incorporated areas, with the exception of Pine Haven, had a decrease in population. These population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability.

5 Economy

Table below provides a brief overview of economic characters in Crook County. The following information is provided by the U.S. Census Bureau American Community Survey (ACS) 5-year estimates from 2016-2020.

Table 5-1 Crook County Economic Profile

Economic Characteristics	Campbell County
Families Below Poverty Level	5.1%
Individuals Below Poverty Level	28.9%
Median Home Value	$239,300
Median Household Income	$66,898
Per Capita Income	$29,726
Population > 16 Years Old in Labor Force	61.4%
Population Employed	60.8%

Source: U.S. Census Bureau ACS 5-year estimates, 2016-2020

Table below shows the breakdown of employment in Crook County by the industry sector. According to the ACS, the leading employment sectors in the County are “agriculture, forestry, fishing and hunting, and mining”, which composes of nearly a

quarter of the total employment in the County follows by "educational services, and health care and social assistance".

Table 5-2 Crook County Occupation by Industry Profile

Industry	Population Employed	Percent of Labor Force
Agriculture, forestry, fishing and hunting, and mining	857	24.1%
Construction	388	10.9%
Manufacturing	196	5.5%
Wholesale trade	99	2.8%
Retail trade	304	8.5%
Transportation and warehousing, and utilities	256	7.2%
Information	107	3.0%
Finance and insurance, and real estate and rental and leasing	32	0.9%
Professional, scientific, and management, and administrative and waste management services	149	4.2%
Educational services, and health care and social assistance	565	15.9%
Arts, entertainment, and recreation, and accommodation and food services	175	4.9%
Other services, except public administration	276	7.7%
Public administration	158	4.4%

Source: U.S. Census Bureau www.census.gov/

Crook County's economy has always relied heavily on essential sectors such as ranching, farming, logging, mining, and other activities related to natural resources. Various segments of the county's economy depends on the abundant natural resources found throughout the region. The county is a key producer of resources like bentonite, uranium, limestone, and others. Demand for rare earth elements has surged. Crook County, along with the wider Wyoming economy, heavily relies on energy resources to fund critical infrastructure and services such as healthcare and law enforcement.

Furthermore, family and community traditions have developed around the economic and recreational utilization of the land. The County also draws numerous enthusiasts of recreation and tourism due to its rich endowment of natural resources. These resources include attractions like the Keyhole Reservoir, Devils Tower, State Parks, and several National Forests. Visitors are lured by opportunities for golfing, skiing, hunting, fishing, and a range of other outdoor activities, which contributes significantly to the county's economy. These sectors encompass jobs in hospitality, outdoor retail, guiding, and park management. Most activities take place on public lands, utilizing County resources. In 2011, visitors and residents spent $24.4 million, creating 320 jobs. Over the next decade, spending increased to $30.2 million, generating 290 jobs. Tax revenue from travel in 2020 amounted to $1.6 million for state and local governments.

Nearby National Forests and Parks experience seasonal tourism peaks, significantly impacting surrounding communities. Lands managed by USFS and NPS draw visitors who spend in the nearby towns. Devil's Tower, a National Monument since 1906, is a

major attraction. Visitor numbers peaked in 2017 at nearly 500,000 but have seen a decline since.

Additionally, the timber industry has historically played a vital role in Crook County's economy, relying on private, state, and federal lands. However, due to tax exemptions and subsidies, the county doesn't directly benefit financially. The U.S. Forest Service oversees most of the timber resources. Bear Lodge and Moskee areas are significant sources. In 2018, Crook County contributed 49% of Wyoming's timber harvest. Despite this, timber employment has decreased due to automation and technological advances in mills. Recovery of these jobs is unlikely.

Furthermore, since the mid-1800s, Wyoming's expansive rangelands have been crucial for livestock. Completion of the transcontinental railroad and an influx of cattle enabled the growth of the cattle business. Some Texas cowboys settled in Crook County, establishing thriving ranching operations.

As irrigation advanced, the County became fertile ground for crops, with lowlands transformed into cropland. Livestock grazing on federal lands is vital for ranchers, especially in the Western U.S. Agriculture remains a steady economic pillar, contributing significantly to County revenues. In 2017, Crook County had 554 agricultural operations, a 15% increase from 2012, with a market value of products sold nearing $53 million (Crook County Socioeconomic Supplement, 2022).

6 Hazard Identification and Risk Assessment

6.1 Identified Hazards

The HMPC reviewed the hazards from the 2018 Regional Hazard Mitigation Plan for inclusion in the 2023 update. The hazards list was also compared with the hazards list found in the State of Wyoming's hazard mitigation plan, updated and adopted in 2021. The following table notes the summary of significance for each jurisdiction in the County based on a combination of geographic extent, potential magnitude/severity and probability as defined below. Hazard significance is rated as High, Medium, or Low based on the combination of factors described in the table below and the methodology in Chapter 4 of the Regional Plan.

Table 6-1 Overall Hazard Significance Summary Table

HAZARD	CROOK COUNTY	HULETT	MOORCROFT	PINE HAVEN	SUNDANCE
Dam Failure	M	M	L	L	L
Drought	H	H	H	H	H
Earthquake	L	L	L	L	L
Expansive Soil	L	L	L	L	L
Flood	M	H	M	L	H
Hail	M	M	M	M	M
Hazardous Materials	H	M	H	M	M
High Winds and Downbursts	M	M	M	M	M
Landslide/ Rockfall/ Debris Flow	L	M	L	L	M
Lightning	H	H	H	H	H
Mine and Land Subsidence	L	L	L	L	L
Severe Winter Weather	H	H	H	H	H

HAZARD	CROOK COUNTY	HULETT	MOORCROFT	PINE HAVEN	SUNDANCE
Tornado	M	H	H	H	M
Wildfire	H	H	H	H	H
Coal Seam Fire	L	NA	NA	NA	NA

Geographic Extent
Negligible: Less than 10 percent of planning area or isolated single-point occurrences
Limited: 10 to 25 percent of the planning area or limited single-point occurrences
Significant: 25 to 75 percent of planning area or frequent single-point occurrences
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Potential Magnitude/Severity
Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time or result in many permanent disabilities and a few deaths.
Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

Probability of Future Occurrences
Unlikely: Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.
Occasional: Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Highly Likely: Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Overall Significance
Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.
Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

6.1.1 Hazards Considered but Not Profiled

Though noted in other relevant plans such as the Wyoming State Multi-Hazard Mitigation Plan from 2016, this plan does not further evaluate the following hazards:

- Avalanche
- Pandemic
- Space weather
- Volcanism

It is important to be aware of the probability of these events and the associated impacts for Crook County. However, the hazard identification described in Chapter 4 of

the Base Plan omits these hazards due to the limited relevance in the regional context of this plan, or the hazards being sufficiently addressed in other planning mechanisms. Some of the previously profiled hazards are acknowledged to some degree under other hazard profiles, such as windblown deposits carried by wind that could be associated with drought conditions.

6.2 Building Inventory and Assets

In addition to people, structures, critical facilities and infrastructure, other important assets exist in Crook County that are potentially exposed to hazards identified in this plan. **Error! Reference source not found.**Table 6-2 summarizes the property inventory for the county and jurisdictions, based on the improvement value and contents by parcel type and jurisdiction. This as an assessment of the overall property exposed within the county and by jurisdiction.

Assets inventoried to determine vulnerability include people, structures, critical facilities, and natural, historic, or cultural resources. For the regional planning process, locally available GIS databases were utilized. Parcel and assessor data were obtained through sources such as the Wyoming Property Tax Division's Assessor's Portal. This information provided the basis for building exposure and property types. The focus of the analysis was on "improved," or developed, parcels. These parcels were identified based on an improvement value greater than zero. Abstract Codes were used to identify occupancy type as shown in the following table, which includes summations of total improved value for the various property types and jurisdictions, and the population exposed in each.

Table 6-2 Crook County Building Inventory and Value by Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Hulett	Commercial	37	$8,166,292	$8,166,292	$16,332,584
	Industrial	1	$1,221	$1,832	$3,053
	Residential	124	$23,420,060	$11,710,030	$35,130,090
	Total	**162**	**$31,587,573**	**$19,878,154**	**$51,465,727**
Moorcroft	Commercial	64	$11,970,510	$11,970,510	$23,941,020
	Exempt	2	$318,548	$318,548	$637,096
	Residential	251	$37,643,347	$18,821,674	$56,465,021
	Total	**317**	**$49,932,405**	**$31,110,732**	**$81,043,137**
Pine Haven	Commercial	16	$4,231,493	$4,231,493	$8,462,986
	Residential	237	$47,963,197	$23,981,599	$71,944,796
	Total	**253**	**$52,194,690**	**$28,213,092**	**$80,407,782**
Sundance	Commercial	111	$39,155,455	$39,155,455	$78,310,910
	Exempt	1	$1,126	$1,126	$2,252
	Industrial	1	$371,552	$557,328	$928,880
	Residential	416	$65,622,087	$32,811,044	$98,433,131
	Total	**529**	**$105,150,220**	**$72,524,953**	**$177,675,173**
Unincorporated	Commercial	897	$39,320,793	$39,320,793	$78,641,586
	Industrial	4	$6,341,807	$9,512,711	$15,854,518
	Residential	1,043	$256,186,517	$128,093,259	$384,279,776
	Total	**1,944**	**$301,849,117**	**$176,926,762**	**$478,775,879**

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
	Grand Total	**3,205**	**$540,714,005**	**$328,653,691**	**$869,367,696**

Source: Wyoming CAMA 2022, WSP GIS Analysis

Total building exposure within Crook County based on the analysis of improved parcels is over $1.2 billion, with over $739 million in improved value properties and over $460 million in estimated contents value. The unincorporated parts of the county have the greatest number of buildings, followed by Sundance and Moorcroft.

Based on these exposure estimates, there are 8,206 individuals exposed to the various hazards identified for Crook County. To calculate these population exposure summaries, a household average of 2.43 was used, based on the most current statistics from the U.S. Census. Note that this method over-estimates the Census-estimated population. There is also a seasonal influx of visitors during the summer months.

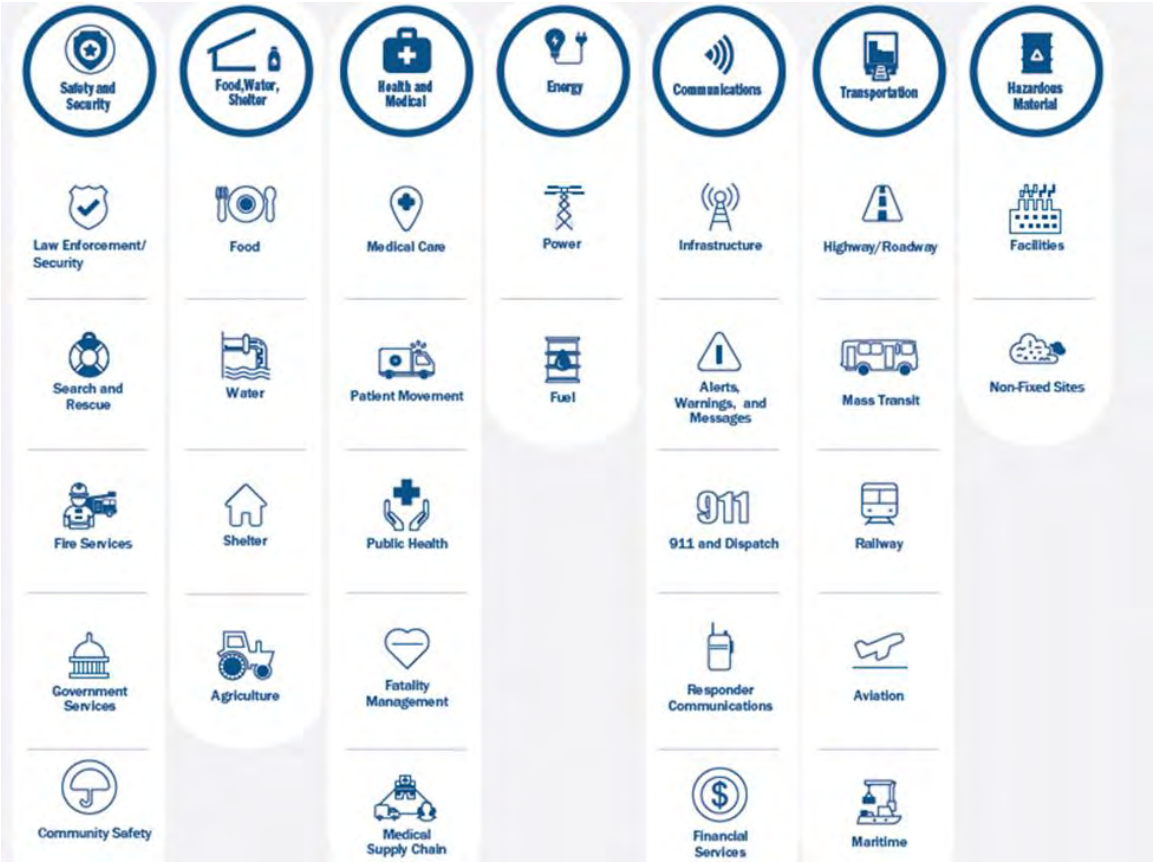
6.2.1 Critical Facilities, Infrastructure, and Other Important Community Assets

A critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Much of this data is based on GIS databases associated with the 2022 Homeland Infrastructure Foundation-Level Data (HIFLD) and the 2023 National Bridge Inventory (NBI). Where applicable, this information was used in an overlay analysis for hazards such as dam failure, expansive soil, flood, landslide, and wildfire.

FEMA organizes critical facilities into seven lifeline categories as shown in Figure 3. These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

Figure 3 FEMA Lifeline Categories



Source: FEMA

Table 6-3 summarizes critical facility counts in Crook County and the jurisdictions, which examines the distribution of critical facilities across each individual jurisdiction. Critical facilities were based on the databases from Homeland Infrastructure Foundation-Level Data (HIFLD) and the National Bridge Inventory (NBI).

Table 6-3 Crook County Critical Facility Summary

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Hulett	-	-	-	-	1	4	1	**6**
Moorcroft	1	-	2	-	2	6	2	**13**
Pine Haven	1	-	-	-	1	1	-	**3**
Sundance	3	-	-	-	5	8	9	**25**
Unincorporated	45	15	2	4	-	2	160	**228**
Total	**50**	**15**	**4**	**4**	**9**	**21**	**172**	**275**

Source: HIFLD, National Bridge Inventory, WSP GIS Analysis

6.2.2 Natural, Historic, and Cultural Assets

- Assessing the vulnerability of Crook County to disasters also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:
- The community may decide that these types of resources warrant more protection due to their unique and irreplaceable nature as well as contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Historic and Cultural Resources

By definition, a historic property not only includes buildings of other types of structures, such as bridges and dams, but also includes prehistoric of Native American sites, roads, byways, historic landscapes, and many other features. Given the history of the County, these types of historic properties exist in the planning area.

Table lists the properties and districts in Crook County that are on the National Register of Historic Places, which is the Nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.

Table 6-4 Crook County Historic Properties

Location	Historic Name
Aladdin	Wyoming Mercantile
Beulah	Ranch A
Devils Tower	Old Headquarters Area Historic District
	Entrance Station--Devils Tower National Monument
	Entrance Road--Devils Tower National Monument
	Tower Ladder--Devils Tower National Monument
Hulett	DXN Bridge over Missouri River
Moorcroft	Arch Creek Petroglyphs (48CK41)
	McKean Archeological Site (48CK7)
Sundance	Inyan Kara Mountain
	Vore Buffalo Jump
	Sundance State Bank
	Sundance School

Sources: National Register of Historic Place Program, https://www.nps.gov/Nr/research/

Natural Resources

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

Wetlands

Wetlands are a valuable natural resource for communities, due to their benefits to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital.

Endangered Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

There are four federally-recognized endangered, threatened, or candidate species present in Crook County according to the U.S. Fish and Wildlife Service. These species are listed in Table .

Table 6-5 Endangered and Threatened Species in Crook County

Common Name	Scientific Name	Type of Species	Status
Ute ladies'-tresses	Spiranthes diluvialis	Flowering Plants	Threatened
Gray wolf	Canis lupus	Mammals	Recovery
Northern Long-Eared Bat	Myotis septentrionalis	Mammals	Threatened
Bald eagle	Haliaeetus leucocephalus	Birds	Recovery

Source: http://www.fws.gov/endangered/

6.3 Vulnerability to Specific Hazards

This section provides vulnerability to specific hazards, where quantifiable, to summarize the information of the Region and/or provide more detail at the county and jurisdictional level. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas and details by jurisdiction and building type in Crook County. For a discussion of the methodology used to develop the loss estimates refer to Chapter 4 of the Base Plan. In many cases, Chapter 4 contains information that differentiates the risk by county and jurisdiction for hazards that lend themselves to be analyzed with GIS including dam inundation, expansive soil, flood, landslide and wildfire, thus the information is not duplicated but noted here where applicable. Additional detail is provided to the jurisdictional level for

buildings at risk. Vulnerability of populations (including socially vulnerable populations), structures, systems, natural, historic, and cultural resources or other activities that have value to the community are described in more detail where possible and applicable. For most of the weather-related hazards the risk does not vary significantly enough from the rest of the Region and thus the reader should refer to Chapter 4.

6.3.1 Dam Failure

There have not been any recent dam failure events in the county. There are three high hazard dams and five significant hazard dams located within close proximity to population centers in Crook County. Table below identifies the dams and the affected communities; they are also shown in Figure 4.

Table 6-6 High and Significant Level Dams in Crook County

Hazard Level	Dam Name	Normal Capacity (AF)	Nearby Jurisdiction/Populated Area
High	Keyhole	191,500	Hulett
High	Cook Lake	337	Alva
High	Washington Memorial	31	Sundance
Significant	Foster Storage	103	Camp Creek, Sd
Significant	French	37	Alva
Significant	Kruger Creek	674	Belle Fourche Sd
Significant	Oak Creek	915	Belle Fourche, Sd
Significant	Tract 37	2,454	Alzada, Mt

Source: National Inventory of Dams

There are also several other dams rated as low hazard. There is a possibility of structure failure-based flooding in the future, though it is not likely. The overall risk of dam failure across Crook County and its jurisdictions is **medium**, however, mainly because the Keyhole Dam has a very large storage capacity (629,025 acre-feet) and, were it to fail and flood nearby areas, Hulett and other unincorporated portions of the county could be highly affected.

6.3.1.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Based on GIS analysis only two structures in Sundance have been identified in dam inundation zones. This analysis does not reflect inundation data for Keyhole Dam which is a federal dam and does not have publicly available risk data. Based on the downstream geography its likely a large percentage of the buildings and population of Hulett could be at risk in the unlikely event of a failure of this dam. Vulnerable populations could include the elderly and school-children, but more specifics are not quantifiable.

Critical facilities/lifelines within inundation areas include:

- Sundance: Microwave Tower, Wyoming Highway Patrol building
- Unincorporated area: Bridge over Sundance Creek.

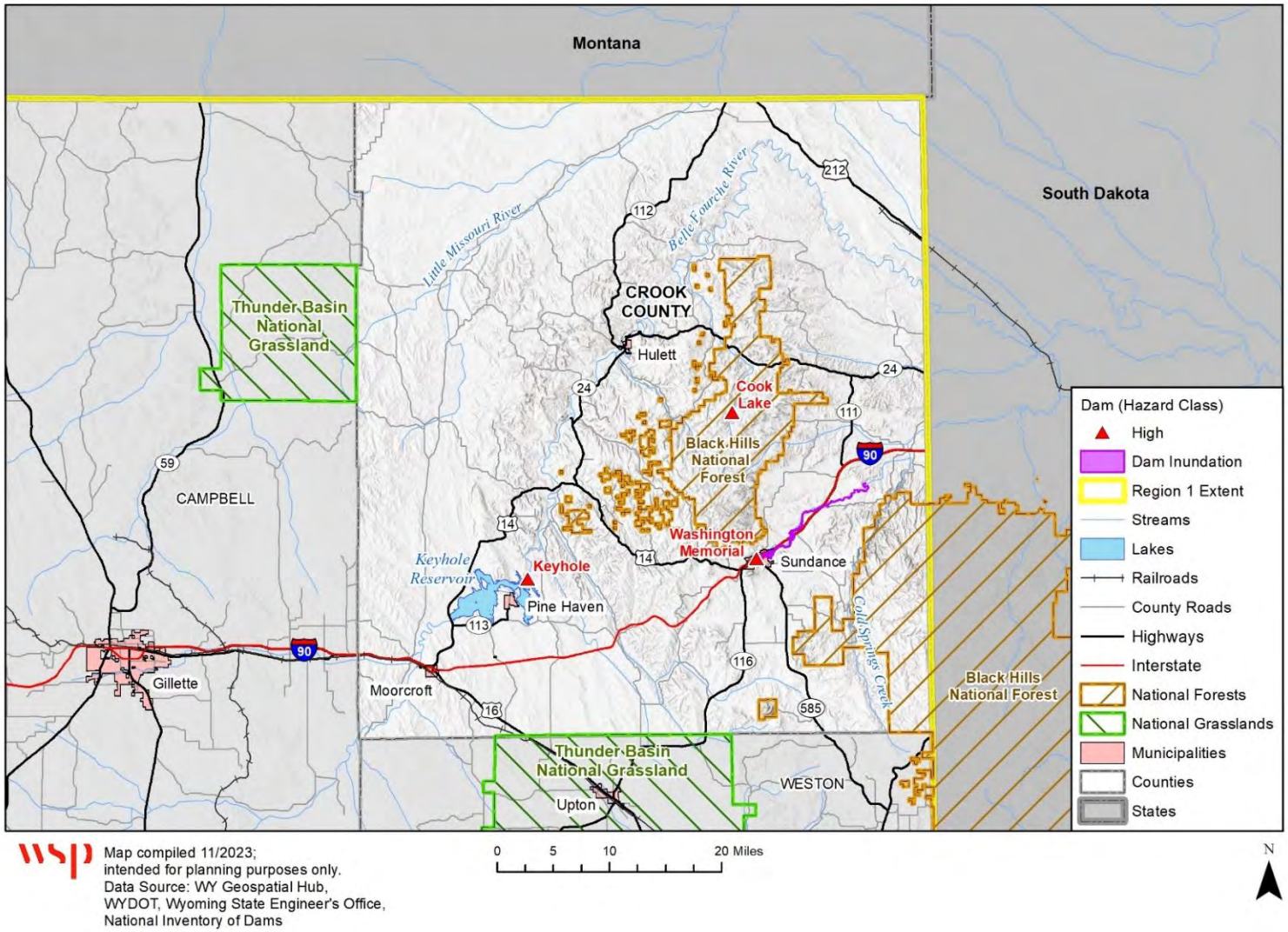
Natural and cultural resources could include compromised access and visitation to Devils Tower National Monument in the unlikely event of a Keyhole Dam failure. The historic DXN Bridge over the Missouri River could also be impacted. While not

downstream of Keyhole, loss of water resources and recreational resources was noted as a potential vulnerability for the Town of Pine Haven. Moorcroft does not have risk to dam failure.

6.3.1.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

Figure 4 Dam Inundation and High Hazard Dams in Crook County



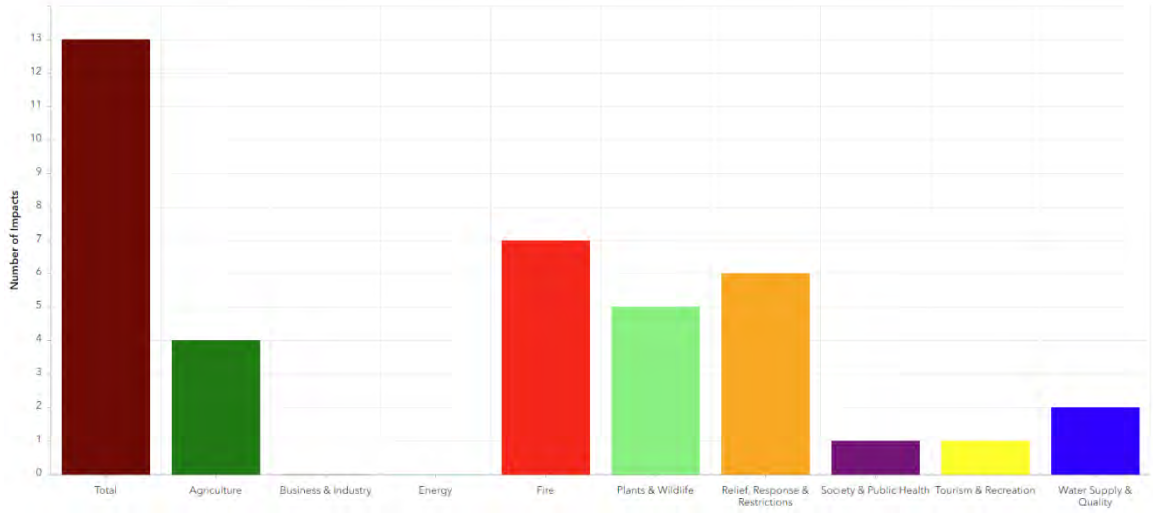
6.3.2 Drought

6.3.2.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Drought is a high significance hazard across the County. Drought-related impacts to the local economy can be extensive, affecting the water supply and quality, plants and wildlife, relief response efforts, and even the tourism and recreation industries (e.g., due to increased wildfire danger, forest closures, and fire bans). One of the most affected sectors in Crook County is fire, as drought often leads to higher fire risks and various measures such as burning restrictions, fireworks bans, increased occurrence of wildfires, emergency declarations, road and land closures, and increased expenses for firefighting efforts by state and county governments. The other highly affected sector impacts are to relief, response, and restrictions related services, as the county and jurisdictional agencies see significantly increased management costs that prevent them from maintaining revenue flows.

Since 2005, Crook County has received thirteen reports of countywide impacts to the various sectors due to drought. Figure 5 below summarizes the number and type of reports that have been made at the county level, from 2005 to the end of 2022. These reports were submitted to indicate negative effects to the economic sectors and local industries due to drought events. Refer to Chapter 4 in the Base Plan for additional discussion of drought risk related to the region and the county.

Figure 5 County-Level Drought Reports in Crook County, 2005-2022



Source: https://www.drought.gov/data-maps-tools/drought-impact-reporter-dir

Table takes the impacts of drought on crop production detailed in Table 4-17 of the base plan and breaks out the losses specific to Crook County.

Table 6-7 Indemnities Paid for Commodities that Suffered from Drought in Crook County, 2007-2021

Commodity	Acres Damaged	Indemnity Amount
Barley	538.2	$14,495
Forage Production	124,170.1	$6,071,119
Forage Seeding	566.0	$36,056
Oats	541.7	$14,270
Wheat	5,999.6	$378,877

Commodity	Acres Damaged	Indemnity Amount
Grand Total	**131,815.6**	**$6,514,816**

Source: USDA – Risk Management Agency

Drought can stress water supply systems, including reservoirs, water treatment plants, and pipes. Specific water system vulnerability has not been identified during the planning process.

Vulnerable populations that may be affected by drought may include ranchers and farmers as well as those dependent on recreation and tourism. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a prolonged period of drought.

Natural resources include the National Forest and Devil's Tower National Monument, which could be more susceptible to wildfire impacts during droughts. No historic resources are expected to be vulnerable to drought.

6.3.2.2 Development Trends

Recent and future development in the County and municipalities is not anticipated to change vulnerability to drought in a significant way.

6.3.3 Earthquake

Since 1972, there has only been one recorded seismic event centered in Crook County. The intensity was reported to be in the IV-V intensity scale, with no associated damages or injuries.

Table 6-8 Crook County Seismic Events, 1972 – 2023

Location	Date	Magnitude/Intensity	Damage or Injuries
18 Miles East of Gillette	2/18/1972	IV	No

Source: http://earthquake.usgs.gov and Wyoming Geological Survey

Crook County has experienced shaking from two seismic events since 1897. The earthquakes occurring in the county are not usually felt by anyone due to the weakness of the events, and both which took place also failed to cause any reportable damages or injure populations. Below are the occurrence summaries:

- One of the first recorded earthquakes in northeastern Wyoming occurred near Sundance on February 3, 1897. The intensity IV-V earthquake severely shook the Shober School on Little Houston Creek southwest of Sundance. Many residents of Sundance reported hearing three loud reports resembling the explosion of a boiler or a great blast. (Sundance Gazette, February 5, 1897).
- On February 18, 1972, a magnitude 4.3 earthquake occurred approximately 18 miles east of Gillette near the Crook County-Campbell County border. No damage was reported.

6.3.3.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Based on the Level 1 HAZUS-MH analysis conducted for the State of Wyoming in 2020, Crook County is projected to have the lowest level of overall impact in Region 1 under a 2,500-Year Probabilistic event scenario, with $3 million in projected damages and 2 minor injuries. There are not vulnerable populations, lifelines and other natural

resources within the County and jurisdictions of note. Historic buildings may be slightly more susceptible but overall the risk is low.

Overall, earthquakes are a **low** significance hazard in the county and municipalities.

6.3.3.2 Development Trends

Recent and future development in the County and municipalities is not anticipated to change vulnerability to earthquake in a significant way.

6.3.4 Expansive Soils

Crook County classifies expansive soils as a low risk hazard with low probability of impact in the municipalities Hulett, Moorcroft, Pine Have, and Sundance. Though is projected to have minimal impact, the County is shown to have a high concentration of expansive soils.

6.3.4.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The map shown in the Hazard Analysis and Risk Assessment chapter, section 4.2.5, is a region map that shows soil types and risk of expansive soil. The map notes Crook County to be highly dense of expansive soil. Based on GIS analysis of parcels, buildings, building improved values, building contents, population, and critical facilities in Crook County it is estimated that there is some risk of exposure to expansive soils across unincorporated portions. The tables below summarize the findings of the analysis, including exposure as an estimate of potential losses and the type and number of parcels and facilities that could be affected by this hazard.

Table 6-9 Building/Structure and Population at Risk to Moderate Expansive Soils in Crook County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Pine Haven	Commercial	12	$3,092,157	$3,092,157	$6,184,314
	Residential	168	$34,471,272	$17,235,636	$51,706,908
	Total	**180**	**$37,563,429**	**$20,327,793**	**$57,891,222**
Unincorporated	Commercial	130	$5,043,819	$5,043,819	$10,087,638
	Industrial	2	$6,075,011	$9,112,517	$15,187,528
	Residential	204	$46,417,953	$23,208,977	$69,626,930
	Total	**336**	**$57,536,783**	**$37,365,312**	**$94,902,095**
	Grand Total	**516**	**$95,100,212**	**$57,693,105**	**$152,793,317**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-10 Building/Structure and Population at Risk to Low Expansive Soils in Crook County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Pine Haven	Commercial	4	$1,139,336	$1,139,336	$2,278,672
	Residential	69	$13,491,925	$6,745,963	$20,237,888
	Total	**73**	**$14,631,261**	**$7,885,299**	**$22,516,560**
Unincorporated	Commercial	242	$7,715,150	$7,715,150	$15,430,300
	Residential	202	$53,739,026	$26,869,513	$80,608,539
	Total	**444**	**$61,454,176**	**$34,584,663**	**$96,038,839**

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
	Grand Total	**517**	**$76,085,437**	**$42,469,962**	**$118,555,399**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-11 Crook County Critical Facilities at Risk to Moderate Expansive Soil by Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Pine Haven	1	-	-	-	1	1	-	**3**
Unincorporated	2	5	2	1	-	-	14	**24**
Total	**3**	**5**	**2**	**1**	**1**	**1**	**14**	**27**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

An estimated 978 people reside on areas of expansive soils, mostly in Pine Haven and Unincorporated areas. However, no direct impacts on people are anticipated. Should an impact occur, it is anticipated to be localized. Social vulnerability is not considered a factor. Natural and historic resource impacts are not considered to be a concern.

6.3.4.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Modern construction techniques typically account for and mitigate this hazard. The Town of Pine Haven should be wary of this hazard when new development takse place, based on generalized soil mapping indicating some risk.

6.3.5 Flood

Crook County has a historical record of flood-related incidents, leading to significant financial losses and property damage. The county faces flooding risks from various sources, including the Little Missouri River, Belle Fourche River, Sundance Creek, and, in the event of a dam failure, the Keyhole Reservoir (for detailed information, please refer to Section 4.2.2, Dam Failure, in Chapter 4).

6.3.5.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

As of 2023, Crook County has partial coverage for digital floodplains mapped by FEMA's National Flood Insurance Program and a Hazus flood model was utilized for mapping and analysis to create a comprehensive flood risk assessment. Figure 6 through Figure 10 show the FEMA and Hazus modeled floodplains. The jurisdiction maps below depict FEMA and HAZUS designated floodplains overlaid by the parcels/infrastructure at risk of flooding (displayed as parcel centroid points). Crook County is shown first, then its jurisdictions.

Table 6-12 summarizes the building counts and improved value of parcels in the County, broken out by jurisdiction, that fall within the 1% chance floodplains where available. Additionally, the table also summarizes loss estimate values, which are calculated based upon the improved value and estimated contents value and assumes

a two-foot deep flood which usually results in 25% of the total value, based on FEMA depth-damage curves. Table 6-13 summarizes improved properties at risk to the 0.2% flood hazards where mapped within Crook County.

Table 6-12 also indicates the estimated flood losses in each applicable jurisdiction in Crook County. The unincorporated areas of the County have the largest number of properties at risk to the 1% annual chance flood. The majority of the properties are commercial with a total value of $2 million in improved values however residential properties account for $8.8 million and $3.3 million in total estimated losses.

Approximately 197 persons reside in flood hazard areas. General trends with populations vulnerable to flooding can be referenced in Section 4.2.6 in the base plan. More specifics are not known, but the slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts and recovery from a significant flood. No natural or historic resources are known to be at-risk.

Table 6-12 Crook County Parcels at Risk to 1% Flood Hazard (FEMA & Hazus) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Hulett	Residential	2	$644,407	$322,204	$966,611	$241,653	5
	Total	**2**	**$644,407**	**$322,204**	**$966,611**	**$241,653**	**5**
Moorcroft	Residential	2	$172,452	$86,226	$258,678	$64,670	5
	Total	**2**	**$172,452**	**$86,226**	**$258,678**	**$64,670**	**5**
Sundance	Commercial	6	$1,467,247	$1,467,247	$2,934,494	$733,624	
	Residential	29	$4,270,806	$2,135,403	$6,406,209	$1,601,552	76
	Total	**35**	**$5,738,053**	**$3,602,650**	**$9,340,703**	**$2,335,176**	**76**
Unincorporated	Commercial	47	$2,125,789	$2,125,789	$4,251,578	$1,062,895	
	Residential	42	$8,822,848	$4,411,424	$13,234,272	$3,308,568	110
	Total	**89**	**$10,948,637**	**$6,537,213**	**$17,485,850**	**$4,371,463**	**110**
	Grand Total	**128**	**$17,503,549**	**$10,548,293**	**$28,051,842**	**$7,012,960**	**197**

Source: FEMA NFHL, Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-13 Crook County Parcels at Risk to 0.2% Flood Hazard (FEMA) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Hulett	Commercial	5	$527,049	$527,049	$1,054,098	$263,525	
	Residential	34	$7,181,762	$7,181,762	$14,363,524	$3,590,881	89
	Grand Total	**39**	**$7,708,811**	**$7,708,811**	**$15,417,622**	**$3,854,406**	**89**

Source: FEMA NFHL, Wyoming CAMA 2022, WSP GIS Analysis

Crook County has a total of 59 critical facilities located in the 1% annual chance floodplain and 0 within the 0.2% floodplain. 56 of the 59 facilities are transportation lifelines and these consist of non-scour bridges in varying degrees of condition ranging from poor, fair, or good condition. This is shown in Table 6-14. No details are avaialbe about historic or cultural resources at risk to flooding.

Table 6-14 Crook County Critical Facilities at Risk to 1% (FEMA & Hazus) Flood Hazards Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Hulett	-	-	-	-	-	-	1	**1**
Moorcroft	-	-	2	-	-	-	-	**2**
Sundance	-	-	-	-	-	1	-	**1**
Unincorporated	-	-	-	-	-	-	55	**55**
Total	**0**	**0**	**2**	**0**	**0**	**1**	**56**	**59**

Source: FEMA NFHL & Hazus-MH MR2, HIFLD, National Bridge Inventory, WSP GIS Analysis

Figure 6 Crook County FEMA and Hazus Flood Hazards

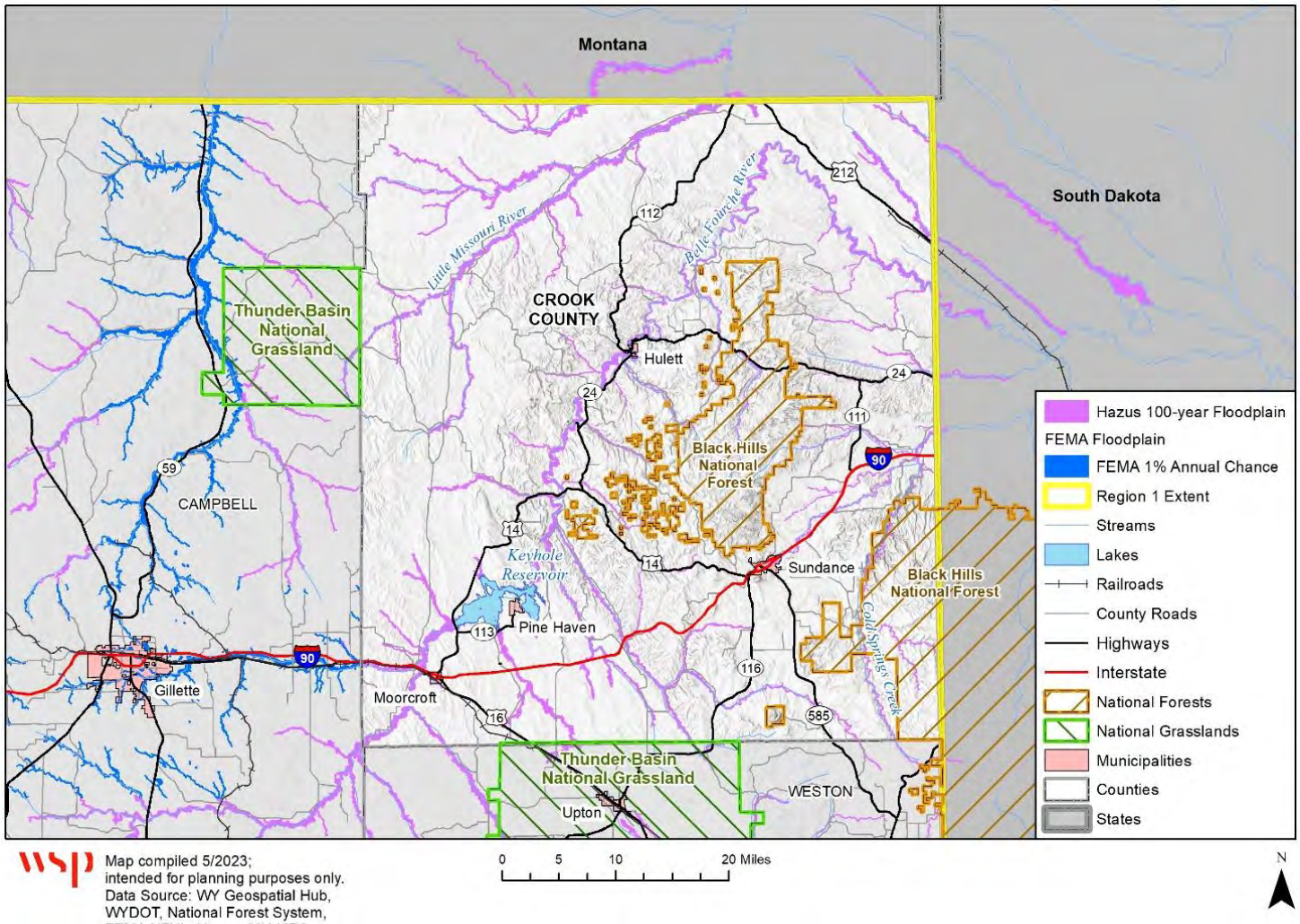


Figure 7 Town of Hulett FEMA and Hazus Flood Hazards

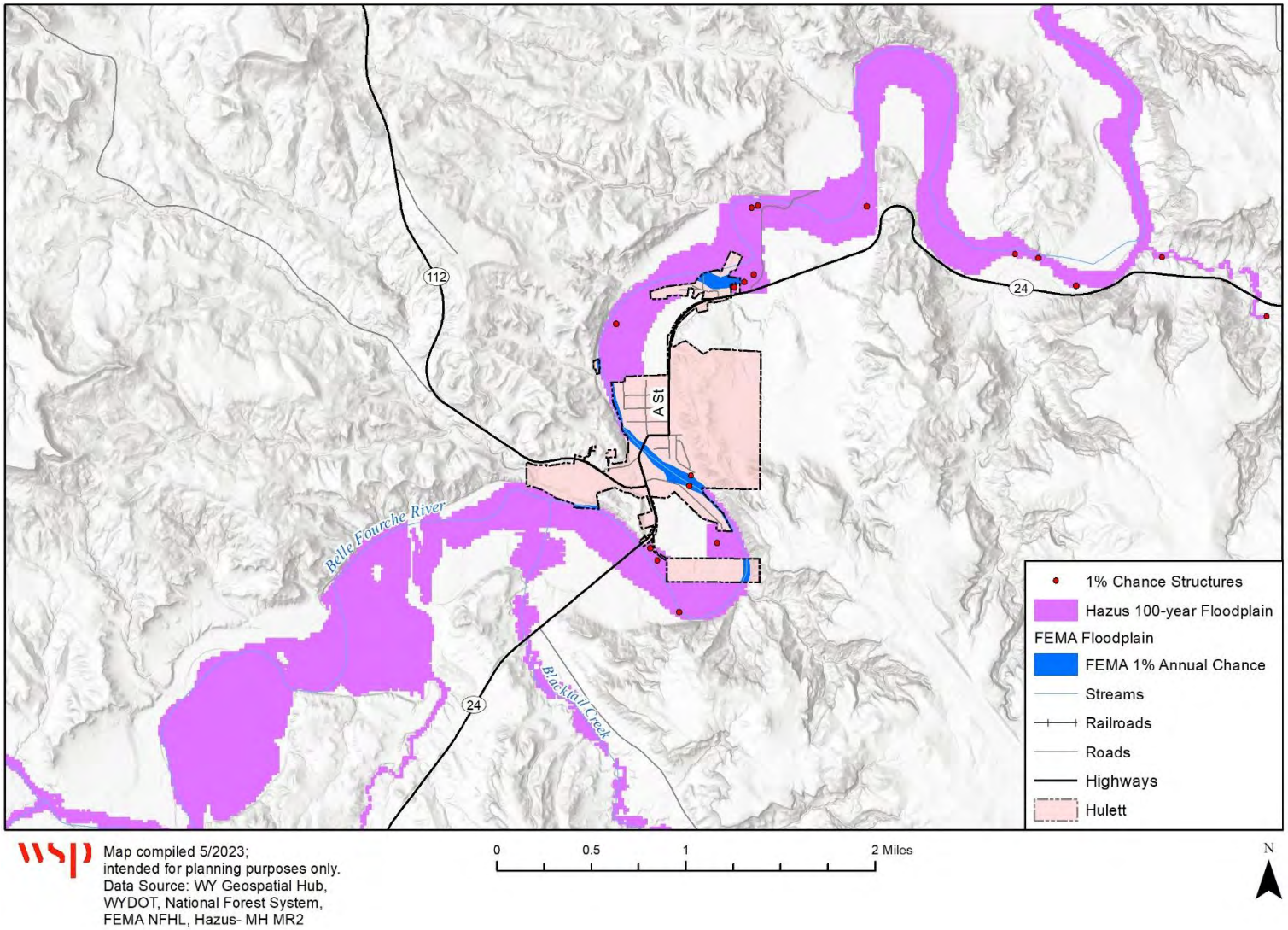


Figure 8 Town of Moorcroft FEMA and Hazus Flood Hazards

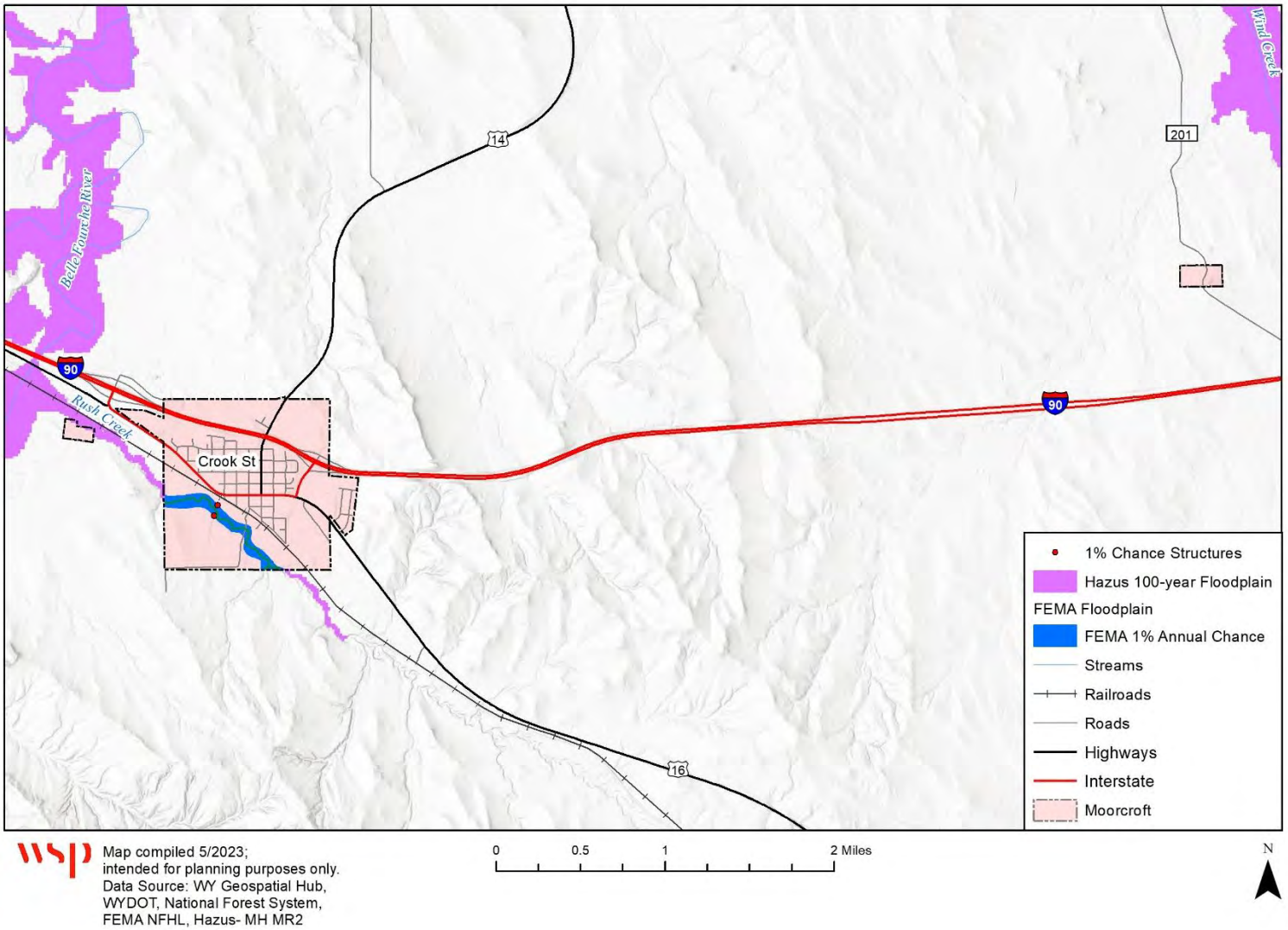
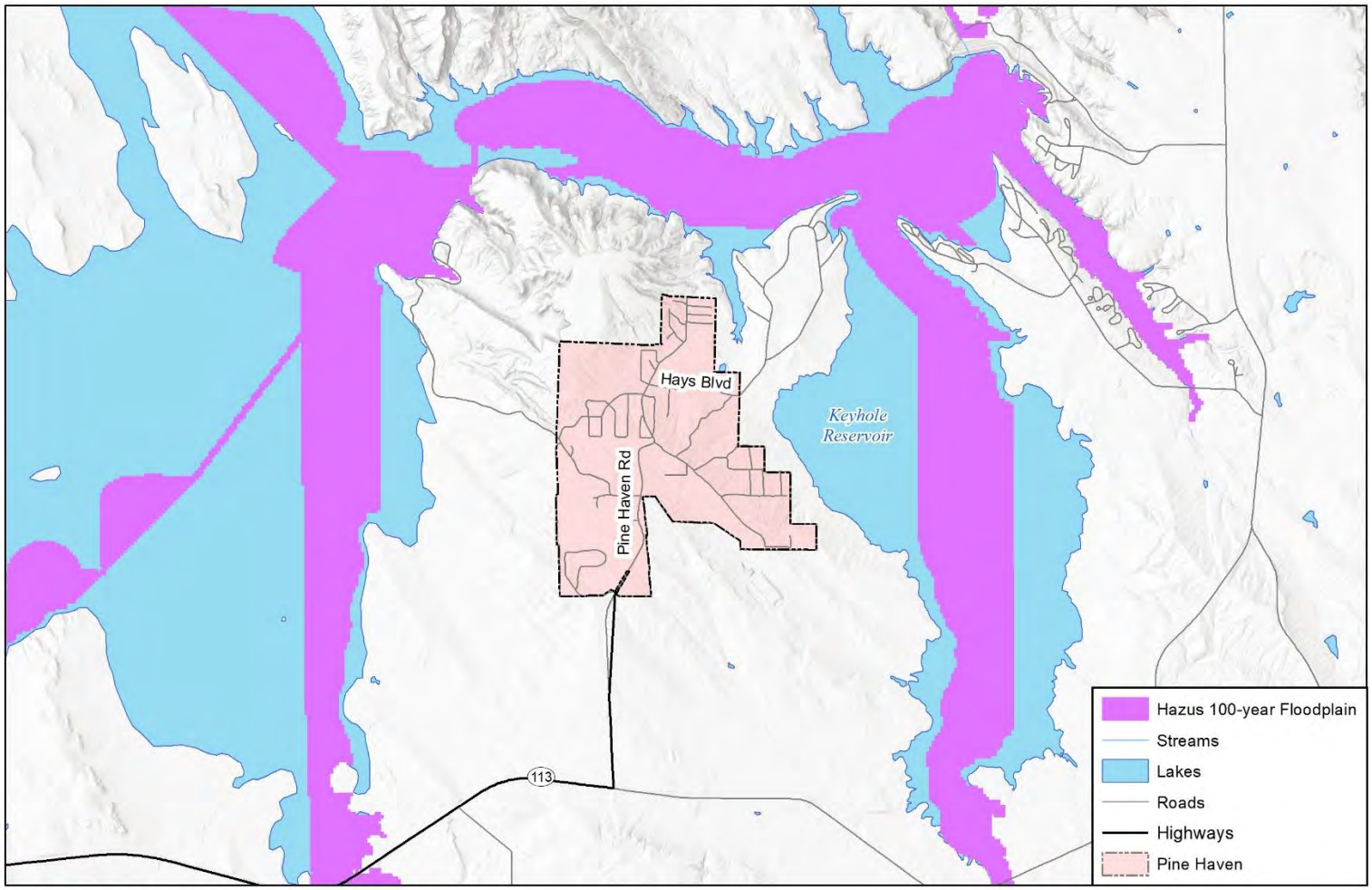
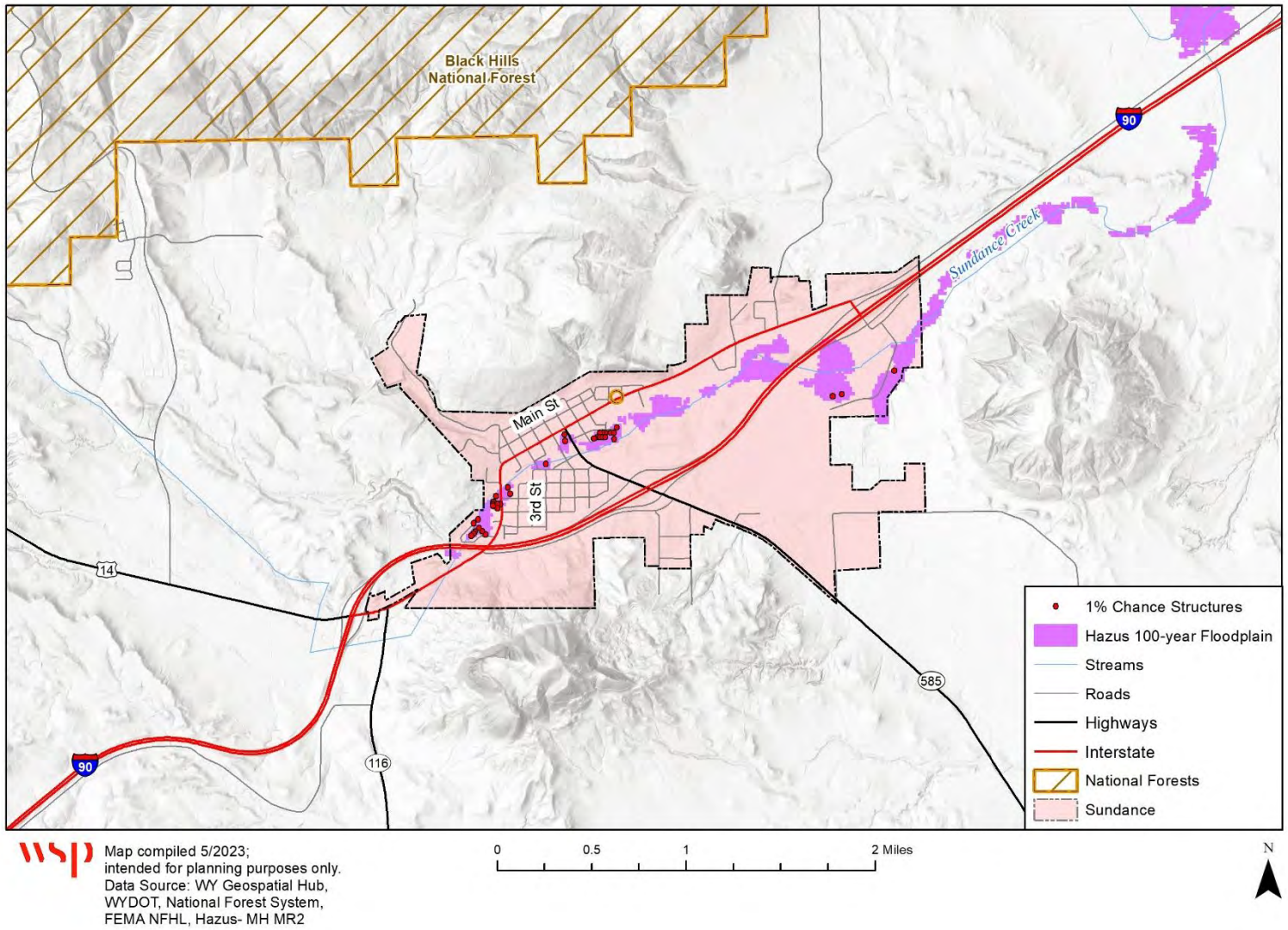


Figure 9 Town of Pine Haven FEMA and Hazus Flood Hazards



Map compiled 5/2023;
intended for planning purposes only.
Data Source: WY Geospatial Hub,
WYDOT, National Forest System,
FEMA NFHL, Hazus- MH MR2

Figure 10 City of Sundance FEMA and Hazus Flood Hazards



Sources of flooding in Crook County include the Little Missouri River, Belle Fourche River, Sundance Creek, and potentially the Keyhole Reservoir. Most reported flooding has taken place near Moorcroft and Sundance as well as surrounding unincorporated areas including Aladdin, Colony, Lightning Flat, Oshoto, and New Haven. There has been nineteen events with total of $266,000 has been lost in property damages since 2001. The sources of the flooding were all heavy rains.

During early June of 2008 there was riverine flooding of the Belle Fourche River, Oak Creek, Hay Creek, and other smaller streams north of Aladdin, which caused inundation of many roads.

In 2013 there were two events affecting New Haven. One started May 31 of 2013, and the other a day after, on June 1st. These two days' flooding combined caused $160,000 in property damages, due to several creeks and streams across the county flooding. Several areas of the Belle Fourche River were reported to have reached a stage of 7.5 feet, which is three feet above the flood stage level.

Table 6-15 summarizes several significant flood events that occurred between 2001 and 2023 in Crook County, as reported to the NOAA National Centers for Environmental Information (NCEI) system. Table below contains information on NFIP policy and insurance claims information for Crook County.

Table 6-15 Flood Events in Crook County, 2001-2023

County	Type	Location	Date	Property Damage	Crop Damage
Crook County	Flood	Aladdin	6/4/2001	0	0
Crook County	Flash Flood	Sundance	6/30/2001	0	0
Crook County	Flood	Moorcroft	5/5/2007	0	0
Crook County	Flood	Moorcroft	5/23/2008	0	0
Crook County	Flood	Colony	6/5/2008	$100,000	0
Crook County	Flash Flood	Colony	5/18/2010	0	0
Crook County	Flood	Lightning Flat	5/21/2011	0	0
Crook County	Flash Flood	Oshoto	7/2/2011	0	0
Crook County	Flood	Colony	3/11/2012	0	0
Crook County	Flood	New Haven	5/31/2013	$60,000	0
Crook County	Flood	New Haven	6/1/2013	$100,000	0
Crook County	Flash Flood	Sundance	7/22/2014	0	0
Crook County	Flash Flood	Moorcroft	6/17/2015	$5,000	0
Crook County	Flood	Moorcroft	7/27/2017	$1,000	0
Crook County	Flood	Colony	5/29/2018	0	0
Crook County	Flash Flood	Lightning Flat	7/17/2018	0	0
Crook County	Flash Flood	Aladdin	7/17/2018	0	0
Crook County	Flood	Lightning Flat	7/17/2018	0	0
Crook County	Flood	Moorcroft	3/28/2019	0	0
Crook County	Flood	Moorcroft	4/1/2019	0	0
Crook County	Flash Flood	Sundance	6/30/2019	0	0
Total				**$266,000**	**0**

Source: NOAA NCEI

Table 6-16 NFIP Policy and Insurance Claim Data

Crook County	Policies	Coverage "Insurance in Force"	# of Claims "Closed Paid Losses"	Paid Losses "$ of closed paid losses"	# of Policies in A Zones
Hulett, Town of	2	$600,000	0	$0	1
Sundance, Town of	2	$472,000	0	$0	0
Total	**4**	**$1,072,000**	**0**	**$0**	**1**

Source: FEMA Policy and Claim Statistics http://www.fema.gov/policy-claim-statistics-flood-insurance and State of Wyoming Department of Homeland Security, NFIP Coordinator as of 5/10/2023

6.3.5.2 Development Trends

For NFIP participating communities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. The lack of comprehensive flood hazard mapping in unincorporated areas of Crook County makes floodplain management challenging. No major growth or development in the County or jurisdictions is expected to significantly alter the general area flood risk, but good planning, zoning, and general hazard mitigation practices are always necessary to prevent future development from being heavily impacted by flooding.

6.3.6 Hail

Hailstorms are intermittent in Region 1, typically occurring in conjunction with severe summer storms. They mainly impact buildings and agriculture. Crop damage accounts for the majority of the harm, although there's the potential for significant structural damage caused by exceptionally large hailstones. The likelihood of future hail events in Sheridan County is moderate, but the scale of these incidents tends to be relatively minor.

6.3.6.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Although, hail presents a moderate threat throughout the County and remains consistent across jurisdictions. However, it's important to note that property damage is more likely in urban areas (due to exposed infrastructure and vehicles), whereas potential harm to crops and livestock is concentrated in rural areas and unincorporated areas.

See Section 4.2.7 of the Base Plan for more information on the previously recorded hail events and associated damages, and to revisit the hail map found on Figure 4-37. The total property damage recorded for the County since 1950 due to this hazard is $3,349,200, with $20,000 crop damages on file. (Source: NOAA's NCEI database.)

All above-ground critical infrastructure and lifelines are potentially exposed to hail events and it is not possible to refine risk further. No specific natural, cultural or historical resources are at risk.

Vulnerable populations that may be affected by hail may include ranchers and farmers that work outdoors. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a major hail event.

6.3.6.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.7 Hazardous Materials

As further discussed at a regional level in the Base Plan, since 2007 Crook County has been exposed to an average if 16 NRC- reported incidents per year, that were significant enough to be recorded in the U.S. Coast Guard's National Response Center (NRC) database and Risk Management Plans (RMP) network; more information can be obtained at http://www.rtk.net/#rmp. Crook County contains four RMP facilities: Donkey Creek BG Mix Tanks, Raudsep BG Mix Tank, Reynolds BF Mix Tank (all of which handle flammable materials), and the Madison Pump Station which handles and treats chlorine. In addition, crude oil has been noted as a hazardous chemical also handled in the county. The table below summarizes the number of hazardous materials events that have occurred from 2007-2022 in Crook County.

Table 6-17 NRC-Reported Incidents in Crook County: 2007-2022

Year	Crook County
2007	33
2008	17
2009	22
2010	15
2011	22
2012	13
2013	9
2014	6
2015	10
2016	7
2017	23
2018	4
2019	4
2020	3
2021	3
2022	8
Yearly Average	**16.0**

Source: http://www.rtk.net/#rmp

The HMPC notes that life safety is a concern related to transportation incidents that can occur on the state and interstate highways and Burlington Northern/Santa Fe Railroad corridors in the County. I-90, state highways, and the railroads all serve as major corridors for transporting hazardous materials. According to the Crook County HazMat Response Plan, Crook County has roughly 50 miles of railroad track. The Burlington Northern Santa Fe Railroad averages nearly150 trains per day traveling through Crook County. Approximately 20% of these trains carry some hazardous materials cargo.

The most prevalent type of hazardous material transported appears to be combustible liquids. Commonly shipped hazardous materials include: gasoline and diesel fuel, paint related material, phosphoric acid, propane, and wet batteries, to name a few. Radiological materials are also transported on Crook County roads, but amounts are not known. Future uranium mining will greatly increase the amount of radiological material transported on both County

roads and the railroad. Overall, hazardous materials pose a high significance risk to Crook County.

6.3.8 High Winds and Downbursts

Wind is a constant presence in Wyoming but can be often overlooked. Assessing vulnerability based on location is challenging since damaging winds have occurred throughout the entire region.

6.3.8.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The primary risk associated with high winds include damage to inadequately constructed buildings, the potential for flying debris, car accidents, and harm to electrical and power infrastructure. High winds are typically unpredictable, and the resulting damages are often discussed in a regional context, even though downbursts can affect smaller areas.

Wind damage report in Wyoming Region 1 has totaled approximately of $165,163 indemnity payments for a total 1814.1 acres lost to wind events. Additionally, the NCEI reported a total of $547,000 in property damages between both types of wind events since 1950 in Crook County.

The probability of future occurrence for this event is likely, but the magnitude of these events is negligible. Overall, high winds pose a medium threat across the County and do not vary between the jurisdictions. There is not anticipated variation or specific vulnearbilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to wind damage leading to periodic power outages. See Chapter 4 of the base plan for more information on wind zones, events, and impacts.

6.3.8.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.9 Landslide/Debris Flow/Rockfall

The geologic history and unique conditions of Wyoming make landslides one of the most common hazards. In Crook County, landslide deposits are found primarily in the forms of slump and complex slope movements, concentrated in the central portions of the county. These landslide areas are rather sprinkled throughout, with very small parts to the east seeing some unstable rock, and a few minor areas to the southeast at risk of debris or earth flows.

6.3.9.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

While the overall hazard significance is low in the county, GIS analysis of properties reveals the following potential exposure; a site specific analysis would be required to determine true risk. The results are summarized by jurisdiction in the table below.

Table 6-18 Landslide Exposure by Jurisdiction and Property Type in Crook County

Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value	Estimated Content Value	Total Value
Hulett	4	40	-	**44**	$10,705,907	$6,787,651	$17,493,558
Moorcroft	-	-	50	**50**	$10,394,837	$6,650,837	$17,045,674
Pine Haven	-	-	95	**95**	$20,287,758	$10,143,879	$30,431,637
Sundance	24	162	13	**199**	$42,325,582	$27,604,039	$69,929,621
Unincorporated	150	347	440	**937**	$148,782,091	$81,319,840	$230,101,931

Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value	Estimated Content Value	Total Value
Total	**178**	**549**	**598**	**1,325**	**$232,496,175**	**$132,506,245**	**$365,002,420**

Source: WYGS Landslide Susceptibility data, Wyoming CAMA 2022, WSP GIS Analysis

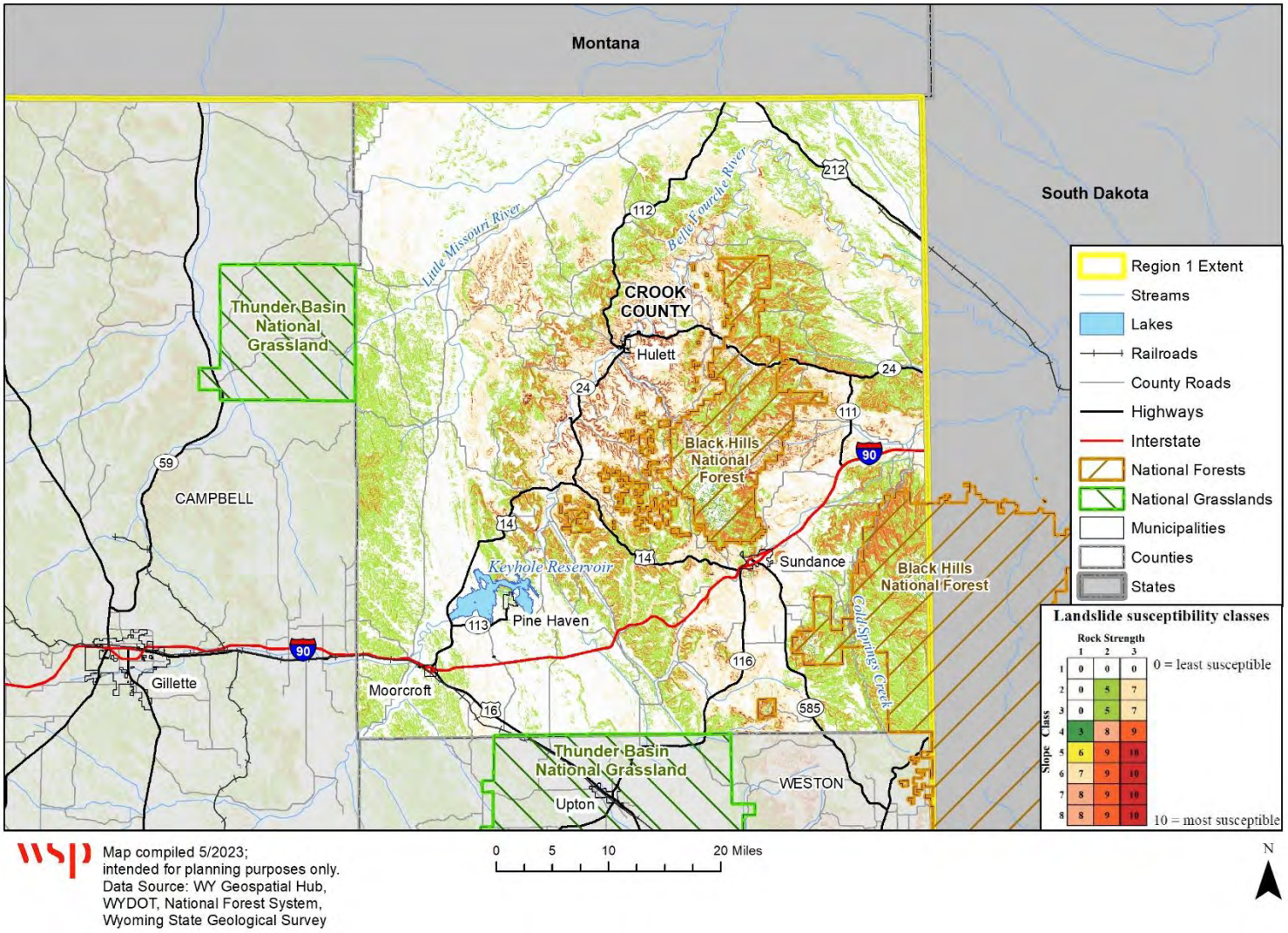
Based on the GIS analysis approximately 2,275 may reside on landslide susceptible areas, mostly in the unincorporated areas. Risk to populations is generally considered low as the landslides are commonly slow moving events in this part of the Region. A preschool and assisted living facility in Sundance were noted to be in Moderately High landslide susceptibility areas.

While some events are small and have limited impact on people and infrastructure, other occurrences can involve large sections of earth and may obstruct major roadways, power line corridors, or gas lines. Future impacts are likely to affect transportation corridors, rivers, lakes and reservoirs, transmission lines, campgrounds and the occasional structure or property in the county. Twenty critical facilities were found to be exposed to landslides, debris flows, or rockfall hazards, primarily communications and transportation infrastructure, but notably the Crook County Fire Department (2 facilities).

Landslides, debris flows, and rockfalls occur regularly in Wyoming and the Region, though limited information was available on previous occurrences that caused a particular high amount of damage or incurred some other cost or unique impact. The HMPC noted that Cook Lake and Carlisle had mitigation efforts related to landslides, ongoing as of 2023. On July 22, 2011, a federal disaster was declared for the State of Wyoming for emergency work and the repair or replacement of facilities damaged by the severe storms, flooding, and landslides in Albany, Big Horn, Carbon, Crook, Fremont, Goshen, Johnson, Lincoln, Platte, Sheridan, Sublette, Teton, Uinta, Washakie, and Weston Counties. This declaration made Public Assistance funding available. In addition, WYDOT spent an estimated $7.8 million in between 2004 and 2012 in Crook County to fix three slide areas that had damaged state highways, including work on a major slide near Devils Tower. Landslides can also damage utility lines and disrupt services around the county.

The distribution of landslide susceptibility can be seen in the figure below.

Figure 11 Crook County Landslide Hazards



To summarize, landslides, debris flow, and rockfall hazard significance varies based on the magnitude and the location. There is also a possibility that natural resources including creeks or rivers within the county could become dammed by landslide activity, resulting in a flash flood hazard downstream if the landslide dam fails or is overtopped, or flood nearby developed areas as pooling behind the landslide dam occurs.

6.3.9.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Furture planning in areas of steep slopes should consider the potential for slope failure/landslide hazards, notably in and around Sundance.

6.3.10 Lightning

6.3.10.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

All areas in western Wyoming are susceptible to lighting strikes. Impacts to persons and property are likely to remain isolated. Outdoor workers and outdoor enthusiasts and livestock will remain susceptible to lightning strikes. In Crook County, higher elevation/mountainous areas remain more susceptible. Ten lightning events have been recorded in Crook County from 1950-2022, with $250,000 in total damages accrued from the various events (in the form of property damages and crop losses). Lightning caused wildland fires may result in more extensive and compound/secondary damages as well. The table below summarizes the recorded events from this hazard.

Table 6-19 Lightning Events in Crook County, 1950-2022

County	Number of Events	Injuries	Fatalities	Property Damage	Crop Damage	Total Damage
Crook	4	2	0	$ 250,000	$ 0	$ 250,000

Source: 2016 Wyoming State Multi-Hazard Mitigation Plan

On July 9, 2001, a lightning strike ignited a sporting goods store in Moorcroft; most of the building was destroyed in the fire.

The HMPCs reported that lightning strikes are very common, and have led to losses of livestock, damage to houses, fences, and a hay stack fire that led to $6M in damages across Region 1. Sometimes, communications and infrastructure are interrupted by lightning strikes. These events raise the vulnerability of the essential functions by delaying response times, hindering interagency communication efforts, or endangering or damaging communication networks. Lightning has at least twice struck communications towers, knocking out radio systems. Livestock strikes are more common than strikes to humans. Crook County's HMPC felt this hazard should be raised to high significance due to past damages and potential for wildfire ignitions, which could impact local natural resources. No specific cultural resources have been identified as at risk.

6.3.10.2 Development Trends

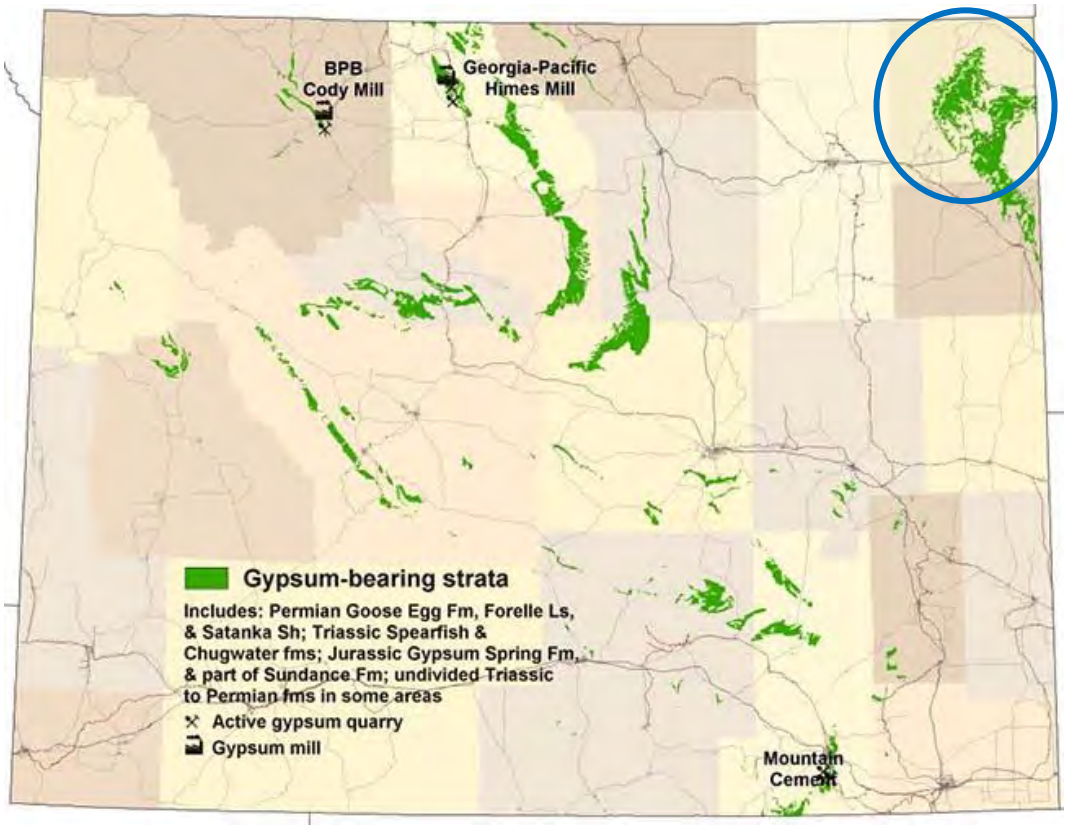
As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.11 Mine and Land Subsidence

There are numerous abandoned mine sites with subsidence-prone underground workings in Crook County. Many mines across the county have been identified and there are mitigation projects designed to reduce the impacts from underground mining and subsidence, and to remove the threat they pose to the surrounding area. The unmitigated identified mines pose little to no threat to infrastructure in the surrounding area. Mine and general land subsidence events occur occasionally, and the degree of risk and impact varies based on the characteristics of each area. Crook County should continue to make efforts to study geologic hazards as they relate to future industry and development to avoid future problems.

A layer of prehistoric rock known as the Triassic Spearfish Formation traverses Crook County. The formation is abundant with gypsum, a soluble mineral that dissolves as water infiltrates the ground. As the gypsum dissolves, caves form underground; sinkholes appear on the ground surface when the roof of an underground cave collapses. This type of landscape is referred to as "karst," identified by the dissolution of layers of soluble minerals and bedrock. Karst landscapes may be marked by caves, sinkholes, cenotes, and other surface features. Figure 12 depicts known locations of gypsum-bearing strata in the State. Note the abundance of gypsum in Crook County (circled in blue).

Figure 12 Gypsum-bearing strata in Wyoming



Source: Wyoming State Geological Survey, "Gypsum," accessed December 13, 2012.

Refer to Section 4.2.12 from the Base Plan for a more detailed vulnerability assessment and maps with the location of abandoned mine sites, mine reclamation and abandonment programs, land subsidence information, and other details relevant to Crook County and Region 1.

6.3.11.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The overall risk of this hazard in the County is low and not anticipated to have substantial effects on structures, populations, natural or cultural resources or variability across jurisdictions. Linear infrastructure in the unincorporated areas could be potentially vulnerable. A study was conducted to evaluate the presence of geologic hazards along the proposed Bakken Pipeline route in Crook and Weston counties. The report, published April 4, 2012, determined that the abundance of soluble gypsum beneath the proposed pipeline route could compromise the project. If the pipeline were damaged by a sinkhole, natural gas or liquid petroleum could seep out. Liquid petroleum leaking out of the pipeline could contaminate local ground water. Subsidence issues could seriously compromise the Bakken Pipeline project

6.3.11.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Linear pipeline development initiatives shouldn't be undertaken without a thorough geologic hazard study.

6.3.12 Severe Winter Weather

Winter storms are a yearly feature of the Wyoming climate and may occur anywhere in the state. Blizzard conditions bring the triple threat of heavy snowfall, strong winds, and low temperatures. Poor visibility and huge snowdrifts are major hazards caused by blowing snow. These storms disrupt work, make travel difficult or impossible, isolate communities, kill livestock by the hundreds or thousands, and sometimes leave human fatalities in their wake. Higher elevation and mountainous areas tend to be more susceptible to severe winter weather events. In Crook County, there have been $2,190,000 worth of reported property damage from 1996 to 2023 according to NCEI. In this time period, 166 winter storms were reported. (Source: NOAA's NCEI database.)

6.3.12.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The HMPCs reported that Interstate closures are common during winter storm events, which leads to the need to shelter stranded motorists, can create economic impacts, and can cause problems due to diverted semi-trucks on city and town streets. Access to rural homes can also become an issue, especially during prolonged storms; residents are encouraged to keep a 3-day supply of food, medication, and oxygen.

The overall significance of this hazard is **high** across the County and does not largely vary between the jurisdictions. Winter storms do not have substantial impacts to natural or cultural resources. Impacts on livestock are a concern that can have socioeconomic impacts.

Refer to Section 4.2.13 of the Base Plan for more details, since winter storms and related weather are easier to describe regionally than on a county by county basis.

6.3.12.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.13 Tornado

Many documented tornadoes occurring in the counties in Region 1 are given low ratings on the Fujita Scale (F0s and F1s) simply because these tornadoes are often formed over open land and result in little or no damage. Crook County has had 32 reported incidents of this kind from 1950-2022, according to the NOAA NCEI database. The table below summarizes the tornado events in this time period:

Table 6-20 Tornado History in Crook County, 1950-2016

County	Total Incidents	Magnitude	Damage-Causing Incidents	Fatalities	Injuries	Property Damage
Crook	32	F3	21	0	3	$ 848,120

Source: NOAA's NCEI, Crook County Multi-Hazard Mitigation Plan

Historical tornadoes in Crook County and Region 1 overall are most common during the months of May through August. Based on the historical data, it is estimated that one tornado will occur in Crook County about every 2.2 years on average.

6.3.13.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The overall significance is medium in the county and does not vary between the jurisdictions. There is not anticipated variation or specific vulnerabilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to tornado damage leading to periodic power outages. See Chapter 4 of the base plan for more information on tornadoes, events, and impacts.

6.3.13.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.14 Wildfire

Historically, most significant fires in Crook County have occurred north of Pine Haven and southeast of Sundance, in and around the Black Hills National Forest. The fires affecting over 1,000 acres of land in the county are summarized on Table .

According to the Federal Wildland Fire Occurrence Data, 53,122 acres have burned just in fires of 1,000 acres and above since 1980. The largest fire in Crook County occurred in 2006, when the Thorn Divide Complex burned, causing damage to 14,973 acres. The table below describes only the Crook County wildfires that burned 1,000 or more acres between 1980 and 2023, though many more have taken place over the years.

Table 6-21 Wildfires over 1,000 acres in Crook County: 1980-2023

Name	Year	Acres Burned
Thorn Divide Complex	2006	14,896
Kara Creek	2016	12,359
Fish	2022	6,793
Woods	2000	6,089
Basin Draw	2004	4,718
South Sundance Complex	2005	2,933
Douglas	2016	2,347
Ghost	2012	1,507
McFarland Divide	2001	1,480
TOTAL		**53,122**

Source: National Incident Feature Service (NIFS)

6.3.14.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

There have been no catastrophic urban fires documented in Crook County although large wildland fires become increasingly damaging as the population expands into the more rural areas. The method utilized for estimating potential future impact is to determine the value of structures that are located within Wildfire Risk Areas, or wildland fire building exposure values. Wildland fire building exposure value is the value of buildings that can be potentially damaged by wildland fire in an area. Building exposure values are based on county assessor data. The methodology utilized is like that used to model flood exposure described in the flood chapter.

Table below summarizes the building counts, property value, and estimated population exposed to medium, high, or highest wildfire risk areas throughout Crook County. Total exposure is estimated at $427 million in property value, with approximately $195 million of this total located in the unincorporated areas of the county. An estimated 2,943 people in Crook County reside in areas of medium wildfire risk or higher. Vulnerable populations may include school-aged children and elderly populations, or those that may not have resources to evacuate. Visitor populations may also be vulnerable.

Refer to Section 4.2.15 of the HIRA for details on vulnerable critical facilities in Crook County. The lifelines in areas of medium to high risk include communications, energy and transportation facilities, as well as two hazardous materials facilities.

Natural and cultural resources impacts could be significant due to the large amount of National Forest and the Devils Tower National Monument.

Figure 13 through Figure 17 below display the areas of greatest wildfire risk, according to WYWRAP data, for the county and towns of Hulett, Moorcroft, Pine Haven, and Sundance, respectively. Generally, the areas of highest risk are concentrated in and around the municipalities of Crook County. Figure 18 displays the wildfire history in and around Crook County since 1980. Wildfire is a **high** significance hazard for Crook County.

Table 6-22 Crook County General Building and Population Exposure within Medium, High, and Highest Wildfire Risk Areas

Jurisdiction	Parcel Count Highest	Parcel Count High	Parcel Count Medium	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Hulett	102	3	-	**105**	$22,162,180	$14,477,991	**$36,640,171**	210
Moorcroft	180	-	-	**180**	$29,764,931	$17,307,244	**$47,072,175**	410
Pine Haven	189	23	-	**212**	$43,691,727	$23,213,488	**$66,905,215**	531
Sundance	267	17	-	**284**	$50,121,332	$31,298,600	**$81,419,932**	655
Crook Unincorporated	105	235	269	**609**	$121,147,825	$73,873,834	**$195,021,659**	1,136
Total	**843**	**278**	**269**	**1,390**	**$266,887,995**	**$160,171,156**	**$427,059,151**	**2,943**

Source: WYWRAP, Wyoming CAMA2022, WSP GIS Analysis

Figure 13 Crook County Wildfire Risk

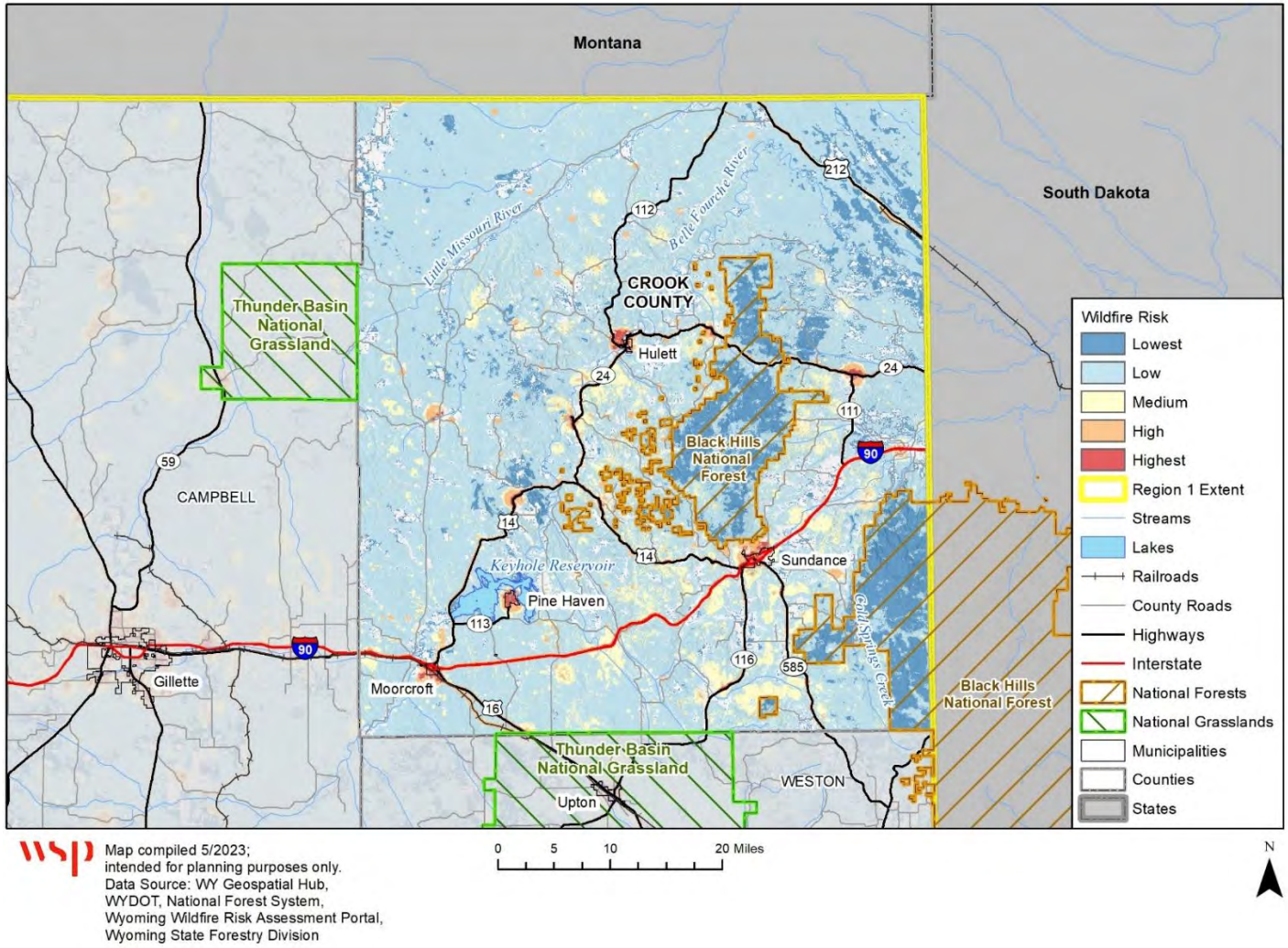
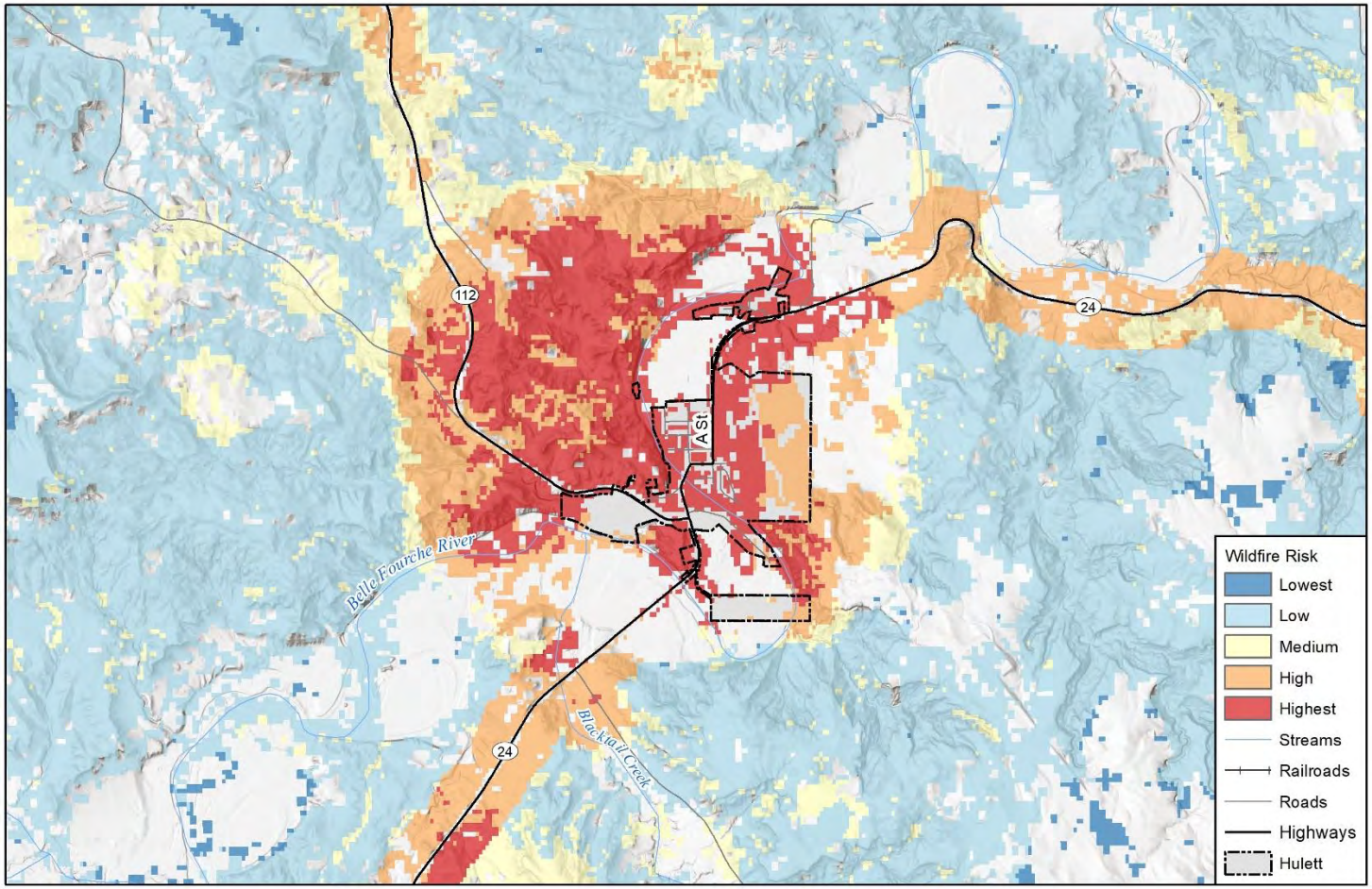


Figure 14 Town of Hulett Wildfire Risk



Map compiled 5/2023;
intended for planning purposes only.
Data Source: WY Geospatial Hub,
WYDOT, National Forest System,
Wyoming Wildfire Risk Assessment Portal,
Wyoming State Forestry Division

Figure 15 Town of Moorcroft Wildfire Risk

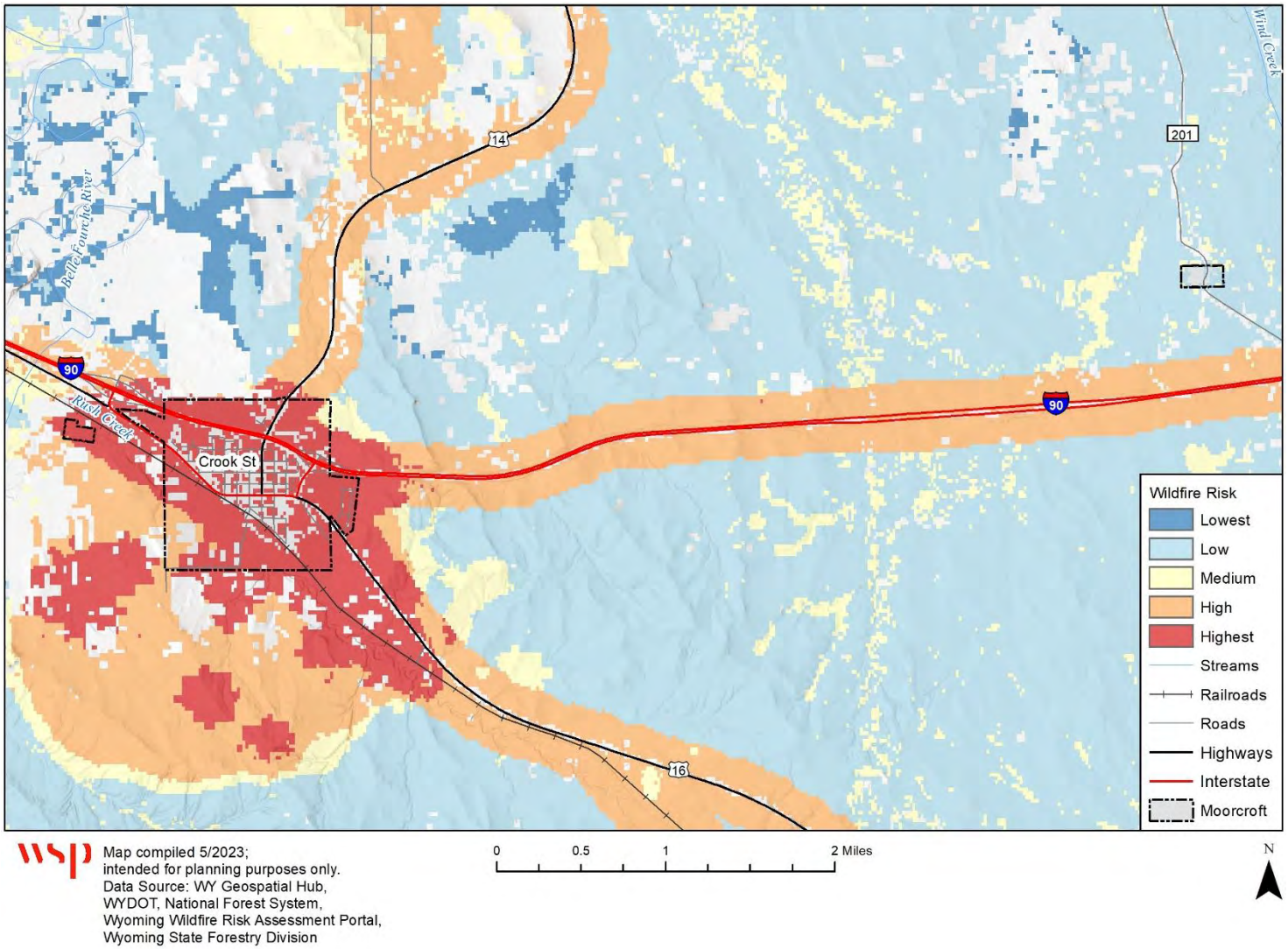


Figure 16 Town of Pine Haven Wildfire Risk

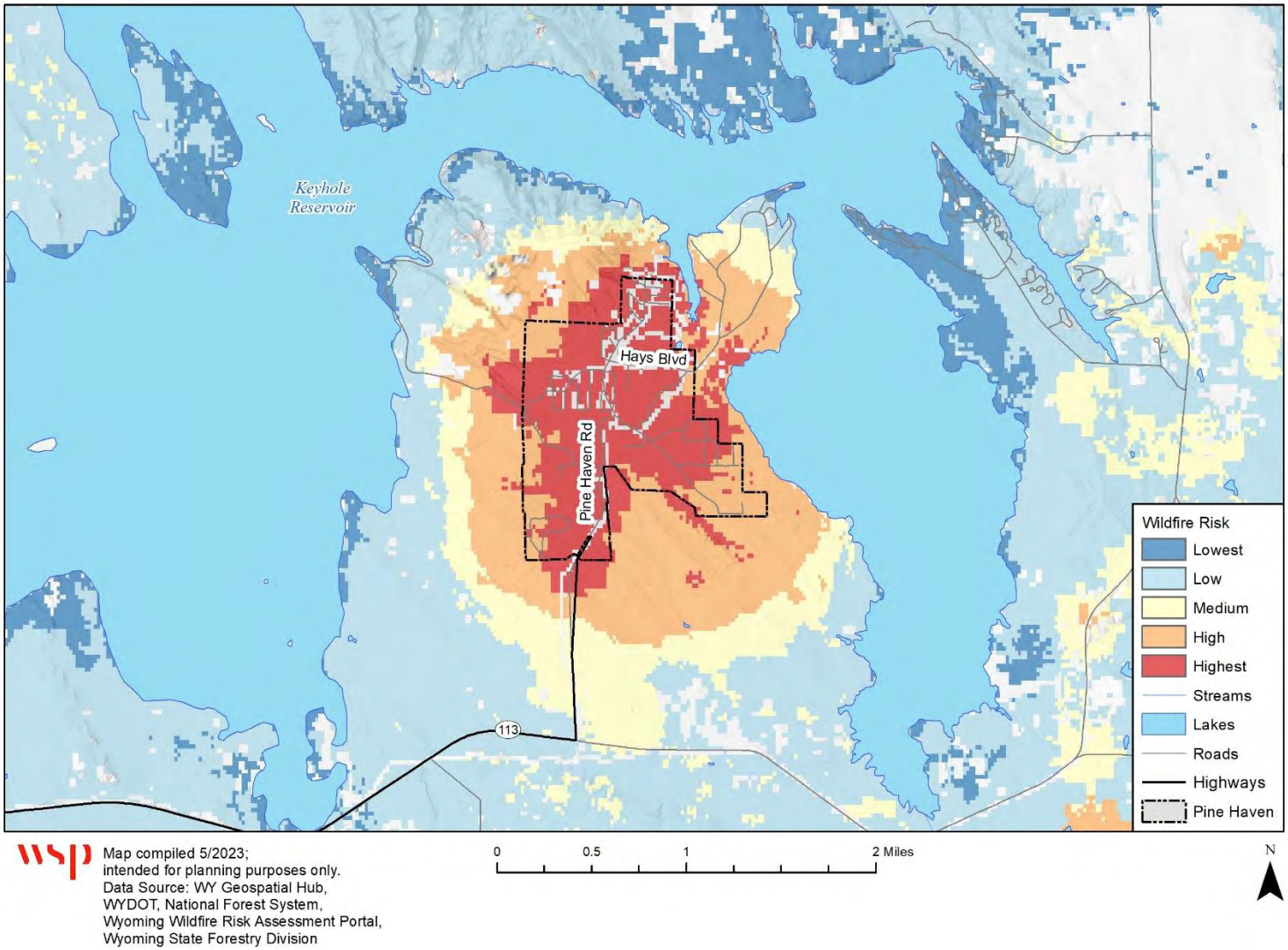


Figure 17 City of Sundance Wildfire Risk

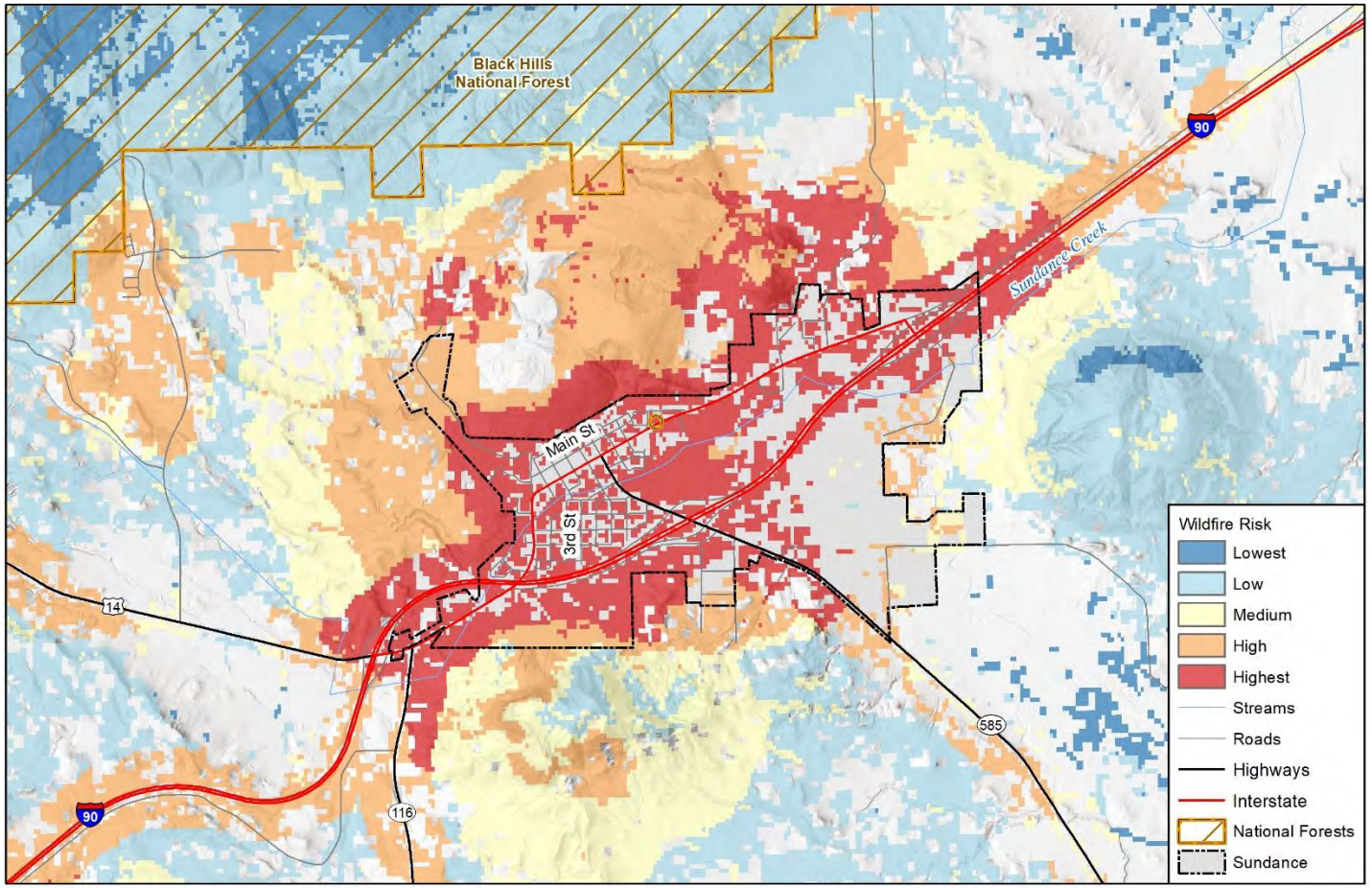
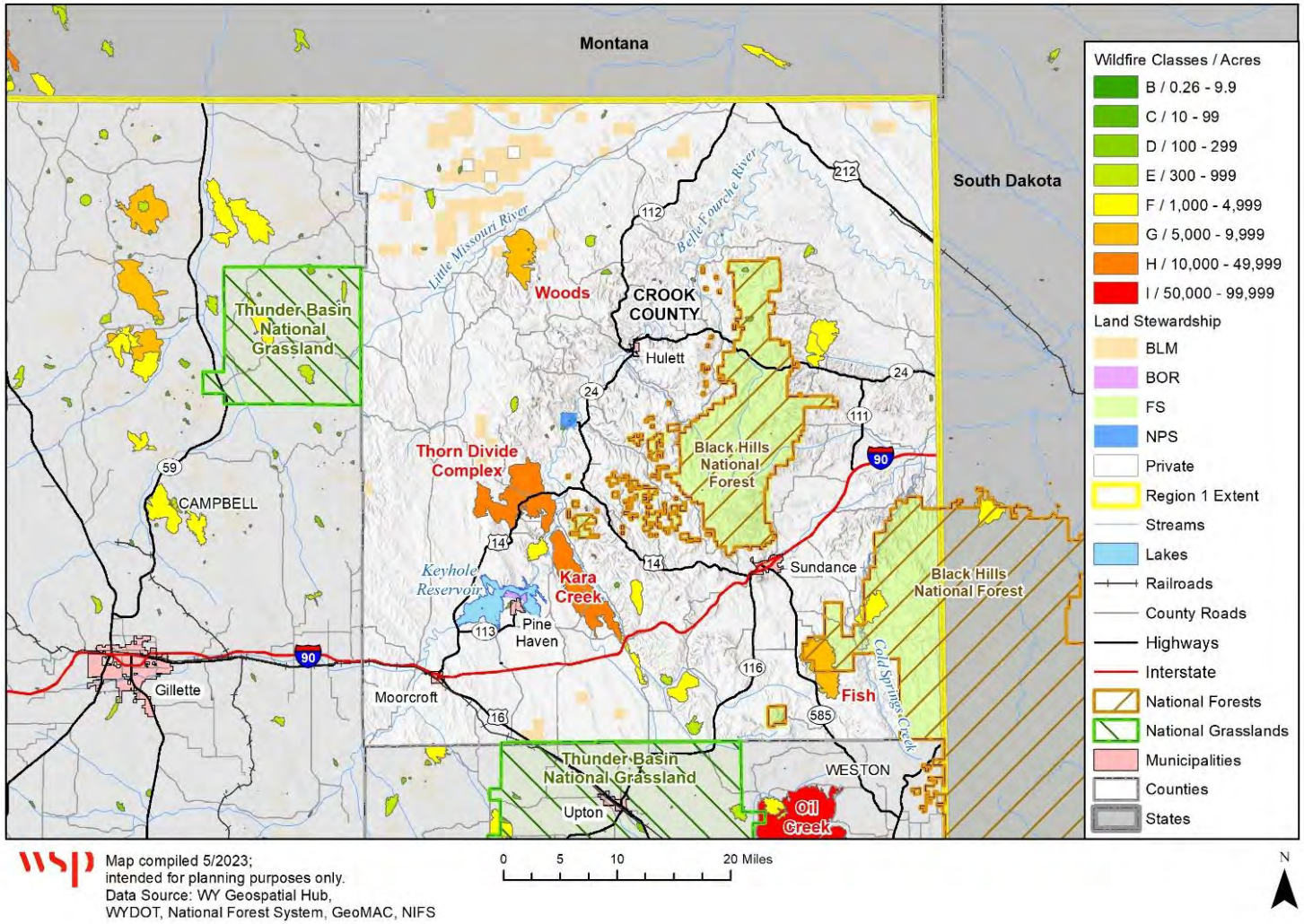


Figure 18 Crook County Wildfire History, 1980-2023



6.3.14.2 Development Trends

As noted in Sections 3 and 4, population growth in the unincorporated County may be indicative of a potential increase in hazard exposure. The wildland/urban interface (WUI) is a very popular building location, as shown by national and statewide trends. Anecdotal input from the HMPC indicates that this trend is occurring in Weston County.

6.3.15 Coal Seam Fire

Crook County has a history of coal mining and as such may have experienced coal seam fires at various times. However, research from E.L. Heffern (2013)[1] shows limited history of coal seam fires in the area.

6.3.15.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

This does not exempt Crook County from the effects of these fires, however, but effects are expected to be negligible/limited in the unincorporated County and not directly affect the municipalities. Effects from fires in Campbell County to the west can cross county borders, but would be highly unlikely to reach the incorporated areas of the municipalities. The combustion of coal produces toxic gases which can contribute to poor air quality and pose health risks to nearby communities, but the areas of Crook County adjacent to Campbell County are sparsely populated.. The smoke and particulate matter emitted by the fires can also cause respiratory issues and exacerbate existing respiratory conditions. The runoff from coal seam fires can contaminate nearby water sources with pollutants and harmful substances. The leaching of chemicals from the burning coal and the ash can enter streams, rivers, and groundwater, potentially affecting aquatic life and human water supplies.

6.3.15.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

7 Mitigation Capabilities Assessment

As part of the regional plan development, Region 1 and participating jurisdictions developed a mitigation capability assessment. Capabilities are those plans, policies and procedures that are currently in place and contribute to reducing hazard losses. Capabilities also include staffing and financial considerations, including the ability to leverage funding for mitigation projects. Combining the risk assessment with the mitigation capability assessment results in “net vulnerability” to disasters and more accurately focuses the goals, objectives, and proposed actions of this plan. The purpose of this effort was to identify policies and programs that were either in place or could be undertaken, if appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, projects, and programs to determine if they contribute to reducing hazard related losses.

1 *Known Historic Or Active Coal Fires In The Powder River Basin, Wyoming and Montana*, Compiled by E.L. Heffern, 2013; *Clinker Distribution and Age in the Powder River Structural Basin*, E. L. Heffern, P. W. Reiners, and C. A. Riihimaki, 2013

7.1 Capability Summary

Table provides an assessment of Crook County's mitigation capabilities, based on input collected from the HMPC via data collection guides and information contained on county and municipal websites.

Table 7-1 Crook County Capability Assessment

Element	Crook County	Hulett	Moorcroft	Pine Haven	Sundance
Planning Capabilities					
Comprehensive Plan	Yes	Yes (Town of Hulett Emergency Mgmt. Update) – 2012. Events in 2009/10/11	Yes – May 2017	No	No
Capital Improvement Plan	Yes	No	Yes	No	Yes
Emergency Operations Plan	Yes	Yes – Call down list. Flood response at the county level – March 24, 2011	Yes – May 2017	Yes – 03/01/18	No
Recovery Plan	No	Yes - 2012	Yes – May 2017	Yes - at the county level, but no local one	Yes
Mitigation Plan	Yes, 12/23/13	Yes	Yes	Yes	Yes
Debris Management Plan	No	No	Yes	No	No
Economic Development Plan	No	No	Yes	No	Yes
Transportation Plan	No	Yes – 2004. Keyhole dam emergency evacuation	Yes	N/A	No
Land-use Plan	Stated in 1977 but revoked in 1998; addresses only public lands. County has rural addressing.	No	N/A	No	Yes
Flood Mitigation Assistance (FMA) Plan	No	No	N/A	No	No
Watershed Plan	No	No	N/A	Yes	No

Element	Crook County	Hulett	Moorcroft	Pine Haven	Sundance
Community Wildfire Protection Plan or other fire mitigation plan	Yes – 2005	No	Yes – ongoing	No	No
Critical Facilities Plan (Mitigation/Response/ Recovery)	No	No	May 2017	No	No
Floodplain Management Plan	No	No	No	No	No
Stormwater Program/Plan/Ordinance	No	No	No	No	No
Erosion / Sediment Control Program	No	No	No	No	No
Policies/Ordinance					
Zoning Ordinance	N/A	Yes – March 2010	No	Yes	Zoning codes written in 1994
Building Code	No	Original 1994	Yes – IBC 2012	2012 – IBC	Building codes written in 1994
Floodplain Ordinance	No – Not mapped/not required	Yes (No. 1-2007)	Yes	No	Yes
Subdivision Ordinance	Yes	Zoning	Yes	Yes	Subdivision regulation written in 1994
Tree Trimming Ordinance	No	Zoning	No	No	No
Nuisance Ordinance	No	Yes	Yes	Yes	Yes
Storm Water Ordinance	No	Sewers zoning – 51.40	No	No	Yes
Drainage Ordinance	No	Zoning	No	Yes	Yes
Site Plan Review Requirements	No	Zoning – approved by Board	Yes	Yes	Yes
Historic Preservation Ordinance	No	No	No	No	No
Landscape Ordinance	No	Zoning	No	No	Yes
Growth Management Ordinance	No	No	No	No	No
Elevation Certificates for Floodplain Development	NA	No	No	NA	No

Element	Crook County	Hulett	Moorcroft	Pine Haven	Sundance
Other Hazard Ordinance (Steep slope, wildfire, snow loads, etc.)	No	No	No	No	No
Programs					
Zoning/Land-use Restrictions	No	Yes – Zoning	No	Yes	Yes
Codes Building Site/Design	No	Zoning	Yes	Yes	Yes
Hazard Awareness Program	No	EM	Yes	No	No
National Flood Insurance Program	No/ Not Required	Yes, Access online – mapped for floodplain	Yes	No/ Not Required	Yes
Community Rating System (CRS)	No	Yes – Rated	N/A	No	No
National Weather Service (NWS) Storm Ready Certification	Yes	No	No	No	No
Firewise Community Certification	Yes	No	Crook County	Yes	No
Building Code Effectiveness Grading (BCEGs)	No	No	N/A	Yes	No
ISO Fire Rating	No	No	4	Classification – 07/7x	Yes
Economic Development Program	No	No	Yes	No	Yes
Land-use Program	No	Zoning	No	No	No
Public Education/Awareness	No	No	Some	No	No
Property Acquisition	No	Council	Yes	No	No
Planning/Zoning Boards	Yes	Via Council	Yes	Yes	Yes
Stream Maintenance Program	No	Keyhole Watershed District – Corp of Engineers	N/A	No	Yes
Tree Trimming Program	No	Public Works – PreCorp WYDOT - Private	No	No	Yes
Engineering Studies for Streams (Local)	No	Municipal, as needed	Yes	Yes	Yes
Mutual Aid Agreements	Yes	County Fire – CC Sheriff – Red Cross	Yes	Yes	Yes
Studies/Reports/Maps					

Element	Crook County	Hulett	Moorcroft	Pine Haven	Sundance
Flood Insurance Rate Maps (FIRM)	No	Yes – 09/28/07	Yes - 02/02/07	N/A	02/02/07
Hazard Analysis/Risk Assessment	Yes	Yes	Yes	Yes	Yes
Evacuation Route Map	No	School	Yes	No	Yes
Critical Facilities Inventory	No	Yes	Yes	Yes	Yes
Vulnerable Population Inventory	Being developed	Being developed	Yes	No	No
Land-use Map	No	Yes - Zoning	Yes	Yes	Yes

7.1.1 Land Use and Development Policies.

Crook County's approach to building regulations is unique. As of now, the county has not adopted any building codes, requires no building permits, conducts no final building inspections, and does not issue Certificates of Occupancy. Additionally, zoning is absent in Crook County outside of the municipalities. The municipalities have building codes. Although the county has a Comprehensive/Land Use Plan, it does not currently include zoning.

7.1.2 NFIP Participation and Continued Compliance

The National Flood Insurance Program (NFIP) Community Status Book outlines participation and flood map status for counties and jurisdictions across the country. Crook County and the Town of Pine Haven are not mapped and are not required to participate in the NFIP but are exploring participation in the future. Hulett, Moorcroft and Sundance all participate.

Table 7-2 NFIP Status in Crook County

Jurisdiction	Effective Map Status	Date Joined	Comments
Crook County	Not mapped	NA	Participation optional due to no mapping
Town of Hulett	09/28/07	04/01/99	
Town of Moorcroft	02/02/07	03/01/86	
Town of Pine Haven	Not mapped	Not mapped	Not mapped
City of Sundance	02/02/07	08/19/86	

Source: NFIP Community Status Book

As participants since 1999 and 1986, the towns of Hulett, Moorcroft, and Sundance will continue to comply with the NFIP to reduce flood losses and increase flood resiliency. Continued compliance with the NFIP includes continuing to adopt floodplain maps when updated as well as implementing, maintaining and updating floodplain ordinances. Actions related to continued compliance are summarized below:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- **Implementation of substantial improvement/substantial damage provisions**. After a flood event, or any event that may cause loss of a structure such as a fire or tornado, it is the role of the floodplain administrator to review and assess damaged structures located within the Special Flood Hazard Area. Substantial improvement/substantial damage occurs when the cost of restoring a structure exceeds 50 percent of its market value before damage occurred. Property owners are advised that structures experiencing substantial damage or undergoing substantial improvements must go through the floodplain application and permit process. Additionally, these structures must be upgraded during the repair or reconstruction process to meet the minimum building standards stipulated in the regulations. If it is determined substantial improvement/substantial damage has occurred, those structures must be brought up to current floodplain management standards. This ensures compliance with floodplain management measures and contributes to the overall safety and resilience of the affected structures. These provisions are common to the the towns of Hulett, Moorcroft, and Sundance floodplain management ordinances. Additional items specific to these jurisdictions include:
  - Hulett: Town Council or designee as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions. All new construction and substantial improvements must be constructred with materials, methods and practices that minimize flood damage.
  - Moorcroft: Town Mayor as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions.
  - Sundance: The City Operations Foreman as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions.
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

Also to be considered are the flood mitigation actions contained in the base Regional Plan and this annex, to support the ongoing efforts by participating counties to minimize the risk and vulnerability of communities to flood hazards, and to enhance their overall floodplain management program/s.

7.2 Administrative/Technical Resources

The following table identifies the County and participating jurisdictions' personnel responsible for activities related to mitigation and loss prevention in Crook County.

Table 7-3 Crook County Administrative/Technical Capabilities

Administrative/ Technical Resources	County	Hulett	Moorcroft	Pine Haven	Sundance
Staff/Department					
Building Code Official	No	Council	Yes	Yes	No
Building Inspector	No	Council	Yes	Yes	No
Mapping Specialist (GIS)	Yes	Yes	No	Yes	Yes
Engineer	Contract	As needed – Bearlodge Archived Project	Yes	Yes	Yes
Development Planner	Yes	None – Council	No	No – Planning & Zoning Commission	Yes
Public Works Official	No	Yes	Yes	Yes	Yes
Emergency Management Coordinator	Yes	Yes	Yes	Yes	Yes
NFIP Floodplain Administrator	No/NA	Yes Town Council	Yes Mayor	No/NA	Yes Public Works/Operations Foreman
Bomb and/or Arson Squad	No	Campbell County	No	No	No
Emergency Response Team	No	HVFD – County – EMS	Yes	Fire Dept. Ambulance	Yes
Hazardous Materials Expert	No	Campbell County	Yes	No	No
Local Emergency Planning Committee	Yes	Council	No	No	No
Sanitation Department	No	Hulett Municipal	Yes	No	Yes
Transportation Department	Yes	Hulett Public Works	No	No	No
Economic Development Department	No	Council via WBC	No	Yes	Yes
Housing Department	No	No	No	No	Yes
Historic Preservation	No	No	No	No	No
Planning Board / Commission	Yes	Via Council	Yes	Yes	Yes
Warning Systems / Services (Flood)	No	No	No	No	No
Warning Systems / Services (Other/multi	Yes – IPAWs and I Am	No	No	No	No

Administrative/ Technical Resources	County	Hulett	Moorcroft	Pine Haven	Sundance
hazard)	Responding				
Grant Writing/ Management	Yes	No	No	No	No
Other?	Fire Advisory Board (FAB) to county Fire Warden				
Non-Governmental Organizations (NGOs)					
American Red Cross	Campbell County – MOU	Campbell County - MOU	No	No	No
Salvation Army	No	No	No	No	No
Veterans Groups	No	Yes – American Legion (auxiliary)	Yes	No	Yes
Local Environmental Organization	No	No	No	No	No
Homeowner Associations	Yes	Yes – 3 active. IV Rd./Birch/Golf Course	No	No	Yes
Neighborhood Associations	No	Yes	No	No	No
Chamber of Commerce	No	Yes	Yes	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.)	No	Lion – L3GON – Women's Club, GHCC	Yess	No	No

7.3 Financial Capabilities

Table identifies the County and Town financial tools or resources that the jurisdictions have access to or are eligible to use and could potentially be used to help fund mitigation activities.

Table 7-4 Crook County Financial Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)				
	County	**Hulett**	**Moorcroft**	**Pine Haven**	**Sundance**
Apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes
Fund projects through Capital Improvements funding	Yes	Yes	Yes	Yes	Yes

Financial Resources	Accessible/Eligible to Use (Yes/No)				
Authority to levy taxes for specific purposes	Yes	Yes	Yes	Yes	Yes
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes
Impact fees for new development	No	Building permit	Yes	Yes	Yes
Incur debt through general obligation bonds	No	Yes	No	No	No
Incur debt through special tax bonds	No	Yes	No	Yes	Yes
Incur debt through private activities	No	No	No	No	No
Withhold spending in hazard prone areas	No	No	No	No	No
FEMA Hazard Mitigation Assistance Grants	Yes	Yes	Yes	Yes	Yes
Other					

The HMPC noted that they have leveraged FEMA grants for generators in Moorcroft and Hulett (State Homeland Security Grant Program) and the hazardous materials emergency preparedness (HMEP) grant. The State Park noted they have used Montana Conservation Corp funding through the US Bureau of Reclamation to do wildfire mitigation.

7.4 Educations and Outreach Capabilities

Table shows the mitigation education and outreach capabilities the County and Jurisdictions have in place now.

Table 7-5 Crook County Education and Outreach Capabilities

Education & Outreach	Yes/No (And Briefly Describe)
Public Education /Outreach Program	Yes
Local Citizen Groups That Communicate Hazard Risks	Yes, LEPC
Firewise	Yes, State Forestry and NFS have outreach programs in the community
StormReady	NWS does outreach
Other?	

The HMPC noted that the Powder River Energy has been active in doing power pole upgrades, fuels clearing/fuel breaks, and drone inspections on infrastructure to increase grid resiliency in the county.

7.5 Opportunities for Enhancement

Based on the capabilities assessment, Crook County and the municipalities have several existing mechanisms in place that already help to mitigate hazards. There are also opportunities for the jurisdictions to expand or improve on their policies, programs and

fiscal capabilities and further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and WOHS. Additional training opportunities will help to inform County and municipal staff members on how best to integrate hazard information and mitigation projects into their departments. Continuing to train staff on mitigation and the hazards that pose a risk to the County will lead to more informed staff members who can better communicate this information to the public.

Crook County

- Consider developing a Recovery Plan
- Update the County's 2005 CWPP
- Consider adopting Building Codes

Town of Hulett

- Consider developing a Capital Improvements Plan and tie specific projects to mitigation actions
- Become a NWS StormReady Community

Town of Moorcroft

- Adopt a zoning ordinance
- Become a NWS StormReady Community

Town of Pine Haven

- Adopt a Comprehensive Plan
- Develop a public awareness/education program focused on disaster readiness

City of Sundance

- Adopt a Comprehensive Plan
- Become a NWS StormReady Community

8 Mitigation Strategy

This section describes the mitigation strategy and mitigation action plan for Crook County. See Chapter 5 of the Base Plan for more details on the process used to develop and update the mitigation strategy.

8.1 Mitigation Goals

As part of the 2023 planning process, the HMPC reviewed the six goals and their respective objectives which were developed in prior iterations of the regional plan. The goals and objectives provide a guide to help protect people and property in Crook County from natural and human-caused disasters. During the 2023 planning process the HMPC retained these goals for the 2023 plan. The objectives were removed as it was determined they were duplicative of individual mitigation actions identified for the plan. The goals are as follows:

Goal 1: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the Town of Hulett.

Goal 2: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the Town of Moorcroft.

Goal 3: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the Town of Pine Haven.

Goal 4: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the City of Sundance.

Goal 5: Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in Crook County.

Goal 6: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering

8.2 Mitigation Actions

This section provides updates on the actions identified in the 2018 Wyoming Region 1 Multi-Hazard Mitigation Plan, along with new actions identified during the 2023 Regional Plan update.

8.2.1 Progress on 2018 Actions

During the 2023 planning process the Crook County Planning Team reviewed all the mitigation actions from the 2018 plan. Of their 25 mitigation actions from 2018, 19 of the county actions are continuing or are implemented annually, demonstrating ongoing progress towards building the community's resiliency to disasters. These continuing actions are detailed in Section 8.2.2.

Three (3) actions have been completed since 2018 and another three (3) have been deleted, which are detailed in Table below.

Table 8-1 Completed and Deleted Mitigation Actions

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
1.1	Obtain generator for community building/shelter	Backup Power generation	Crook County/ Hulett	High	Completed in 2020
2.6	Re-purpose old school into a tornado and evacuation shelter	Severe Weather	Moorcroft	Medium	Deleted. Plan scrapped, no longer viable
4.1	Design and build new dam on Sundance Pond/Reservoir	Flooding	Sundance	High	Deleted. No longer considered in plan.
5.9	Conduct tabletop exercise as per Hazard Materials Response Plan	Hazmat	Crook County	Medium	Completed. Done in 2022 - will continue each year.

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
5.11	Conduct a Hazardous Materials Commodity Flow Study for the County	Hazmat	Crook County	Medium	Completed. Done in 2022.
5.14	Retrofit Alladin community building as tornado shelter	Extreme Weather	Crook County	Medium	Deleted. Plan scrapped, no longer seen as viable

8.2.2 Identification and Implementation of Mitigation Measures

During the 2023 Regional Plan development, existing mitigation projects for Crook County were assessed to determine whether the action was completed, deleted, or ongoing/continued. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources. The action plans were also shared amongst the regional plan participants to showcase progress and stimulate ideas amongst the respective planning committees in each county. The HMPC's evaluation of action items and goals also lead to the development of new strategies.

Table 8-2 details all continuing and new mitigation actions for the 2023 regional plan. Crook County has developed eight (8) new mitigation actions in 2023 to accompany the 25 continuing mitigation actions from 2018, for a total of 27 mitigation actions.

Background information as well as information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and timeline also are described. Per the DMA requirement, actions have been identified that address reducing losses to existing development as well as future development.

The Cost Estimate column describes the estimated project costs using the following categories:

- Little to no cost
- Low: Less than $10,000
- Moderate: $10,000-$100,000
- High: $100,000-$1,000,000
- Very High: More than $1,000,000

The Timeline column describes the estimated time of completion for each project using the following categories:

- Short Term: 1-2 years
- Medium Term: 3-5 years
- Long Term: 5+ years
- Ongoing: action is implemented every year

The Status/Implementation Notes column describes the progress made on the actions so far using the following categories:

- Not Started: project is carried over from the previous Crook County Plan; little to no work has been completed.
- In Progress: project is carried over from the previous Crook County Plan; work has begun on the project and is proceeding.
- Annual: project is carried over from the previous Crook County Plan and is implemented every year on an ongoing basis.
- New in 2023: The action is new to this plan update; little to no work has been completed.

Table 8-2 Mitigation Action Plan

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Cr-1	Improve capability for all-hazard response through airport improvements. Containment for fuel spills has been implemented.	Hazmat	Town of Hulett	**Town of Hulett**, CCEM	Ongoing	Moderate; Hazardous Materials Emergency Preparedness (HMEP) Grant, Hulett Municipal Airport operating budget, Staff Time	Low	In Progress. Still in research
Cr-2	Construct an all-weather bridge to access the wastewater treatment plant. Previous flood events have submerged existing bridge.	Flood	Town of Hulett	**Hulett Public Works**	Short Term	Moderate; BRIC, USDA Rural Development Grants, USDA Rural Utilities Service Grants	Low	Not Started. Still in research
Cr-3	Conduct a county-wide hazmat incident awareness training	Hazmat	Crook County	**CCEM**, LEPC	Short Term	Low; HMEP Grant	Medium	In Progress. Still in progress
Cr-4	Prepare an evacuation plan for the town	Dam Failure, Earthquake, Flood, Hazmat, Wildfire	Town of Moorcroft, Town of Pine Haven	Moorcroft, **CCEM**, Pine Haven	Short Term	Moderate; Emergency Mgmt. Performance Grant (EMPG), Crook County EM Operating Budget, Staff Time	Medium	In Progress. Still working on this
Cr-5	Address stormwater system capacity issues	Flooding, Severe Winter Weather	Town of Moorcroft	**Moorcroft Public Works**	Medium Term	High; Moorcroft Capital Improvements Budget, BRIC, USDA Rural Development Grants, USDA Rural Utilities Service Grants	Medium	In Progress. Still in progress

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Cr-6	Work with town to obtain easements for second ingress/egress route to the community	Dam Failure, Earthquake, Flood, Hazmat, High Winds, Severe Winter Weather, Tornado, Wildfire	Town of Pine Haven	**Pine Haven**, CCEM	Long Term	Moderate; County Capital Improvements, BRIC, EMPG,	High	In Progress. Still in progress
Cr-7	Determine the number of people potentially needing shelter from an event. Obtain supplies.	Dam Failure, Earthquake, Flood, Hazmat, High Winds, Landslide, Tornado, Wildfire	Crook County, City of Sundance, Town of Hulett, Town of Moorcroft, Town of Pine Haven	**CCEM**, LEPC	Short Term	Low; HMEP/EMPG, CCEM Operating Budget, Red Cross	Medium	In Progress. Some supplies obtained. Working with Red Cross on plans and locations.
Cr-8	Educate citizens on preparing to put pets in shelter.	Dam Failure, Earthquake, Flood, Hazmat, High Winds, Landslide, Tornado, Wildfire	Crook County	**CCEM**, LEPC	Ongoing	Low; EMPG, County	Low	In Progress. In progress and combined with Sheltering plans.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Cr-9	Increase awareness of accessing information before, during, and after a hazard event through social media	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Crook County, City of Sundance, Town of Hulett, Town of Moorcroft, Town of Pine Haven	**CCEM** and Public Health LEPC, Sundance administration, Hulett administration, Moorcroft administration and Police, Pine Haven administration	Ongoing	Low; EMPG, CCEM budget, Staff Time	High	Annual Implementation. CCEM will lead this by pushing out periodic social media blasts on severe weather awareness, drought and water conservation messaging, wildfire mitigation, and landslide awareness (particularly during wet periods in the spring). Public Health has Facebook page, Emergency Management has Facebook Page and Twitter. The City and town administration will participate by relaying messages through social media channels.
Cr-10	Replace Arizona style creek crossings at Spring Creek and the Little Missouri River.	Flooding	Crook County	**CC Road and Bridge**	Medium Term	High; County Capital Improvements, BRIC	Medium	In Progress. Plans in progress, as funds allow.
Cr-11	Enroll the county in the National Flood Insurance Program (NFIP)	Flooding	Crook County	**CCEM**, County Commissioners	Medium Term	Low; CCEM Budget, NFIP Community Assistance Program (CAP), Risk MAP Program	Low	In Progress. Commissioners continue to look into this.
Cr-12	Work with public health to put on training session on radiological and bioterrorism response	Hazmat	Crook County	**CCEM**, CC Public Health	Ongoing	Low; EMPG, Public Health Budget, CCEM Budget, Staff Time	Medium	Annual Implementation. Continues in planning and cooperation between Public Health PHRC and County EMC

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Cr-13	Offer workshops to rural landowners on protecting property from wildland fire	Wildfire	Crook County	**CC Fire**, CCEM	Ongoing	Moderate; EMPG, CC Fire Staff Time, FP&S Grants	High	In Progress. Continuing efforts and training on Wildfire Risks and mitigation efforts
Cr-14	Flood hazard risk identification and notification and evacuation planning. Identify all at risk flood plains and notify residences of possible hazards involved in the flood plain. ID escape routes in the event of a flood. Determine notification methods.	Flood, Dam Failure	Crook County, Town of Hulett, Town of Pine Haven, City of Sundance, Town of Moorcroft	**CCEM**	Medium Term	Low; CCEM Budget, NFIP Community Assistance Program (CAP), Risk MAP Program	Medium	In Progress. Still in progress
Cr-15	Hazardous Materials Preparedness. Hazmat training, PPE acquisition and training - certify firefighters to be responders	Hazmat	Crook County, Town of Hulett, Town of Pine Haven, City of Sundance, Town of Moorcroft	**CCEM**, LEPC	Medium Term	Low; County EM Budget, Staff Time, Fire Dept. Operating Budgets, Hazardous Materials Emergency Preparedness (HMEP) Grant	Medium	In Progress. Still in progress

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Cr-16	Rural water supply enhancement for Hulett. An enhancement to the Horsehead station water supply is needed for wildfire and drought mitigation: filling area for local and county firetrucks is needed to effectively mitigate wildfire starts and protect structures; protect critical facilities and assets, and enhances rural water supply; urgent water fill for fire trucks; Source for rural residents and tourism for water fill station	Wildfire, Drought	Town of Hulett	**Town of Hulett**, CCEM	Long Term	Moderate; USDA Rural Development Grants, USDA Rural Utilities Service Grants, Hulett Municipal Budget	Low	In Progress. In progress
Cr-17	Update the Community Wildfire Protection Plan. An updated wildfire protection plan/mitigation plan for county is needed. Previous plan developed in 2005. Get federal, state, local and landowners involved to getting rid of the	Wildfire	Crook County, Town of Hulett, Town of Pine Haven, City of Sundance, Town of Moorcroft	**CC Fire**, CCEM, Natural Resource Protection district	Short Term	Moderate; Community Wildfire Defense Grants, CC Fire Operating Budget,	High	In Progress. Some training and actual mitigation projects have been completed in Pine Haven, and in the County Rural areas. 2020 - 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	fuels to help protect their property and not endanger their neighbors							
Cr-18	Post wildfire watershed protection, mitigation and restoration. Look into public funding for wildfire aftermath for cleanup, rural & town	Wildfire	Crook County, Town of Hulett	**County EM** and Road and Bridge	Medium Term	High; HMGP-Post Fire mitigation funding associated with Fire Management Assistance declarations	Medium	In Progress.
Cr-19	Indoor/ Outdoor warning system upgrades. Upgrades to existing systems so there isn't any relying on people to manually setting the system. Add additional towers within the county in rural areas.	Multi-Hazard: dam failure, lightning, hail, wind, tornado, severe winter weather, wildfire, hazmat	Town of Pine Haven	**CCEM**, Pine Haven administration	Medium Term	High; Town of Pine Haven General Fund, Next Generation Warning System Grant Program (NGWSGP)	Medium	In Progress. Pine Haven has upgraded some of its system but needs more comprehensive system. County still is yet to see any.
Cr-20	Work with other counties in the region to show support for addressing weather radar shadow/ gap with mobile radar units; project is being advocated by State Engineers Office (SEO); this would enhance visibility of	Dam Failure, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Crook County, Town of Hulett, Town of Pine Haven, City of Sundance, Town of Moorcroft	**County EM** and other EM coordinators in Region 1; WY SEO; NOAA	Short Term	Moderate; SEO, NOAA	High	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
	storms tracking from the west.							
Cr-21	Coordinate with WYDOT and other state, local, or federal agencies on mitigation efforts underway or completed in the county related to landslides (Hwy 14, Oden Hill, Carlisle, Cook Lake) and winter storms (snow fences and road improvements)	Landslide, Severe Winter Weather	Crook County	**CC Road and Bridge**	Medium Term	Moderate; WYDOT, FHWA	Medium	New in 2023
Cr-22	Coordinate with Wyoming State Parks, Bureau of Reclamation and Forest Service to understand fuels treatment efforts, including leveraging the Montana Conservation Corp for mitigation efforts	Wildfire	Crook County	**County EM**, Wyoming State Parks	Medium Term	Moderate; State Parks, Reclamation, Conservation Corp, Volunteers	Medium	New in 2023
Cr-23	Coordinate with Powder River Energy on grid resilience efforts that may include other mutual benefits such as fire breaks	Earthquake, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	Crook County	**County EM**, Powder River Energy	Medium Term	High; Powder River Energy	Medium	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Cr-24	Enhance operational resiliency related to wildfire fighting capacity through RT130 fire fighter safety trainings (approximately 5/year) and Fire Advisory Board zone meetings scenario trainings	Wildfire	Crook County	**County EM**, Fire Advisory Board	Medium Term	Low; Staff Time	Low	New in 2023
Cr-25	Leverage existing grant writing capability for mitigation funding, including attending FEMA or WOHS trainings on mitigation grant funds	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Crook County	**County EM**, Grant writer position	Short Term	Low; Staff Time	Low	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
Cr-26	Identify viable community shelter in Moorcroft (possibly gym?) and work with County Emergency Management to develop a shelter plan including public education/awareness and staffing considerations	Dam Failure, Earthquake, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Severe Winter Weather, Tornado, Wildfire	Town of Moorcroft	**Moorcroft Police**	Short Term	Low; Staff Time	Medium	New in 2023
Cr-27	Emergency Management cache and Emergency Operations Center consolidation to enhance operational resiliency	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Crook County	**County EM**	Short Term	Low; Staff Time	Low	New in 2023

9 Implementation

Moving forward, the Crook County HMPC and LEPC will use the mitigation action tables in the previous section to track progress on implementation of each project. Implementation of the plan overall is discussed in more detail under Chapter 6 of the Regional (Base) Plan.

The Crook County HMPC formed during the 2023 Regional Plan update will be responsible for implementing and reviewing the plan action items. The HMPC will meet no less than semi-annually, or as time permits.

The Crook County Commissioners and the Mayor of all cities and towns (except where noted in Section 1) in Crook County will adopt the Region 1 Hazard Mitigation Plan and each jurisdiction will take responsibility for plan implementation of mitigation issues arising in their jurisdictions. Plan implementation and evaluation will be a shared responsibility among the HMPC. The Crook County EM Coordinator will serve as a convener to facilitate the HMPC meetings and will assign tasks such as updating and presenting the Plan to the members of the group.

9.1 Incorporation into Existing Planning Mechanisms

Also, discussed in Chapter 6 of the base plan is the importance of implementation and incorporation of the principles of this plan into other planning mechanisms.

9.1.1 General Process

To determine if this plan is consistent with goals identified in other community plans, the members of the Crook County Emergency Management Agency, along with the Hazard Mitigation Planning Team and LEPC, will meet with other agencies who have plans that address such issues as comprehensive, capital improvement, subdivision resoluations/ordinances, or planning/zoning boards. The process will provide an opportunity to integrate and/or correlate plans for the purpose of:

- Determining if the mitigation plan is compatible with goals stated in other plans.
- Identifying mitigation initiatives or proposed projects which serve multiple objectives for the communities and could be included in multiple plans.
- Identifying needs for revision or updating to the mitigation plan, or other plans, to provide a more comprehensive approach to hazard mitigation (including addition of new mitigation measures).

During the 2023 planning process, the HMPC discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. To date the plan has been integrated with other planning efforts that include:

- Cross referenced in update of Emergency Operations Plan
- Risk Assessment informed Threat and Hazard Identification and Risk Assessments (THIRA)

9.1.2 Individual Process

The group discussed opportunities to cross reference the hazard mitigation plan in other upcoming planning efforts. As described in the capability assessment and Table 7-1 the County and municipalities already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. The list below show plans that are

both common and/or unique to the participating jurisdictions that may have applicable goals, projects or actions related to mitigation and resilience. When these plans are updated identifying relevant cross-references to the hazard mitigation plan will foster resilience by factoring in hazard considerations into multiple planning mechanisms:

- County
  - County Comprehensive Plan
  - Emergency Operations Plan
  - Capital Improvement Plan
  - Crook Land-Use Plan
  - Mitigation Planning effort
  - Community Wildfire Protection Plan (CWPP)
- Municipalities (Hulett, Moorcroft, Pine Haven, Sundance)
  - Comprehensive Plan (Hulett, Moorcroft)
  - Emergency Operations Plan (Hulett, Moorcroft, Pine Haven)
  - Economic Development Plan (Moorcroft and Sundance)
  - Transportation Plan (Moorcroft)
  - Sundance Land-Use Plan

9.2 Funding Sources

Funding for mitigation projects may come from a variety of sources. Below is a partial list of possible sources of funding that could help fund the actions identified in Section 8.

Local Government

- General revenues in the form of matches.
- One Percent Sales Tax
- County and Municipal Utility Authorities

State of Wyoming

- Community Development Block Grant Program
- Federal Mineral Royalty Capital Construction Account
- Wyoming Water Development Program
- State and Community Highway Safety, Department of Transportation
- State Lands and Investments Board (SLIB) Grants and Loans
- Transportation Enhancement Activities Local (TEAL)
- Wildfire Mitigation Grant (State Forestry Division)

Federal Government Programs

- Federal Emergency Management Agency Hazard Mitigation Assistance Grants including:
  - Building Resilient Infrastructure and Communities (BRIC)

  - Pre-Disaster Mitigation (PDM)
  - Flood Mitigation Assistance Program (FMA)
  - Hazard Mitigation Grant Program (HMGP)
  - Notice of funding availability typically released in June with applications due in October/November of each year.
  - HMGP is dependent on federally declared disasters within the state and funding amount is based on a percentage of disaster relief costs.
  - FEMA Fire Management Assistance Grants - As of June 8, 2018 FEMA is making HMGP funds available for states, territories, and federally-recognized tribes that have a Fire Management Assistance Grant (FMAG) declaration

- USDA Environmental Quality Incentive Program
- USDA Conservation Reserve and Conservation Reserve Enhancement Program
- USDA Small Watersheds (NRCS)

There are many more potential funding opportunities available to the municipalities and county.

Funding research will be done during the scoping process for each project to determine what funding mechanisms are available and appropriate for that project. Funding cycles will be monitored to ensure there is adequate time to prepare grant applications.

9.3 Monitoring, Evaluating and Updating the Plan

Crook County will follow the procedures to review and update this plan in accordance with Region 1 as outlined in Chapter 6 of the Base Plan. Crook County realizes it is important to review and update this plan regularly. This is especially important as the County receives additional information, which might change the risk analysis and resulting mitigation projects list.

Continued public involvement is imperative to the overall success of the plan's implementation. Crook County will continue to solicit participation from the public in the following ways:

- Hard copies of the updated HMP will be available at the County Emergency Management office, with an electronic version available on the County website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions Cr-8, Cr-9, and Cr-13.
- The public will be invited to LEPC meetings where the HMP is discussed. The meetings will provide the public a forum for which they can express concerns, opinions, or ideas about the plan.
- The DES Coordinator will publicize meetings through public information channels including social media and web posting.

The Town of Hulett will:

- Post a link to the plan from the City's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions Cr-9 and Cr-26, as well as partnering with county-led initiatives.

The Town of Moorcroft will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably action Cr-9, as well as partnering with county-led initiatives.

The Town of Pine Haven will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably action Cr-9, as well as partnering with county-led initiatives.

The City of Sundance will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably action Cr-9, as well as partnering with county-led initiatives.

Wyoming Region 1
Regional Hazard Mitigation Plan
Johnson County Annex

1 Mitigation Planning and Johnson County Planning Team

This County Annex builds upon previous versions of the Johnson County Multi-Hazard Mitigation Plan that were incorporated into the regional hazard mitigation plan completed in 2018. Prior to the Region 1 Plan, Johnson County had a multi-jurisdictional Hazard Mitigation Plan approved in 2013. This updated plan is the result of a collaborative effort between Johnson County Government, municipal governments, citizens, public agencies, non-profit organizations, and the private sector. Johnson County Emergency Management was responsible for updating the plan in coordination with a multi-jurisdictional County Planning Team/Hazard Mitigation Planning Committee (HMPC) during the update of the 2023 Regional Plan. The following jurisdictions were provided the opportunity and fully participated in the planning process; the two conservation districts are new participating jurisdictions in 2023:

- Johnson County
- City of Buffalo
- Town of Kaycee
- Clear Creek Conservation District
- Powder River Conservation District

More details on the planning process followed and how the counties, municipalities and stakeholders participated can be referenced in Chapter 3 of the base plan, as well as how the public was involved during the 2023 update.

2 Geography and Climate

The County of Johnson covers about 4,155 square miles of land in north-central Wyoming, sharing a border with the counties of Sheridan, Washakie, Big Horn, Campbell, Natrona, and a corner of Converse. The county lies southeast of the Big Horn Mountains, with elevations ranging from about 3,688 feet in the plains to 9,666 feet in the mountains. The Powder River is the largest river crossing Johnson County, flowing east and north out of the county. Major tributaries flowing into the Powder River include Crazy Woman Creek, Beaver Creek, and Clear Creek, among others. Watersheds located in Johnson County include the Clear Creek, Crazy Woman, Upper Powder, Middle Fork, South Fork, Salt, and Upper Tongue, with others intersecting slightly in minor ways throughout the corners and edges of the county boundaries.

Both Interstate 90 and Interstate 25 run through the county. I-90 crosses in a north-central central-east fashion, traversing very close to Buffalo's northeast corner. I-25 splits the county east to west, crossing in a north-central to south-central fashion; it goes through Buffalo, and runs almost parallel to Kaycee's west boundaries. State highway 14 and 16 connect to I-90 and I-25, with highway 14 running central-north to Buffalo, and highway 16 continuing from that area and into Washakie and Big Horn on the west of Johnson County, through the Big Horn National Forest. Other major highways in the county include 196 (running north-south) and 192 (running east-west and connecting to Kaycee).

Johnson County, in north-central Wyoming, holds a significant place in Western history. It witnessed inter-tribal rivalries, beaver trapping, and the establishment of trading posts and forts in the 18th and 19th centuries. The Powder River region, with its abundant buffalo and prime hunting grounds, was crucial for Plains Indian cultures.

After European contact, fur trappers like Francois Antoine Larocque and expeditions led by the likes of Wilson Price Hunt explored the area. The Bozeman Trail, cutting

through Powder River country, sparked tensions with Plains tribes, leading to Red Cloud's War.

Post-Indian wars, ranchers arrived, and Fort McKinney became a hub. Buffalo, originating as a supply village for the fort, grew into a bustling town. Johnson County was formally recognized in 1880, encompassing parts of present-day Sheridan and Big Horn counties.

The Johnson County War of 1892 saw tensions between small ranchers and wealthy cattle barons erupt. Although significant, the conflict gradually tapered off. Buffalo thrived as a central point for ranching, and Fort McKinney became the Wyoming Veterans Home.

In the 20th century, sheep operations and Basque herders left an enduring mark on the community. While coal-bed methane exploration brought economic activity, oil and gas drilling in the 21st century led to a tax assessment boom, funding major infrastructure projects. Today, Johnson County cherishes its rich history through museums and remains deeply connected to its agricultural heritage (Wyoming Historical Society, 2014).

The climate of Johnson County is mainly semi-arid. Precipitation in the form of rain is about 12 inches per year, but in terms of snow it can get around 39 inches. Winter temperature lows are about 11 degrees Fahrenheit, and summers often reach 90 degrees in late July and August.

3 Population Trends

As of the July 2020 United States Census estimates, there were a total of 8,588 people living in Johnson County. The population has stayed consistent since 2010 Census with small fluctuations. The county seat is the City of Buffalo.

Table 3-1 Johnson County Population Distribution

Jurisdiction	2020 Estimated Population	% of County Total
Total	**8,588**	**-----**
City of Buffalo	4,373	50.9%
Town of Kaycee	251	2.9%
Unincorporated	3,964	46.2%

Source: US Census Bureau

Table 3-2 Johnson County Population Change, 2010-2020

Jurisdiction	2010 Census	2015	2016	2017	2018	2019	2020	% change
Total	**8,591**	**8,622**	**8,492**	**8,457**	**8505**	**8548**	**8,588**	**-0.03%**
City of Buffalo	4,592	4,636	4,576	4,562	4,593	4,628	4,373	-4.77%
Town of Kaycee	270	275	278	276	277	283	251	-7.04%
Unincorporated	3,729	3,711	3,638	3,619	3,635	3,637	3,964	6.30%

Source: US Census Bureau

Select Census demographic and social characteristics for Johnson County are shown in the table below. The county's average age is 46.4 years old, about 9 years older than the state average, 37.7. The table also indicates some populations that may have special needs or prove vulnerable, such as the 14.3% of people with disabilities, the 12.7% of people without health insurance, and the 15.3% of people who live below the poverty line.

Table 3-3 Johnson County Demographic Profile

Population	
Population estimate, 2020	8,588
Population Growth, 1970-2020 (US average was 63.1%)	0.5%
Age and Sex	
Median Age (US median age is 38.8)	46.4
Percent of population under 18	19.8%
Percent of population 18-34	16.0%
Percent of population 35-44	11.8%
Percent of population 45-64	26.8%
Percent of population 65 and over	25.6%
Percent of population male	52.7%
Percent of population female	47.3%
Race and Hispanic Origin	
White alone, 2020	96.7%
White alone, not Hispanic or Latino	91.3%
Hispanic or Latino	4.8%
Two or More Races	1.2%
American Indian and Alaska Native alone	1%
Black or African American alone	0.6%
Asian alone	1.5%
Native Hawaiian and Other Pacific Islander alone	0%
Education	
High school graduate or higher, age 25 years+	95.1%
Bachelor's degree or higher, age 25 years+	33.1%
Vulnerable Populations	
Percent of population under 5 years old	4.6%
Percent of population 85 years and older	2.0%
Percent of population that speak English "not well"	0.2%
Percent of population with disabilities	14.3%
Percent of population without health insurance	12.7%
Percent of population below poverty level	15.3%
Percent of population in deep poverty (<1/2 federal poverty level)	7.6%
Percent of population 65 and over and in poverty	7.1%

Source: U.S. Census Bureau www.census.gov/

*Hispanic or Latino is considered to be an ethnicity and not a race. People who identify themselves as Hispanic or Latino can belong to one or more races. Therefore, the total percentage can be greater than 100%.

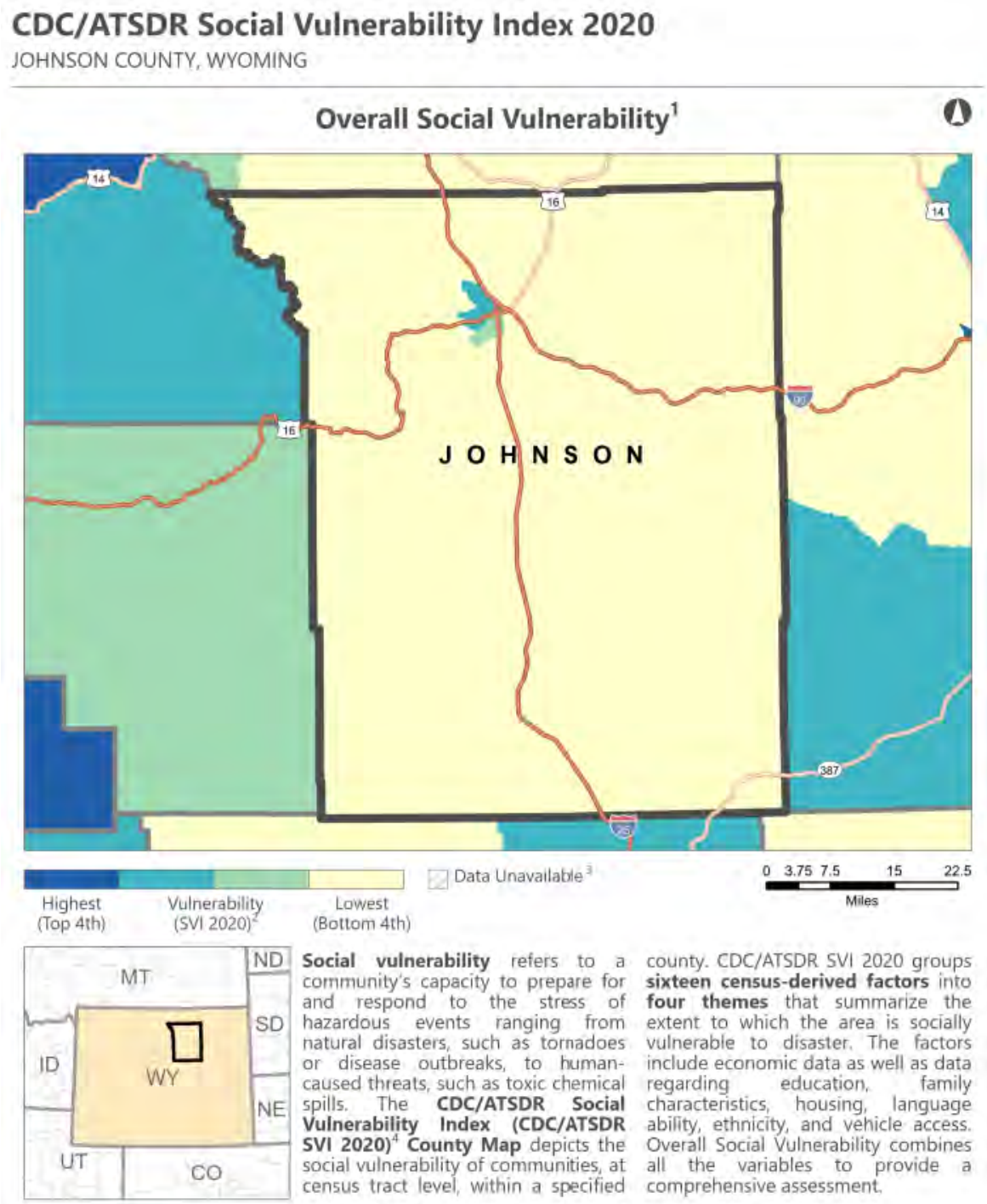
3.1 Social Vulnerability

Social vulnerability is broadly defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards. Additional details on social vulnerability, the Centers for Disease Control and Prevention (CDC) social vulnerability index (SVI), and community resilience ratings can be found in Section 4.1.4 of the Base Plan.

The SVI utilizes 16 demographic variables organized into four broader categories (Socioeconomic Status, Household Characteristics, Racial & Ethnic Minority Status, and Housing Type & Transportation) in order to determine the overall social vulnerability of a community at the census tract and county level. The figure below displays the overall social vulnerability rating for Johnson County at the census tract level, while Figure 2

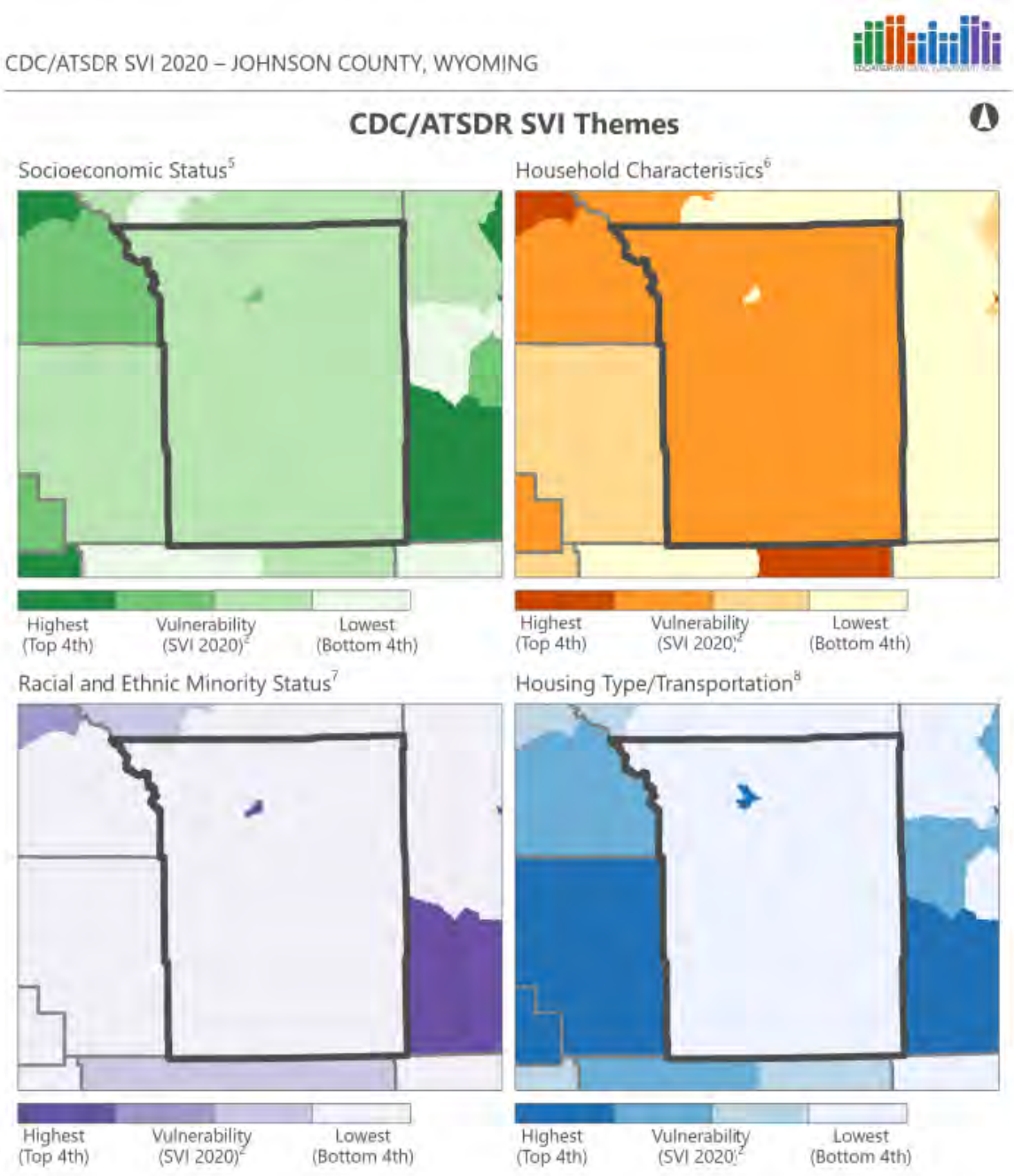
details each of the four SVI themes. As a whole, Johnson County is rated as low social vulnerability, with census tracts around the City of Buffalo identified as having higher SVI ratings. This trend generally holds true for each of the four SVI themes as well, with the exception of Household Characteristics indicating greater vulnerability in the rural parts of the county and lower in the City of Buffalo.

Figure 1 Johnson County Overall Social Vulnerability



Source: CDC Social Vulnerability Index

Figure 2 Johnson County SVI Themes



Source: CDC Social Vulnerability Index

4 Development Trends

Johnson County, the tenth largest in Wyoming, spans 4,175 square miles and heavily relies on federally owned lands for various industries including tourism, recreation, mining, oil and gas, hunting, and grazing. Private land accounts for 59 percent of the county's area, followed by federal land at 31 percent, with the Bureau of Land Management (BLM) managing 60 percent and the Forest Service overseeing 40 percent. State land makes up 9 percent, mostly state trust land. The county's economic

landscape is evolving, with a growing emphasis on diversifying the energy sector, including renewable sources like wind and solar. The real estate market reflects rising demand for housing, both in towns and rural areas, driving property values upward. Agriculture remains a cornerstone, with cattle ranching and sheep herding playing a vital role. Grazing leases on federal lands are crucial for maintaining healthy stock. Mining of coal, uranium, bentonite, and oil and gas production continue to be significant industries. Tourism, a key driver of Wyoming's economy, is a vital sector for Johnson County, particularly as a gateway for visitors heading to Yellowstone National Park. In 2019, travel and tourism contributed significantly to the county's economy, with approximately $56.5 million spent, $15 million earned, and 630 jobs supported by this sector (Johnson County Natural Resource Management Plan, 2020).

In 2021, the median property value in Johnson County stood at $255,500, surpassing the national average of $244,900 by 1.04 times. This marked a 2.94% increase from the 2020 median value of $248,200. The homeownership rate in Johnson County is 74.3%, closely aligning with the national average of 64.6%. Residents of Johnson County typically spend an average of 18.5 minutes commuting to work, predominantly using personal vehicles for their journeys. The county's car ownership rate mirrors the national average, averaging around 2 cars per household (U.S. Census).

5 Economy

Table 5-1 below provides a brief overview of economic characters in Johnson County. The following information is provided by the U.S. Census Bureau American Community Survey (ACS) 5-year estimates from 2016-2020.

Table 5-1 Johnson County Basic Economic Profile

Economic Characteristics	Johnson County
Families Below Poverty Level	7.3%
Individuals Below Poverty Level	27.4%
Median Home Value	$248,200
Median Household Income	$56,565
Per Capita Income	$36,794
Population > 16 Years Old in Labor Force	60.1%
Population Employed	58.4%

Source: U.S. Census Bureau www.census.gov/

With inflation rates from 2020-2023, property value has increased significantly, while wage ratesand employment have remained fairly stagnant in the county. Table 5-2 below shows the breakdown of employment in Johnson County by the industry sector. According to the ACS, the leading employment sectors in the County are “educational services, and health care and social assistance”, which composes of nearly a quarter of the total employment in the County follows by “agriculture, forestry, fishing, and hunting, and mining.”

Table 5-2 Johnson County Occupation by Industry Profile

Industry	Population Employed	Percent of Labor Force
Agriculture, forestry, fishing and hunting, and mining	690	16.9%
Construction	350	8.6%
Manufacturing	32	0.8%
Wholesale trade	55	1.3%
Retail trade	350	8.6%
Transportation and warehousing, and utilities	179	4.4%
Information	90	2.2%
Finance and insurance, and real estate and rental and leasing	128	3.1%
Professional, scientific, and management, and administrative and waste management services	380	9.3%
Educational services, and health care and social assistance	867	21.3%
Arts, entertainment, and recreation, and accommodation and food services	301	7.4%
Other services, except public administration	350	8.6%
Public administration	308	7.5%

Source: U.S. Census Bureau ACS 5-year estimates, 2016-2020

Johnson County employs nearly 3,900 people and as noted above majority of the population is educational and healthcare and social assistance. Aside from that, visitors who journey to and within Wyoming play a vital role in the state's economic landscape. Visitors indulge in hiking, rock climbing, skiing, and more scenic environs of the Bighorn mountains. While tourism is a key player in the local economy, Johnson County boasts other major sectors, including oil, gas, and mineral exploration and development, as well as agriculture.

6 Hazard Identification and Risk Assessment

6.1 Identified Hazards

The HMPC reviewed the hazards from the 2018 Regional Hazard Mitigation Plan for inclusion in the 2023 update. The hazards list was also compared with the hazards list found in the State of Wyoming's hazard mitigation plan, updated and adopted in 2021. The following table notes the summary of significance for each jurisdiction in the County based on a combination of geographic extent, potential magnitude/severity and probability as defined below. Hazard significance is rated as High, Medium, or Low based on the combination of factors described in the table below and the methodology in Chapter 4 of the Regional Plan. Coal Seam Fire was added as a hazard for the Region in 2023, but Johnson County felt this was not applicable in their case due to most of the coal seams being east of the County.

Table 6 Overall Hazard Significance Summary Table

Hazard	Johnson County	Buffalo	Kaycee	Clear Creek Conservation District	Powder River Conservation District
Dam Failure	H	H	M	H	M
Drought	M	M	M	M	M
Earthquake	M	M	M	M	M
Expansive Soil	L	L	M	L	M
Flood	H	M	H	H	H
Hail	M	M	M	M	M
Hazardous Materials	M	M	M	M	M
High Winds and Downbursts	M	M	M	M	M
Landslide/Rockfall/Debris Flow	M	M	L	M	L
Lightning	M	M	M	M	M
Mine and Land Subsidence	L	L	L	L	L
Severe Winter Weather	H	H	H	H	H
Tornado	M	M	M	M	M
Wildfire	H	H	M	H	M
Coal Seam Fire	NA	NA	NA	NA	NA

Geographic Extent
Negligible: Less than 10 percent of planning area or isolated single-point occurrences
Limited: 10 to 25 percent of the planning area or limited single-point occurrences
Significant: 25 to 75 percent of planning area or frequent single-point occurrences
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Potential Magnitude/Severity
Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time or result in many permanent disabilities and a few deaths.
Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the

Probability of Future Occurrences
Unlikely: Less than 1 percent probability of occurrence in the next year or has a recurrence interval of greater than every 100 years.
Occasional: Between a 1 and 10 percent probability of occurrence in the next year or has a recurrence interval of 11 to 100 years.
Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Highly Likely: Between 90 and 100 percent probability of occurrence in the next year or has a recurrence interval of less than 1 year.

Overall Significance
Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.
Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for

medical response system is overwhelmed for an extended period of time or many deaths occur.

hazards that the jurisdiction identifies as particularly relevant.

6.1.1 Hazards Considered but Not Profiled

Though noted in other relevant plans such as the Wyoming State Multi-Hazard Mitigation Plan from 2020, this plan does not further evaluate the following hazards:

- Avalanche
- Liquefaction
- Public Health Hazards/Pandemic
- Space weather
- Terrorism/Civil Disturbance
- Volcanism

It is important to be aware of the possibility of these events and the associated impacts for Johnson County. However, the hazard identification described in Chapter 4 of the Base Plan omits these hazards due to the limited relevance in the regional context of this plan or being sufficiently addressed in other planning mechanisms. Some of the above listed hazards are acknowledged to some degree under other hazard profiles, such as deposits carried by wind that could be part of a debris flow event.

6.2 Building Inventory and Assets

In addition to people, structures, and critical facilities and infrastructure, other important assets exist in Johnson County that are potentially exposed to hazards identified in this plan. Table 6-1 summarizes the property inventory for the county and each participating jurisdiction, based on the improvement value, and includes the building count and value grouped by parcel type and jurisdiction. This as an assessment of the overall property exposed within the county and by jurisdiction.

Assets inventoried to determine vulnerability include people, structures, critical facilities, and natural, historic, or cultural resources. For the regional planning process,

locally available GIS databases were utilized. Parcel and assessor data was obtained through sources such as the Wyoming Property Tax Division's Assessor's Portal in 2023. This information provided the basis for building exposure and property types. The focus of the analysis was on "improved," or developed, parcels. These parcels were identified based on an improvement value greater than zero. Abstract Codes were used to identify occupancy type as shown in the following table, which includes summations of total improved value for the various property types and jurisdictions, and the population exposed in each.

Table 6-1 Johnson County Building Inventory and Value by Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Buffalo	Commercial	269	$115,484,304	$115,484,304	$230,968,608
	Industrial	2	$1,995,088	$2,992,632	$4,987,720
	Residential	1,720	$326,527,918	$163,263,959	$489,793,597
	Total	**1,991**	**$444,007,310**	**$281,740,895**	**$725,749,925**
Kaycee	Commercial	22	$2,813,932	$2,813,932	$5,627,864
	Residential	95	$9,717,518	$4,858,759	$14,576,277
	Total	**117**	**$12,531,450**	**$7,672,691**	**$20,204,141**
Unincorporated	Commercial	115	$35,535,901	$35,535,901	$71,071,802
	Exempt	2	$269,726	$269,726	$539,452
	Industrial	6	$2,904,220	$4,356,330	$7,260,550
	Residential	1,822	$427,784,270	$213,892,135	$641,676,405
	Total	**1,945**	**$466,494,117**	**$254,054,092**	**$720,548,209**
	Grand Total	**4,053**	**$923,032,877**	**$543,467,678**	**$1,466,502,275**

Source: Wyoming CAMA 2022, WSP GIS Analysis

Total building exposure within Johnson County based on the analysis of improved parcels is over $1.4 billion, with $923 million in improved value properties and over $543 million in estimated contents value. Using GIS, parcels are assessed using tax lot data, while building counts are derived from centroid points which fall in the middle of each parcel. The unincorporated parts of the County have the greatest number of buildings (based on the parcel counts) followed by the City of Buffalo, so these areas would be at most risk.

6.2.1 Critical Facilities, Infrastructure, and Other Important Community Assets

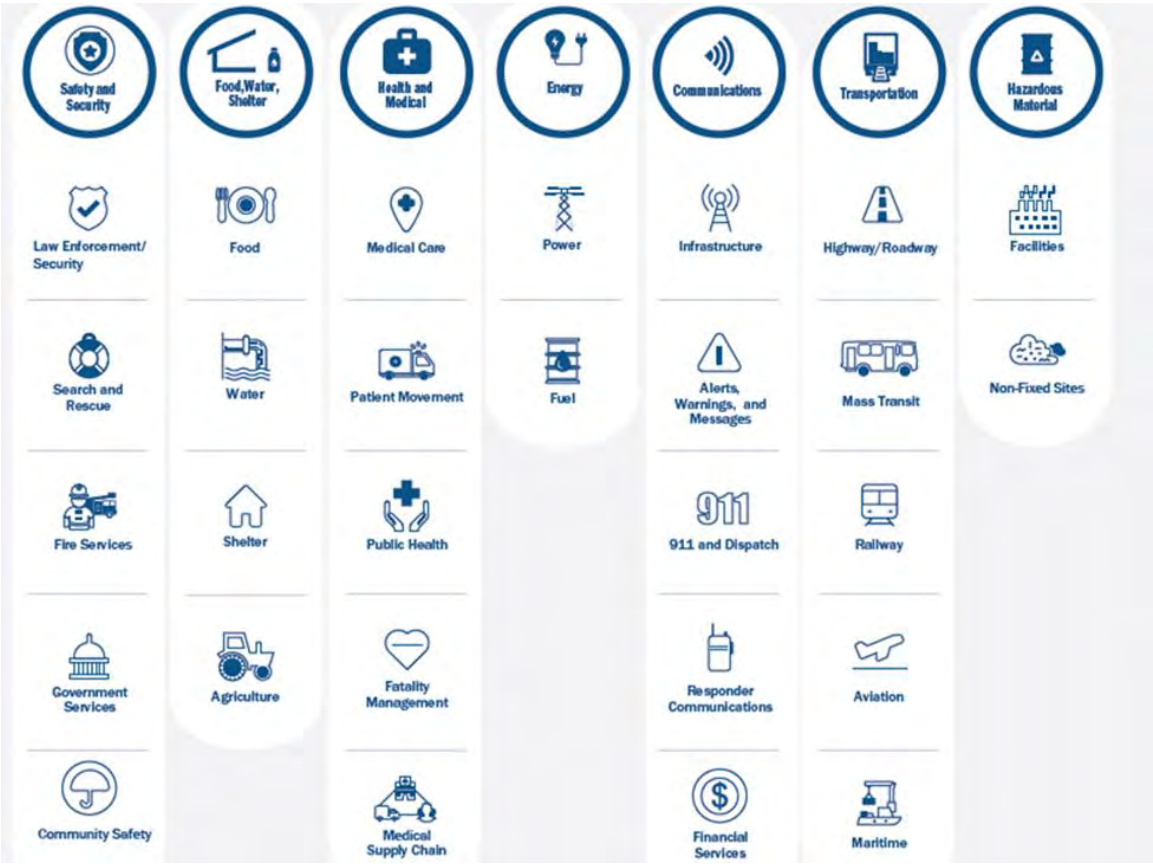
A critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Much of this data is based on GIS databases associated with the 2022 Homeland Infrastructure Foundation-Level Data (HIFLD) and the 2023 National Bridge Inventory (NBI). Where applicable, this information was used in an overlay analysis for hazards such as dam failure, expansive soil, flood, landslide, and wildfire.

FEMA organizes critical facilities into seven lifeline categories as shown in Figure 3. These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to

human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

Figure 3 FEMA Lifeline Categories



Source: FEMA

Table 6-2 provides the summary of critical facilities organized by lifeline and jurisdiction. While the Clear Creek and Powder River Conservation Districts do not have specific facilities/infrastructure lifelines, the primary assets of note are the natural resources within the County, as stewards of promoting sustainability of soil, land and water conservation. Vulnerability of natural resources is discussed by hazard where applicable in Section 6.4.

Table 6-2 Johnson County Critical/Lifeline Facility Summary

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Buffalo	12	-	-	-	8	17	5	**42**
Kaycee	1	-	-	-	2	4	1	**8**
Unincorporated	62	11	4	-	-	-	198	**275**
Clear Creek Conservation District	-	-	-	-	-	-	-	**0**
Powder River Conservation District	-	-	-	-	-	-	-	**0**
Total	**75**	**11**	**4**	**0**	**10**	**21**	**204**	**325**

Source: HIFLD, National Bridge Inventory, WSP GIS Analysis

6.2.2 Natural, Historic, and Cultural Assets

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

- The community may decide that these types of resources warrant more protection due to their unique and irreplaceable nature as well as contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Historic and Cultural Resources

By definition, a historic property not only includes buildings of other types of structures, such as bridges and dams, but also includes prehistoric of Native American sites, roads, byways, historic landscapes, and many other features. Given the history of the County, these types of historic properties exist in the planning area.

Table 6-3 lists the properties and districts in Johnson County that are on the National Register of Historic Places, which is the Nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.

Table 6-3 Johnson County Historic Properties

City	Historic Name
Barnum	Dull Knife Battlefield
	Wold Bison Jump
Buffalo	Beaver Creek Ranch Headquarters
	Blue Gables Motel
	Carnegie Public Library
	EDL Peloux Bridge
	Fort McKinney
	HF Bar Ranch Historic District
	Holland House
	Johnson County Courthouse
	Main Street Historic District
	Methodist Episcopal Church
	St. Luke's Episcopal Church
	TA Ranch Historic District
	Union Congregational Church and Parsonage
	US Post Office--Buffalo Main
NA	Lake Desmet Segment, Bozeman Trail
	Trabing Station--Crazy Woman Crossing
Kaycee	AJX Bridge over South Fork and Powder River
	Sussex Post Office and Store
Story	Fort Phil Kearny and Associated Sites
	Spear-O-Wigwam Ranch
Sussex	Cantonment Reno
	EDZ Irigary Bridge
	Fort Reno
	Powder River Station--Powder River Crossing (48JO134 and 48JO801)

Sources: National Register of Historic Place Program, https://www.nps.gov/Nr/research/

Natural Resources

Natural resources are important to include in benefit-cost analyses for future projects and may be used to leverage additional funding for projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as attenuates and stores floodwaters. The Clear Creek and Powder River conservation districts partner with citizens and private landowners as well as other organizations to promote the sustainability of the land, water, and other natural resources by encouraging the use of Best Management Practices. The Clear Creek district now includes watershed planning for improving water availability and quality, wildlife habitat enhancement, integrated pest management, land use management and conservation education.

Wetlands

Wetlands are a valuable natural resource for communities, due to their benefits to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital.

Endangered Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

There are five federally-recognized endangered, threatened, or candidate species present in Johnson County according to the U.S. Fish and Wildlife Service. These species are listed in Table 6-4.

Table 6-4 Endangered and Threatened Species in Johnson County

Common Name	Scientific Name	Type of Species	Status
Bald eagle	Haliaeetus leucocephalus	Birds	Recovery
Ute ladies'-tresses	Spiranthes diluvialis	Flowering Plants	Threatened
Gray wolf	Canis lupus	Mammals	Recovery
Canada lynx	Lynx canadensis	Mammals	Threatened
North American wolverine	Gulo gulo luscus	Mammals	Proposed Threatened

Source: http://www.fws.gov/endangered/

6.3 Vulnerability to Specific Hazards

This section provides vulnerability to specific hazards, where quantifiable, to summarize the information of the Region and/or provide more detail at the county and jurisdictional level. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas and details by jurisdiction and building type in Johnson County. For a discussion of the methodology used to develop the loss estimates refer to Chapter 4 of the base plan. In many cases, Chapter 4 contains information that differentiates the risk by county thus the information is not duplicated here. For most of the weather-related hazards the risk does not vary significantly enough from the rest of the Region and thus the reader should refer to Chapter 4.

6.3.1 Dam Failure

There are 12 high hazard dams and 8 significant hazard dams located within proximity to population centers in Johnson County. The table and figure below identify the dams and the affected communities.

Table 6-5 High and Significant Level Dams in Johnson County

Hazard Level	Dam Name	Normal Capacity (AF)	Nearby Jurisdiction/Populated Area
High	Big Horn Dike A	4,624	Beckton
High	Big Horn Dike B	--	Bighorn
High	Big Horn Dike C	--	Bighorn
High	Cloud Peak	3,570	Story
High	Dull Knife	4,345	Sussex
High	Healy	5140	Ucross
High	Kearney Lake	6324	Story
High	Lake Desmet (A, B, C & Spillway Dikes)	11,1827	Ucross
High	Lake Desmet (North Dam)	11,1827	Ucross
High	Lake Desmet (South Dam)	11,1827	Ucross
High	Muddy Guard No. 2 South Dam	1,934	Arvada
High	Tie Hack	2,435	Buffalo
High	Willow Park	4,457	Story
Significant	Kelly	102	Arvada
Significant	Kingsbury Todd No. 1	213	HWY 87
Significant	Kingsbury Todd No. 2	453	HWY 87
Significant	Martin	561	Big Horn
Significant	Muddy Guard No. 2 North Dam	1,934	Arvada
Significant	Pole Creek Irrigation	606	Hwy 87
Significant	Reynolds Piney Creek Diversion Dam	51	Kearny

Source: National Inventory of Dams

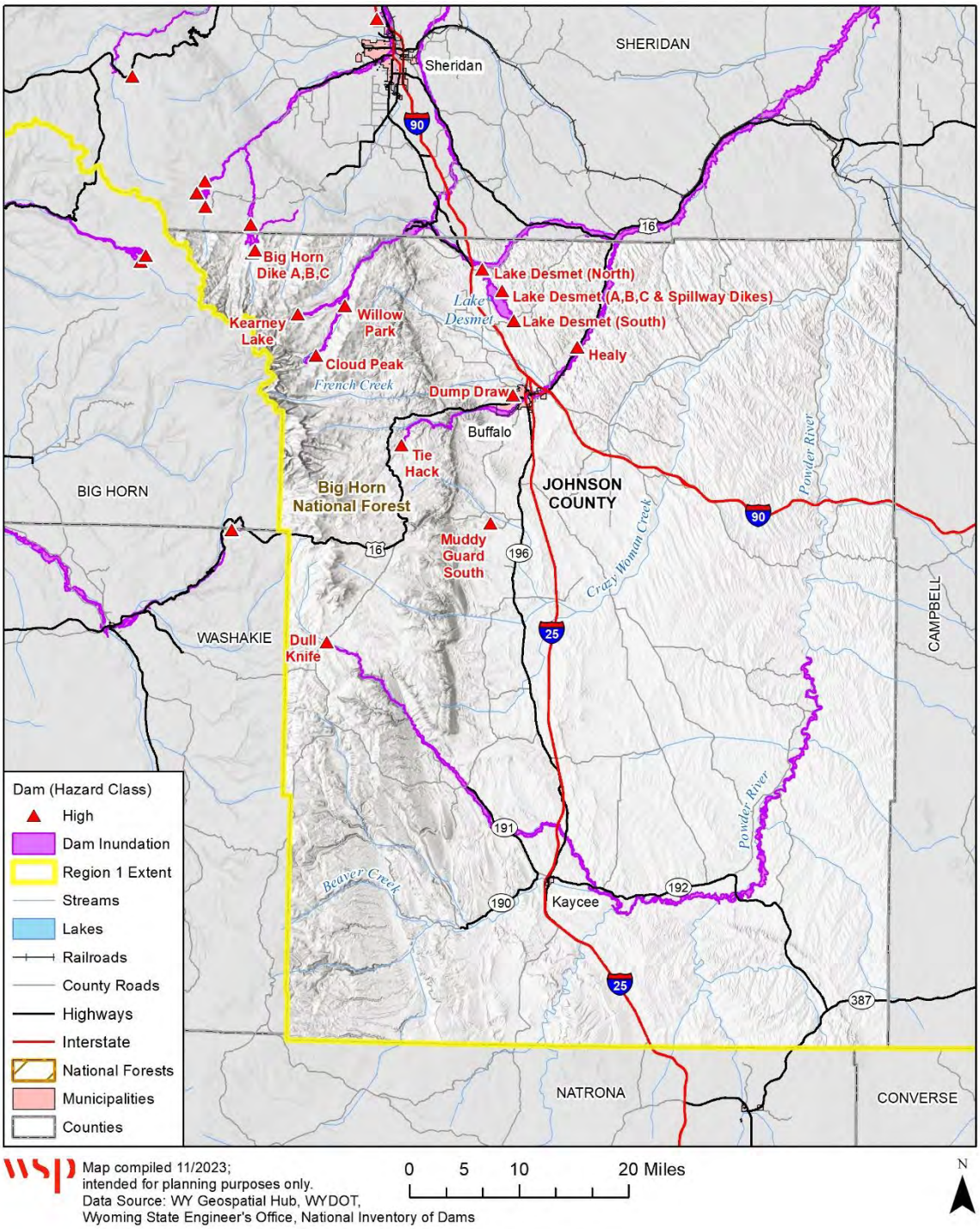
6.3.1.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The HMPC reported concerns of the potential impacts that failure of the Dull Knife Dam could have in the vicinity, but not in, of the Town of Kaycee. Impacts would include damage to existing homes along the North Fork and the Middle Fork of the Powder River as well as potentially making portions of highway 191, 192, Old Highway 87, and Interstate 25 impassible.

There has been one recorded dam failure in the county:

- On the 9th of April 1982, the Case Reservoir on Seventy-Six Draw overtopped and the erosion action of the water resulted in a complete failure of the structure. It was an earthen dam categorized as posing Low hazard, built in 1951, and its base was keyed into the foundation.

Figure 4 Dam Inundation and High Hazard Dams in Johnson County



There are also several other dams rated as low hazard. While it is not considered highly likely, there is a possibility of structure failure-based flooding in the future. The overall risk of dam failure across Johnson County and its jurisdictions is **high**, with the exception of Kaycee which is not below a dam and Powder River Conservation District which has fewer dams within the district.

Based on the GIS analysis summarized in Section 4.2.2 in the base plan Buffalo has 59 structures in the inundation zone of Tie Hack dam. The unincorporated area has 138 structures within inundation zones. An estimated 138 people reside in these inundation zones countywide. Those at greatest risk are those in affected areas who have access and functional needs, such as those with disabilities, injuries, limited access to transportation or financial resources, the elderly, and people experiencing homelessness.

Based on the critical facility inventory and dam inundation extents available, 31 critical facilities were found to be at risk (see Section 4.2.2); the majority of which are bridges but also includes two lifelines classified as Safety and Security facilities. Businesses may suffer damage or destruction, leading to income losses and reduced economic activity. Long-term loss of water in a reservoir, which may be critical for potable water needs, can interrupt the water supply, affecting drinking water availability, agricultural needs, and industrial water usage.

The environment would be vulnerable to a number of risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways, potentially causing the destruction of downstream habitats. No cultural resources are known to be at risk.

6.3.1.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

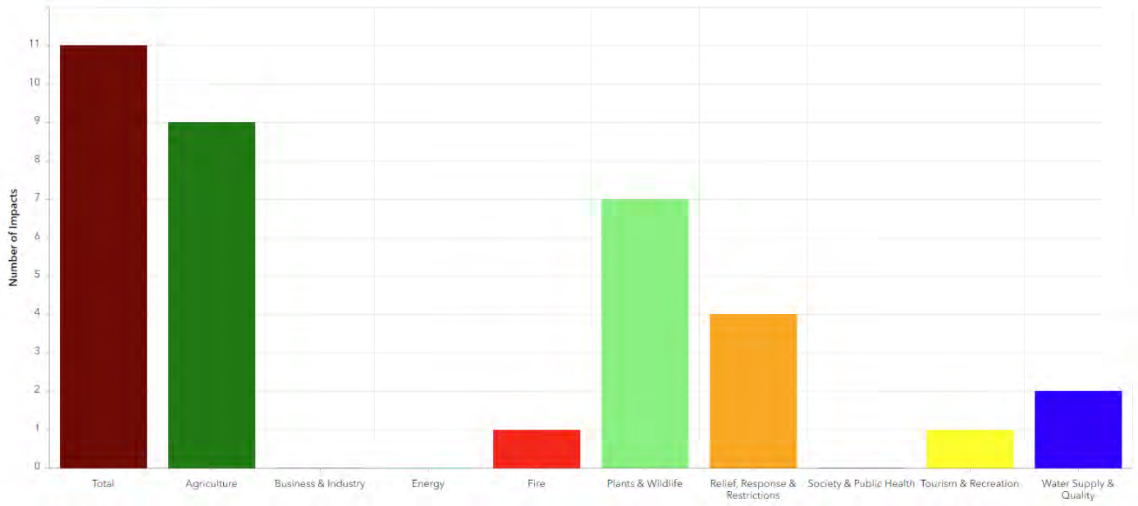
6.3.2 Drought

6.3.2.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Drought is a medium significance hazard across all jurisdictions in Johnson County. Drought-related impacts to the local economy can be extensive, however, affecting the water supply and quality, plants and wildlife, relief response efforts, and even the tourism and recreation industries (e.g., due to increased wildfire danger, forest closures, and fire bans). The most affected sector in Johnson County due to dry periods has been agriculture, as crops, forage, and livestock cannot thrive during longer warmer seasons when there is a continued lack of precipitation, in turn causing farmers and growers to experience sales declines and increased management costs. The other highly affected sector impacts are to plants and wildlife, as droughts can have far-reaching and detrimental effects on ecosystems, including the loss of biodiversity, habitat degradation, and increased stress on wildlife and their environments.

Since 2005, Johnson County has received eleven reports of countywide impacts to the various sectors due to drought. The figure below summarizes the number and type of reports that have been made at the county level, from 2005 to the end of 2022. These reports were submitted to indicate negative effects to the economic sectors and local industries due to drought events. Refer to Chapter 4 in the Base Plan for additional discussion of drought risk related to the region and the county.

Figure 5 County-Level Drought Reports in Johnson County, 2005-2022



Source: Source: https://www.drought.gov/data-maps-tools/drought-impact-reporter-dir

Table 6-6 takes the impacts of drought on crop production detailed in Table 4-17 of the base plan and breaks out the losses specific to Johnson County.

Table 6-6 Indemnities Paid for Commodities that Suffered from Drought in Johnson County, 2007-2021

Commodity	Acres Damaged	Indemnity Amount
All Other Crops	191.9	$9,959
Forage Production	40.3	$2,594
Grand Total	**232.3**	**$12,553**

Source: USDA – Risk Management Agency

Drought can stress water supply systems, including reservoirs, water treatment plants, and pipes. Specific water system vulnerability has not been identified during the planning process.

Vulnerable populations that may be affected by drought may include ranchers and farmers as well as those dependent on recreation and tourism. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a prolonged period of drought.

Natural resources include forests and native grasslands, which could be more susceptible to wildfire impacts during droughts. No historic resources are expected to be vulnerable to drought.

6.3.2.2 Development Trends

Recent and future development in the County, districts and municipalities is not anticipated to change vulnerability to drought in a significant way.

6.3.3 Earthquake

There have been 8 earthquake events that have occurred in Johnson County since 1922. Most of these events fall in the 4.0-4.9/IV-V intensity range, though an earthquake was recorded in 1984 at a magnitude 5.1. These events are presented in the table below and described further in the following text. There has been only one further recorded seismic event greater than a magnitude 3.0 in Johnson County since 2018.

Table 6-7 Johnson County Seismic Events, 1922 – 2023

Location	Date	Magnitude/Intensity	Damage or Injuries
8 Miles east of Sheridan	10/24/1922	IV-V	No
3-4 Miles Southwest of Buffalo	10/6/1943	IV-V	No
15 Miles South-Southeast of Meadow Lark Lake	8/23/2020	3.2	No
12 Miles South of Kaycee	6/3/1965	4.7	No
Kaycee	10/2/1976	4.8	No
33 Miles East-Southeast of Buffalo	10/7/1984	5.1	No
18 Miles East of Buffalo	2/22/1992	2.9	No

Source: http://earthquake.usgs.gov and Wyoming Geological Survey

The following excerpts are from a report published for the Wyoming State Geological Survey in 2002 entitled "Basic Seismological Characterization for Johnson County, Wyoming".

The first earthquake recorded in the county occurred on October 24, 1922. Reagor, Stover, and Algermissen (1985) located the earthquake near Buffalo. The Sheridan Post reported that at Cat Creek, 8 miles east of Sheridan, houses were shaken and dishes were rattled. In addition, the October 26, 1922 edition of the Sheridan Post reports that only a slight earthquake shock was felt in Sheridan. Based upon this information, it seems reasonable to locate the earthquake 8 miles east of Sheridan, and to assign an intensity of IV-V to the event.

On September 6, 1943, an intensity IV earthquake was felt in the Sheridan area, although Reagor, Stover, and Algermissen (1985) located the epicenter approximately 3-4 miles south-southwest of Buffalo. Beds and chairs were reported "to sway" in the Sheridan area (The Casper Tribune Herald, September 7, 1943).

Two earthquakes were recorded in Johnson County in the 1960s. A magnitude 4.7 earthquake occurred on June 3, 1965. This event was centered approximately 12 miles south of Kaycee.

On September 2, 1976, a magnitude 4.8, intensity IV-V earthquake was felt in Kaycee. The event was located approximately 33 miles northeast of Kaycee. No damage was reported.

A magnitude 5.1, intensity V earthquake occurred on September 7, 1984, approximately 33 miles east-southeast of Buffalo. The earthquake was felt throughout northeastern Wyoming, including Buffalo, Casper, Kaycee, Linch, and Midwest, and in parts of southeastern Montana. No significant damage was reported (Laramie Daily Boomerang, September 8, 1984).

Two earthquakes were detected in Johnson County in 1992. The first occurred on February 22, 1992. This magnitude 2.9 event was recorded approximately 18 miles east of Buffalo. As expected with such a small earthquake, no damage was reported. Most recently, a magnitude 3.6, intensity IV earthquake occurred on August 30, 1992. The earthquake was centered near Mayoworth, approximately 22 miles west-northwest of Kaycee. It was felt in Barnum and Kaycee, but no damage was reported.

Several earthquakes have also occurred near Johnson County. Two earthquakes occurred near the Johnson County-Campbell County border in 1984. On May 29, 1984, a magnitude 5.0, intensity V earthquake occurred approximately 38 miles east-southeast of Buffalo. The earthquake was felt in Gillette, Sheridan, Buffalo, Casper, Douglas,

Thermopolis, and Sundance. A rancher, living 35 miles west of Gillette, reported that he could see the ground shaking, and he heard a loud noise similar to a sonic boom. Pictures were shaken from the walls of the ranch house, but no other damage occurred at the ranch (Casper Star-Tribune, May 30, 1984). All other reports only indicated that dishes rattled. On October 29, 1984, a magnitude 2.5 earthquake occurred approximately 35 miles east of Buffalo. No damage was reported.

6.3.3.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Based on the Level 1 HAZUS-MH analysis conducted for the State of Wyoming in 2020, Johnson County had the third highest projected losses in Region 1 under a 2,500-Year Probabilistic event scenario, with $19 million in projected damages, which is the highest loss ratio in the Region. The county is also projected to see eight casualties. There are not vulnerable populations, lifelines and other natural resources within the County and jurisdictions of note. Overall earthquakes are a **medium** significance hazard in the county based on the history of occurrences.

6.3.3.2 Development Trends

Recent and future development in the County, districts and municipalities is not anticipated to change vulnerability to earthquake in a significant way.

6.3.4 Expansive Soils

6.3.4.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Johnson County classifies expansive soils as posing a low risk to the City of Buffalo and the unincorporated areas of Johnson County. The Town of Kaycee, however, is designated as a medium-risk area for the potential impacts of expansive soil.

In the Hazard Analysis and Risk Assessment chapter, specifically in section 4.2.5, there is a regional map illustrating soil types and the corresponding risk of expansive soil. Approximately $47 million in total property value is exposed to moderate expansive soils risk in Johnson County. The analysis indicates that there is some level of risk associated with exposure to expansive soils in the Kaycee area (25 improved parcels). The tables provided below summarize the key findings of this analysis, encompassing potential losses, the affected population, and the types and numbers of parcels and facilities that could potentially be impacted by this hazard.

An estimated 163 people reside on areas of expansive soils, mostly in Kaycee and unincorporated areas. However, no direct impacts on people are anticipated. Should an impact occur, it is anticipated to be localized. Social vulnerability is not considered a factor. Natural and historic resource impacts are not considered to be a concern.

Among the seven lifelines, transportation (21) and communication (8) lifelines have the most facilities that are exposed to moderate expansive soil risk. On the other hand, damage from these soils will be individual events, damaging a small number of buildings or road segments over time.

6.3.4.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Modern construction techniques typically account for and mitigate this hazard.

Table 6-8 Building/Structure and Population Risk to Moderate Expansive Soil by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Population
Kaycee	Commercial	5	$451,152	$451,152	$902,304	
	Residential	20	$2,221,356	$1,110,678	$3,332,034	42
	Total	**25**	**$2,672,508**	**$1,561,830**	**$4,234,338**	**42**
Unincorporated	Commercial	6	$542,955	$542,955	$1,085,910	
	Residential	57	$17,176,654	$8,588,327	$25,764,981	121
	Total	**63**	**$17,719,609**	**$9,131,282**	**$26,850,891**	**121**
	Grand Total	**88**	**$20,392,117**	**$10,693,112**	**$31,085,229**	**163**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-9 Building/Structure and Population Risk to Low Expansive Soil by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Population
Unincorporated	Residential	5	$1,301,395	$650,698	$1,952,093	11
	Total	**5**	**$1,301,395**	**$650,698**	**$1,952,093**	**11**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-10 Johnson County Critical Facilities at Risk to Moderate Expansive Soil by Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Kaycee	-	-	-	-	1	-	1	**2**
Unincorporated	8	-	-	-	-	-	20	**28**
Total	**8**	**0**	**0**	**0**	**1**	**0**	**21**	**30**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

6.3.5 Flood

6.3.5.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

As of 2023, Johnson County only has the Town of Kaycee with digital floodplains mapped by FEMA's National Flood Insurance Program and a Hazus flood model was utilized for mapping and analysis to create a comprehensive flood risk assessment. Figure 6 through Figure 8 show the FEMA and Hazus modeled floodplains.

Table 6-11 summarizes the building counts and improved value of parcels in the County, broken out by jurisdiction, which fall within the 1% chance floodplains. Additionally, the table also summarizes loss estimate values, which are calculated based upon the improved value and estimated contents value and assumes a two-foot deep flood which usually results in 25% of the total value, based on FEMA depth-damage curves.

Table 6-12 summarizes improved properties at risk to the 0.2% flood hazards where mapped within Johnson County.

Table 6-11 also indicates the estimated flood losses in each applicable jurisdiction in Johnson County. The unincorporated areas of the County have the largest number of properties at risk to the 1% annual chance flood. The majority of the properties are residential with a total value of $19.7 million in improved values and $7.4 million in total estimated losses.

Table 6-11 Johnson County Parcels at Risk to 1% Flood Hazard (FEMA & Hazus) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Buffalo	Commercial	7	$8,864,024	$8,864,024	$17,728,048	$4,432,012	
	Industrial	1	$347,046	$520,569	$867,615	$216,904	
	Residential	25	$1,815,539	$907,770	$2,723,309	$680,827	53
	Total	**33**	**$11,026,609**	**$10,292,363**	**$21,318,972**	**$5,329,743**	**53**
Kaycee	Commercial	4	$549,923	$549,923	$1,099,846	$274,962	
	Residential	13	$1,230,141	$615,071	$1,845,212	$461,303	28
	Total	**17**	**$1,780,064**	**$1,164,994**	**$2,945,058**	**$736,264**	**28**
Unincorporated	Commercial	18	$2,794,642	$2,794,642	$5,589,284	$1,397,321	
	Industrial	1	$944,661	$1,416,992	$2,361,653	$590,413	
	Residential	89	$19,763,567	$9,881,784	$29,645,351	$7,411,338	189
	Total	**108**	**$23,502,870**	**$14,093,417**	**$37,596,287**	**$9,399,072**	**189**
	Grand Total	**158**	**$36,309,543**	**$25,550,773**	**$61,860,316**	**$15,465,079**	**269**

Source: Sheridan FEMA NFHL 1/16/2014 & Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-12 Johnson County Parcels at Risk to 0.2% Flood Hazard (FEMA) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Kaycee	Residential	2	$172,734	$172,734	$345,468	$86,367	4
	Grand Total	**2**	**$172,734**	**$172,734**	**$345,468**	**$86,367**	**4**

Source: Sheridan FEMA NFHL 1/16/2014 & Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Approximately 269 persons reside in potential flood hazard areas, mostly in the unincorporated areas. General trends with populations vulnerable to flooding can be referenced in Section 4.2.6 in the base plan. More specifics are not known, but the slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts and recovery from a significant flood.

No natural or historic resources are known to be at-risk.

Johnson County has a total of 70 critical facilities located in the 1% annual chance floodplain and 0 within the 0.2% floodplain. 66 of the 70 facilities are transportation lifelines and these consist of non-scour bridges in varying degrees of condition ranging from poor, fair, or good condition. This is shown in Table 6-13.

Table 6-13 Johnson County Critical Facilities at Risk to 1% (FEMA & Hazus) Flood Hazards Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Buffalo	-	-	-	-	-	-	5	**5**
Kaycee	-	-	-	-	-	-	1	**1**
Unincorporated	-	-	4	-	-	-	60	**64**
Total	**0**	**0**	**4**	**0**	**0**	**0**	**66**	**70**

Source: Sheridan FEMA NFHL 1/16/2014 & Hazus-MH MR2, HIFLD, National Bridge Inventory, WSP GIS Analysis

Figure 6 Johnson County FEMA and Hazus Flood Hazards

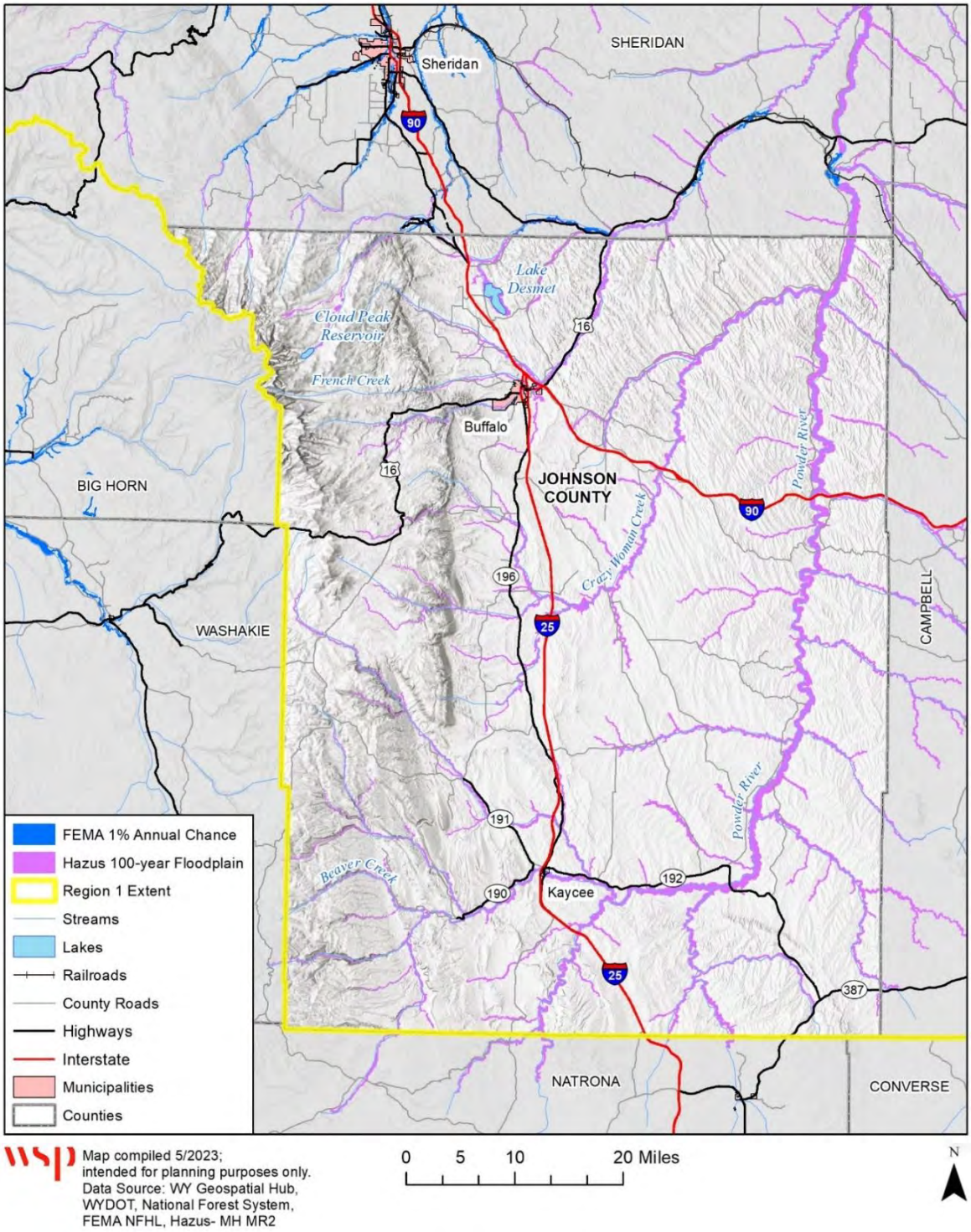


Figure 7 Buffalo Hazus Flood Hazards and Structures at Risk

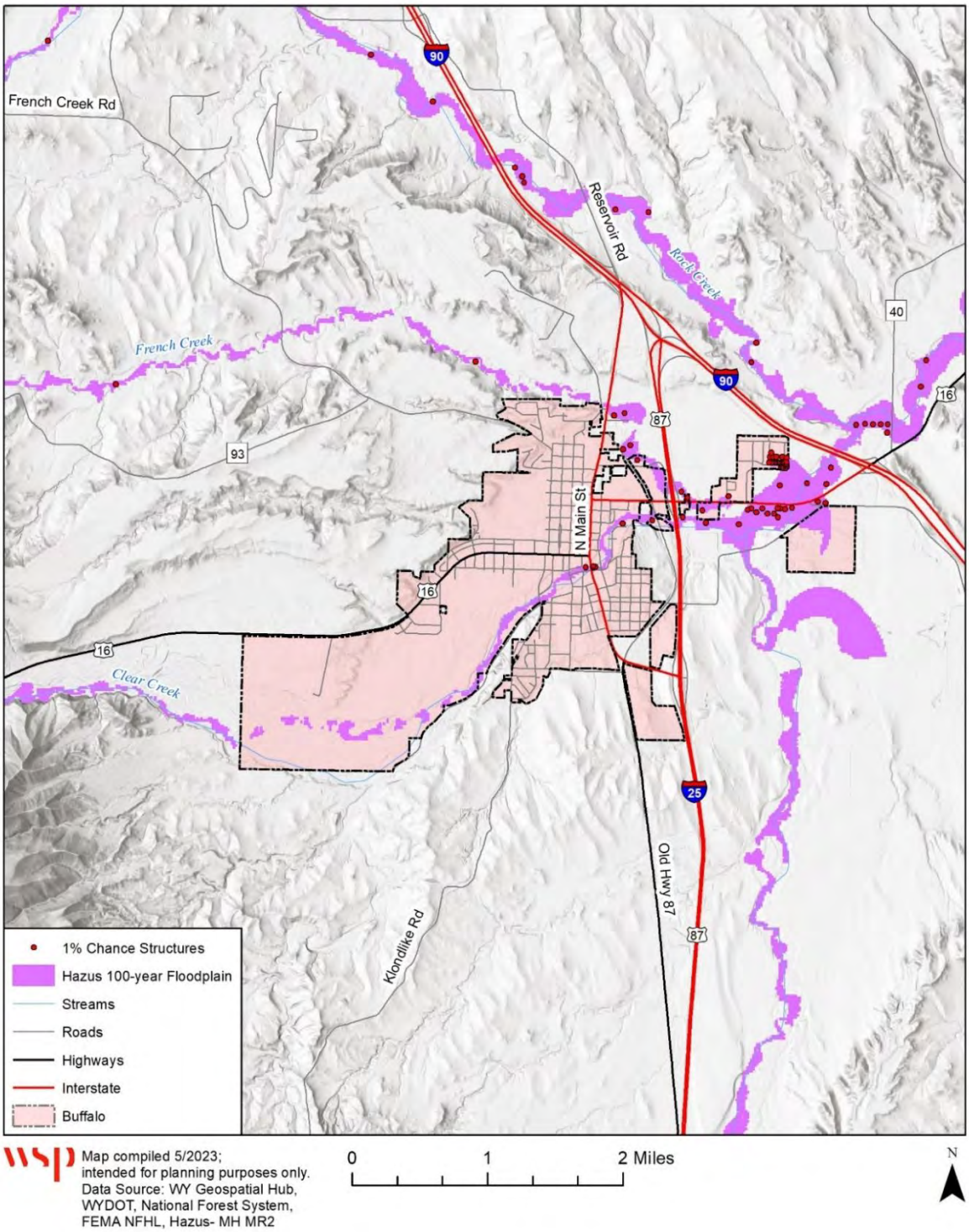
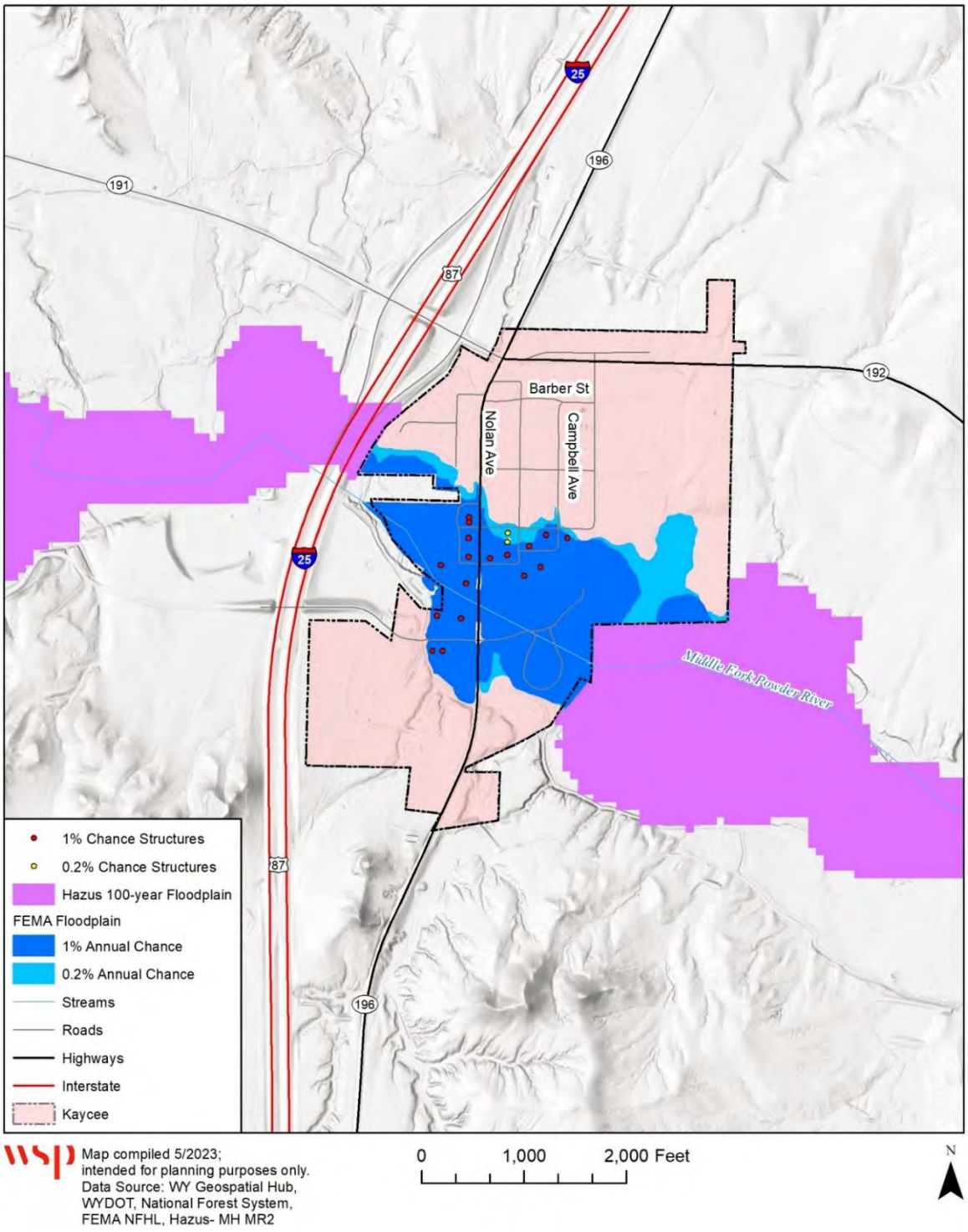


Figure 8 Kaycee FEMA and Hazus Flood Hazards and Structures at Risk



Johnson County has a long history of flooding that has resulted in financial losses and property destruction. For instance, in the summer of 2015, six events flash flooding and river flooding events affected the jurisdictions and unincorporated areas, causing $1,815,000 in property and crop damages. Another flash flood took place in Buffalo in June of 2017 too, although no damages were incurred then. Overall, Johnson County

has lost over $2.26 million in property damages and $262,000 in crop damages based on reported events to NOAA's National Centers for Environmental Information (NCEI) system dating back to 1996. Johnson has had the highest flood related losses in Region 1. Flood disasters have occurred almost every year since 1996, and riverine flooding sources include Rock Creek, French Creek, Clear Creek, the Middle Fork Powder River, Beaver Creek, Crazy Woman Creek, Piney Creek and the Powder River.

The most damaging recent flash flood (costing $1,500,000 in property damages) took place June 3 of 2015, starting around 8 pm near Buffalo. A series of thunderstorms brought heavy rains, causing areas such as the Johnson County Airport to measure almost 1 inch in less than 25 minutes. Saturated soils could not absorb the rapidly incoming precipitation, causing inundation through streets and overfilling streams. Five Buffalo homes were declared destroyed, with reports claiming over four feet high flooding in low-lying areas. Some roads and private bridges were washed out as well. Crop losses from this event.

Table 6-14 summarizes 38 significant flood events that occurred between 1996 and 2023 in Johnson County, as reported to the NOAA National Centers for Environmental Information (NCEI) system.

Table 6-14 Flood Events in Johnson County, 1996-2023

Type	Location	Date	Property Damage	Crop Damage
Flood	Bighorn Mountains Southeast (Zone)	1/29/1996	$2,000	$0
Flood	Bighorn Mountains Southeast (Zone)	3/13/1996	$0	$0
Flash Flood	Barnum	6/8/1997	$0	$0
Flash Flood	Buffalo	6/8/1997	$0	$0
Flash Flood	Southwest Portion	7/30/1998	$0	$0
Flash Flood	Southwest Portion	7/30/1998	$0	$0
Flash Flood	Kaycee	5/17/2000	$0	$0
Flash Flood	Kaycee	5/17/2000	$0	$0
Flash Flood	Kaycee	5/17/2000	$0	$0
Flash Flood	Kaycee	7/10/2001	$0	$0
Flash Flood	Kaycee	7/10/2001	$18,000	$0
Flash Flood	Buffalo	8/21/2002	$0	$0
Flash Flood	South Portion	8/26/2002	$0	$0
Flash Flood	Kaycee	8/26/2002	$459,000	$0
Flash Flood	Buffalo	6/19/2003	$60,000	$0
Flash Flood	Buffalo	8/7/2006	$1,400	$0
Flash Flood	Kaycee	7/19/2007	$50,000	$2,000
Flood	Buffalo Airport	5/22/2008	$50,000	$0
Flood	Mayoworth	5/22/2008	$0	$0
Flash Flood	Mayoworth	7/12/2009	$5,000	$0
Flood	Buffalo	6/8/2010	$0	$0
Flash Flood	Barnum	7/12/2011	$0	$0
Flash Flood	Barnum	7/4/2013	$0	$10,000
Flash Flood	Kaycee	7/5/2013	$50,000	$0

Type	Location	Date	Property Damage	Crop Damage
Flash Flood	Buffalo	5/24/2014	$0	$0
Flash Flood	Kaycee	5/24/2015	$0	$0
Flood	Buffalo	5/24/2015	$0	$0
Flood	Kaycee	5/24/2015	$700,000	$250,000
Flood	Sussex	5/25/2015	$5,000	$0
Flash Flood	Buffalo	6/3/2015	$10,000	$0
Flash Flood	Buffalo Airport	6/3/2015	$1,500,000	$0
Flash Flood	Linch	6/3/2015	$0	$0
Flash Flood	Buffalo	6/12/2017	$0	$0
Flood	Buffalo Airport	5/28/2018	$0	$0
Flood	Saddlestring	5/28/2018	$0	$0
Flood	Barnum	5/27/2019	$0	$0
Flood	Kaycee	5/27/2019	$1,200,000	$0
Flash Flood	Barnum	6/4/2023	$0	$0
TOTAL			**$4,110,400**	**$262,000**

Source: NOAA NCEI, HMPC

According to the statistics from the National Flood Insurance Program, there have been a total of 6 flood insurance claims. The total payments made on these claims in the County is $21,905 and there were 24 flood insurance policies in force in Johnson County for a total of $2,477,000.

Table 6-15 NFIP Policy and Insurance Claim Data for Johnson County

Johnson County	Policies	Coverage "Insurance in Force"	# of Claims "Closed Paid Losses"	Paid Losses "$ of closed paid losses"	# of Policies in A Zones
Buffalo, City of	12	$2,477,000	3	$10,582	6
Kaycee, Town of	6	$1,232,000	1	$4,695	4
Johnson County	4	$4,617,000	2	$6,628	0
Total	**24**	**$2,477,000**	**6**	**$21,905**	**10**

Source: FEMA Policy and Claim Statistics http://www.fema.gov/policy-claim-statistics-flood-insurance and State of Wyoming Office of Homeland Security, NFIP Coordinator as of 5/10/2023

6.3.5.2 Development Trends

For NFIP participating communities such as the County, Buffalo and Kaycee, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. The lack of comprehensive flood hazard mapping in unincorporated areas of Johnson County makes floodplain management challenging. No major growth or development in the County or jurisdictions is expected to significantly alter the general area flood risk, but good planning, zoning, and general hazard mitigation practices are always necessary to prevent future development from being heavily impacted by flooding.

6.3.6 Hail

6.3.6.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Hailstorms are intermittent in Region1, typically occurring in conjunction with severe summer storms. They mainly impact buildings and agriculture. Crop damage accounts for the majority of the harm, although there's the potential for significant structural damage caused by exceptionally large hailstones. The likelihood of future hail events in Johnson County is moderate, but the scale of these incidents tends to be relatively minor. Although, hail presents a moderate threat throughout the County and remains consistent across jurisdictions. However, it's important to note that property damage is more likely in urban areas (due to exposed infrastructure and vehicles), whereas potential harm to crops and livestock is concentrated in rural areas and unincorporated areas.

See Section 4.2.7 of the Base Plan for more information on the previously recorded hail events and associated damages. In the summers of 2019 and 2023 Johnson County saw significant hail events. According to NCEI, the total property damage recorded for the County since 1950 due to this hazard is $40,000, with $25,000 of crop damages on file.

No specific natural, cultural, or historical resources are at risk.

Vulnerable populations that may be affected by drought may include mine workers, ranchers and farmers that work outdoors. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a major hail event.

6.3.6.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.7 Hazardous Materials

As further discussed at a regional level in the Base Plan, since 2007 Johnson County has been exposed to at least 64 hazardous materials incidents that were significant enough to be recorded in the U.S. Coast Guard's National Response Center (NRC) database and Risk Management Plans (RMP) network; more information can be obtained at http://www.rtk.net/#rmp. While Johnson County does not contain any RMP facilities, hazardous material handlers do exist in the form of transporter services, and hence have impacted, and can continue to impact, Johnson County. The table below summarizes the number of events that have occurred from 2007-2022 in Johnson County.

Table 6-16 NRC-Reported Incidents in Johnson County: 2007-2022

Year	Johnson
2007	22
2008	9
2009	9
2010	1
2011	4
2012	1

Year	Johnson
2013	2
2014	3
2015	0
2016	2
2017	3
2018	2
2019	1
2020	0
2021	1
2022	4
Yearly Average	**4.4**
Total	**64**

Source: http://www.rtk.net/#rmp

There are communities in Johnson County in close proximity to highways, pipelines, and other such transportation systems at risk from transportation-related Hazmat events. Due to the consistent requirement for transportation and storage of mine explosives, main transport routes and networks are at highest risk of Hazmat incidents. The overall significance of this type of hazard to the county is medium.

6.3.8 High Winds and Downbursts

Wind is a constant presence in Wyoming but can be often overlooked.

6.3.8.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

It is difficult to assess vulnerability as it relates to location because damaging winds have occurred everywhere in the County. The main risks associated with high wind events are related to poorly constructed buildings, flying debris, car accidents, and damages to electrical/power infrastructure. Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out. It is not uncommon for residents living in more remote areas of the county to be isolated after such events.

Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support.

High wind events are usually somewhat random and damages from high winds are often described in a regional context, though downbursts occur in smaller extents. High winds can cause significant damage to trees (including those in the National Forest) and power lines, blocking roads with debris, incapacitating transportation, isolating populations, and disrupting ingress and egress.

From 1950-2022, a total of 180 wind weather events have caused $36,500 in property damages, with a maximum recorded wind speed of 70 mph (source: NOAA's NCEI). The map below displays the locations of the NOAA-reported wind events in Johnson County and near its jurisdictions, from 1950-2022. Overall, high winds pose a moderate/medium threat across the County that does not vary between the

jurisdictions. See Section 4.2.9 of the Base Plan for more information on wind zones, events, and impacts.

6.3.8.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.9 Landslide/Debris Flow/Rockfall

The geologic history and unique conditions of Wyoming make landslides one of the most common hazards. In Johnson County, landslide deposits are found in the mountainous portions to the west of the county. Complex slope movement is sprinkled near the southwest boundary with Washakie County. Along with other areas of complex slope movement there is debris/earth flow and slump parallel and about 10 miles to the west of Interstate 25, present in a north-south fashion. While unstable rock can also be found, it is not as prevalent; this kind of landslide is also sprinkled throughout the higher elevation parts of the county, near the other landslide types.

6.3.9.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The HMPC noted impacts on I-90 often leading to closures, particularly between Buffalo and Sheridan.

In terms of significance, landslides, debris flow, and rockfall vary based on the magnitude and the location. There is also a possibility that creeks or rivers within the county could become dammed by landslide activity, resulting in a flash flood hazard downstream if the landslide dam fails or is overtopped, or flood nearby developed areas as pooling behind the landslide dam occurs. While some events are small and have limited impact on people and infrastructure, other occurrences can involve large sections of earth and may obstruct major roadways, power line corridors, or gas lines.

On July 22, 2011, President Obama declared a major disaster for the State of Wyoming for emergency work and the repair or replacement of facilities damaged by the severe storms, flooding, and landslides in Albany, Big Horn, Carbon, Crook, Fremont, Goshen, Johnson, Lincoln, Platte, Sheridan, Sublette, Teton, Uinta, Washakie, and Weston Counties. This declaration made Public Assistance funding available.

During the development of this regional plan, a GIS analysis of exposure to landslide hazard areas and potential property losses was performed, with the resulted detailed for all the Region 1 counties in Section 4.2.10 of the Base Plan. To summarize Johnson County's results, Table 6-17 below is included. Table 6-18 summarizes critical facility exposure to landslide for Johnson County.

Based on the GIS analysis approximately 2,410 persons may reside on landslide susceptible areas, mostly in Buffalo and the unincorporated areas. Risk to populations is generally considered low as the landslides are commonly slow moving events in this part of the Region, and there are not any distinct social vulnerability aspects. No specific natural or cultural resources have been identified as at risk.

Figure 9 Johnson County Landslide Susceptibility

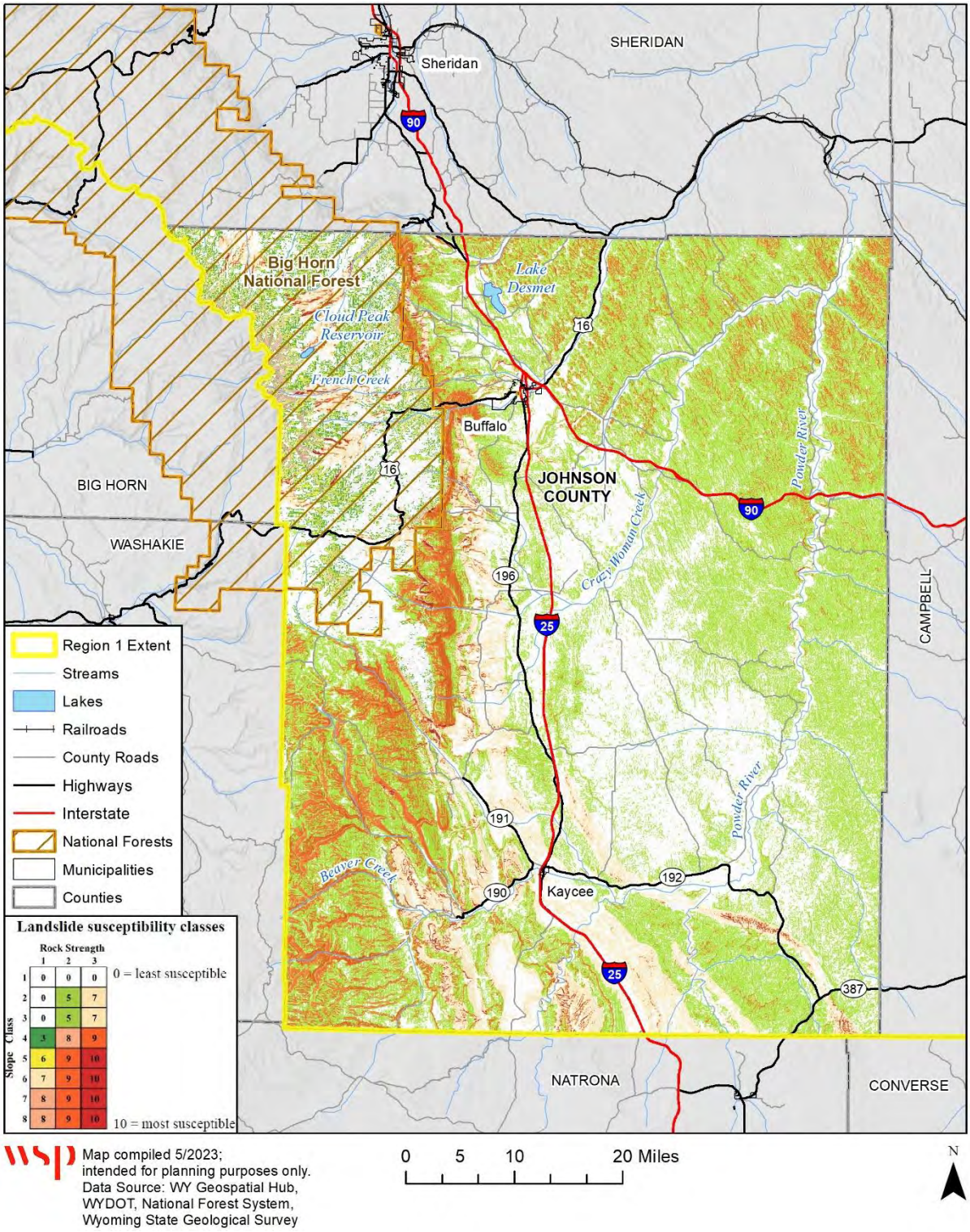


Table 6-17 Johnson County Parcels at Risk to Landslide

Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value
Buffalo	6	27	387	**420**	$109,662,644
Kaycee	-	1	-	**1**	$207,987
Unincorporated	101	106	550	**757**	$199,047,110
Total	**107**	**134**	**937**	**1,178**	**$308,917,741**

Source: WYGS Landslide susceptibility data, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-18 Johnson County Critical Facilities at Risk to Landslide

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Moderate Risk								
Buffalo	3	-	-	-	-	1	-	**4**
Kaycee	-	-	-	-	-	-	-	**0**
Unincorporated	35	-	-	-	-	-	26	**61**
Moderate Total	**38**	**0**	**0**	**0**	**0**	**1**	**26**	**65**
Moderately High Risk								
Buffalo	-	-	-	-	-	-	-	**0**
Kaycee	-	-	-	-	-	-	-	**0**
Unincorporated	1	-	-	-	-	-	14	**15**
High Total	**1**	**0**	**0**	**0**	**0**	**0**	**14**	**15**
Highest Risk								
Buffalo	-	-	-	-	-	-	-	**0**
Kaycee	-	-	-	-	-	-	-	**0**
Unincorporated	5	-	-	-	-	-	1	**6**
Highest Total	**5**	**0**	**0**	**0**	**0**	**0**	**1**	**6**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

Johnson County has a moderate degree of landslide vulnerability, with exposure to complex slope movement, debris or earth flow, and/or slump landslides. These structures are mostly located in unincorporated areas with the total exposure amounts being a little over $308 million. Future impacts are likely to affect transportation corridors, rivers, lakes and reservoirs, transmission lines, campgrounds and the occasional structure or property in the county.

6.3.9.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Future planning in areas of steep slopes should consider the potential for slope failure/landslide hazards.

6.3.10 Lightning

6.3.10.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

All areas in western Wyoming are susceptible to lighting strikes. Impacts to persons and property are likely to remain isolated. Outdoor workers and outdoor enthusiasts and livestock will remain susceptible to lightning strikes. In Johnson County, higher elevation/mountainous areas remain more susceptible. Although there is a higher elevation, there have been no lightning strikes incidents in Johnson County recorded in NCEI. Lightning caused wildland fires may result in more extensive and compound/ secondary damages as well, including to natural resources and watersheds. No specific cultural resources have been identified as at risk.

Sometimes, communications and infrastructure are interrupted by lightning strikes. These events raise the vulnerability of the essential functions by delaying response times, hindering interagency communication efforts, or endangering or damaging communication networks. Overall, lighting poses a medium significance hazard across all jurisdictions in the County.

6.3.10.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

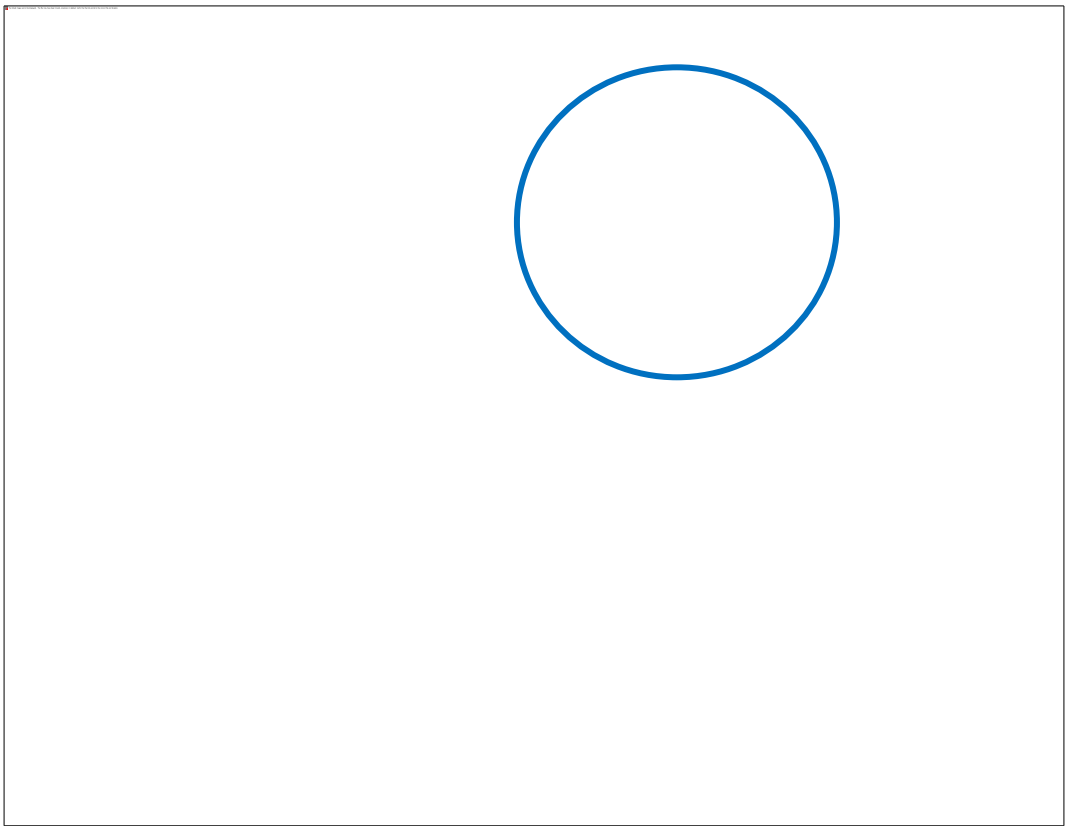
6.3.11 Mine and Land Subsidence

6.3.11.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

There are numerous abandoned mine sites with subsidence-prone underground workings in Johnson County, especially areas close to Interstate 90, I-25, and other major highways. Mines across the county have been identified and there are mitigation projects designed to reduce the impacts from underground mining and subsidence, and to remove the threat they pose to the surrounding area. The unmitigated identified mines pose little to no threat to infrastructure in the surrounding area. Mine and general land subsidence events occur occasionally, and the degree of risk and impact varies based on the characteristics of each area. Although there have not been any mine or land subsidence events in Johnson County recently, occurrences can happen; however, the dollar amounts of the potential damage are not readily available. The voids created can be hazardous to humans, livestock and animals but within limited areas.

A layer of prehistoric rock known as the Triassic Spearfish Formation traverses part of Johnson County. The formation is abundant with gypsum, a soluble mineral that dissolves as water infiltrates the ground. As the gypsum dissolves, caves form underground; sinkholes appear on the ground surface when the roof of an underground cave collapses. This type of landscape is referred to as “karst,” identified by the dissolution of layers of soluble minerals and bedrock. Karst landscapes may be marked by caves, sinkholes, cenotes, and other surface features. Figure depicts known locations of gypsum-bearing strata in the State. Note the locations of gypsum in Johnson County (circled in blue).

Figure 10 Gypsum-Bearing Strata in Wyoming



Source: Wyoming State Geological Survey, "Gypsum," accessed December 13, 2012.

Refer to Section 4.2.12 from the Base Plan for additional specifics on the regional vulnerability assessment and location of abandoned mine sites, mine reclamation and abandonment programs, land subsidence information, and other details relevant to Johnson County and Region 1. The overall threat of this hazard in the County is low and not anticipated to have substantial effects on structures, populations, natural or cultural resources or variability across jurisdictions. Linear infrastructure in the unincorporated areas could be potentially vulnerable.

6.3.11.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.12 Severe Winter Weather

Winter storms are a yearly feature of the Wyoming climate and may occur anywhere in the state. Blizzard conditions bring the triple threat of heavy snowfall, strong winds, and low temperatures. Poor visibility and huge snow drifts are major hazards caused by blowing snow.

6.3.12.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

These storms disrupt work, make travel difficult or impossible, isolate communities, kill livestock by the hundreds or thousands, and sometimes leave human fatalities in their wake. Higher elevation and mountainous areas tend to be more susceptible to severe winter weather events, in Johnson County there have been $165,000 worth of property

damage from 1996 to 2023. In this time period, 164 winter storm events took place, which cumulatively have resulted in 4 deaths and 7 injuries in Johnson County. (Source: NOAA's NCEI database.)

The HMPC reported that Interstate closures are common during winter storm events, which leads to the need to shelter stranded motorists, can create economic impacts, and can cause problems due to diverted semi-trucks on city and town streets. Heavy snow can temporarily affect transportation infrastructure, making access to rural homes difficult. Medically fragile persons and seniors can also be more vulnerable, especially during prolonged storms; residents are encouraged to keep a 3-day supply of food, medication, and oxygen.

Winter storms do not have substantial impacts to natural or cultural resources. Impacts on livestock are a concern that can have socioeconomic impacts.

Other major winter storm events were noted in the 2013 Johnson County HMP as follows:

> *The most significant blizzard in Wyoming's history in terms of total human impact occurred from January 2, 1949 to February 20, 1949. Snowfall in parts of eastern and southeastern Wyoming measured up to 30 inches, with drifts 20-30 feet high. Within twenty-four 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. Multiple people perished, along with 55,000 head of cattle and over 105,000 sheep. That was an estimated loss of 15% of the States cattle. 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 4,194 people received aid through the Interior Department, and that help was given to 994 ranches. Total economic loss is estimated at more than $9,000,000 dollars. In 2004 dollars the economic loss would be equivalent to $70,866,000.*
>
> *In 1984, a three-day blizzard struck the northern part of Wyoming. The northeast, including Johnson County, was the hardest hit as snowfalls of 2 to 3 feet were whipped into 15 to 20 foot drifts by 65 mph winds. A rancher near Wright and one near Sundance died of exposure as they were stranded hauling hay to their livestock. All of northeast Wyoming was effectively shut down for two days by the blizzard. The major damage occurred to the livestock industry as more than 200,000 sheep and cattle perished in the storm. Some ranchers lost up to 95 percent of their sheep, and up to 50 percent of their cattle.*

More recently, over the winter of 2022 Johnson County, and the entire region, saw significant severe winter weather, with temperatures as low as -63 ˚F and significant snowfall, which led to power outages, residential and commercial water/sewer issues, and livestock and wildlife losses. Ice jams pose a problem across the county as well. The overall significance of this hazard is **high** across the County and does not largely vary between the jurisdictions. Refer to Section 4.2.13 of the Base Plan for more information.

6.3.12.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.13 Tornado

Many documented tornadoes occurring in the counties in Region 1 are given low ratings on the Fujita Scale (F0s and F1s) simply because these tornadoes are often formed over open land and result in little or no damage. Johnson County, however, has had 23 reported incidents of this kind from 1950-2023 with two being an EF-2. The table below summarizes the tornado events in this time period:

Table 6-19 Tornado History in Johnson County, 1950-2023

County	Total Incidents	Magnitude	Damage-Causing Incidents	Fatalities	Injuries	Property Damage
Johnson	23	EF2	8	0	2	$ 25,530

Source: NOAA NCEI

6.3.13.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The overall significance of tornadoes in Johnson County is medium for all jurisdictions. Since 1950 there have been 23 recorded tornadoes, and of these events, there were two injuries and relatively low property and crop damages. Region 1 tornado events tend to be very small in terms of magnitude, with limited associated impacts, and the significance of this event does not largely vary across jurisdictions. There is not anticipated variation or specific vulnerabilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to tornado damage leading to periodic power outages. Refer to the map within the base plan for geospatially locations of NCEI-reported tornadoes across Wyoming Region 1.

Johnson County has been impacted by recent tornado events in 2017 and 2018. On June 6, 2017, an EF2 tornado touched down west of Interstate 25 near the Town of Kaycee. The event brought down several trees, caused crop damage, destroyed a trailer throwing it over 200 yards and narrowly missed a house and barn. The National Weather Service in Riverton County estimated the winds were 110 to 120 mph and reported the tornado to be the “strongest tornado that occurred in the NWS Riverton County warning area since 2001.” In total, the event led to $10,000 in property damage.

A recent tornado event took place June 1, 2018: “Two separate surveyed EF-2 tornadoes touched down in eastern Washakie and western Johnson counties on Friday, June 1st. The tornadoes were part of a supercell storm that produced the two tornadoes across the area. The tornado warning for northeast Washakie and west central Johnson County was issued at 1203 PM MDT, with the first reports of tornado damage indicated to have occurred at 1211 PM MDT in northeast Washakie county. Around 1000 trees were either snapped or twisted by the tornado during its nearly one-mile path before dissipating in northeast Washakie county. The tornado was rated as an EF-2 with maximum winds at 130 mph, with a maximum path width of 300 yards. The same supercell thunderstorm again spawned an EF-2 tornado with maximum winds at 120 mph in west central Johnson County, with a 1.07-mile path length, a path width again at 300 yards. The preliminary tornado warning lead time for the Johnson County tornado was at 13 minutes.” This occurrence was reported by the National Weather Service in Riverton, WY. At least two additional tornadoes occurred in the county in June of 2023.

6.3.13.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.14 Wildfire

Johnson County has seen 128,096 acres burned since 1980 from fires over 1,000 acres in size alone. The largest fire in the county was the Cato Fire in 2012, which burned almost 27,700 acres. The fires affecting over 1,000 acres of land in the county are summarized in Table 6-20 below, sorted by acres burned.

Table 6-20 Wildfires over 1,000 acres in Johnson County: 1980-2023

Name	Year	Acres Burned
Cato	2012	27,693
Lost	1988	17,884
Sawmill	2006	16,513
Outlaw 2	2006	12,311
Reno	2020	11,642
Duck Creek	1943	8,485
Gilead	2012	8,189
Deer Creek 2	2021	5,295
Big Spring	2003	3,345
Tw	2022	2,647
Stockwell	1996	2,594
Fire (Not Salvage)	1943	2,203
Gold Mine	1988	1,255
Rock Cr	1919	1,227
Albright	2010	1,200
Cat Creek	2011	1,173
West Range Fire	2014	1,170
Double Cross	2020	1,118
Onion Gulch	1967	1,112
Robinson	2021	1,039
TOTAL		**128,096**

Source: National Incident Feature Service (NIFS)

6.3.14.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

There have been no catastrophic urban fires documented in Johnson County although large wildland fires become increasingly damaging as the population expands into the more rural areas. The method utilized for estimating potential future impact is to determine the value of structures that are located within Wildfire Risk Areas, or wildland fire building exposure values. Wildland fire building exposure value is the value of buildings that can be potentially damaged by wildland fire in an area. Building exposure values are based on assessor data. The methodology utilized is similar to that used to model flood exposure described in the flood chapter.

Table 6-21 below summarizes the building counts, property value, and estimated population exposed to medium, high, or highest wildfire risk areas throughout Johnson County. There are 1,047 improved parcels with a total exposure estimated at $386 million in property value, with the vast majority of this value located in the unincorporated areas of the county (approximately $254 million in property value). An estimated 2,010 people in Johnson County reside in areas of medium wildfire risk or higher. Vulnerable populations may include school-aged children and elderly populations, or those that may not have resources to evacuate. Refer to Section 4.2.15 of the HIRA for details on vulnerable critical facilities in Johnson County.

Refer to Section 4.2.15 of the HIRA for details on vulnerable critical facilities in Johnson County. Overall 122 critical facilities were identified in medium (35), high (72) and highest (15) wildfire risk areas respectively. The lifelines in areas of highest risk include communications (7), food/water/shelter (2), health and medical (1) and safety/security (3) and transportation (2) based on the GIS overlay analysis. A more site-specific analysis would be needed to further refine risk.

Natural and cultural resources impacts could be significant to national protected areas such as the Big Horn National Forest and watersheds within the Big Horn mountains.

Figure 11 through Figure 13 below display the areas of greatest wildfire risk, according to WYWRAP data, for the county, City of Buffalo, and Town of Kacey, respectively. Generally, the areas of highest risk are concentrated in and around the municipalities of the County, with areas of medium to high risk dotted throughout the county. Figure 14 displays the Risk to WUI areas in the county, and Figure 15 shows the extent of areas burned in large fires in Johnson County from 1980 to 2023.

Table 6-21 Johnson County Parcels and Population Exposure within Medium, High, and Highest Wildfire Risk Areas

Jurisdiction	Parcel Count Highest	Parcel Count High	Parcel Count Medium	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Buffalo	151	107	8	**266**	$72,594,446	$46,772,942	**$119,367,388**	513
Kaycee	70	-	-	**70**	$7,833,100	$4,612,481	**$12,445,581**	125
Unincorporated	205	331	175	**711**	$164,295,965	$89,979,141	**$254,275,106**	1,372
Total	**426**	**438**	**183**	**1,047**	**$244,723,511**	**$141,364,564**	**$386,088,075**	**2,010**

Source: WYWRAP, Wyoming CAMA2022, WSP GIS Analysis

Figure 11 Johnson County Wildfire Risk

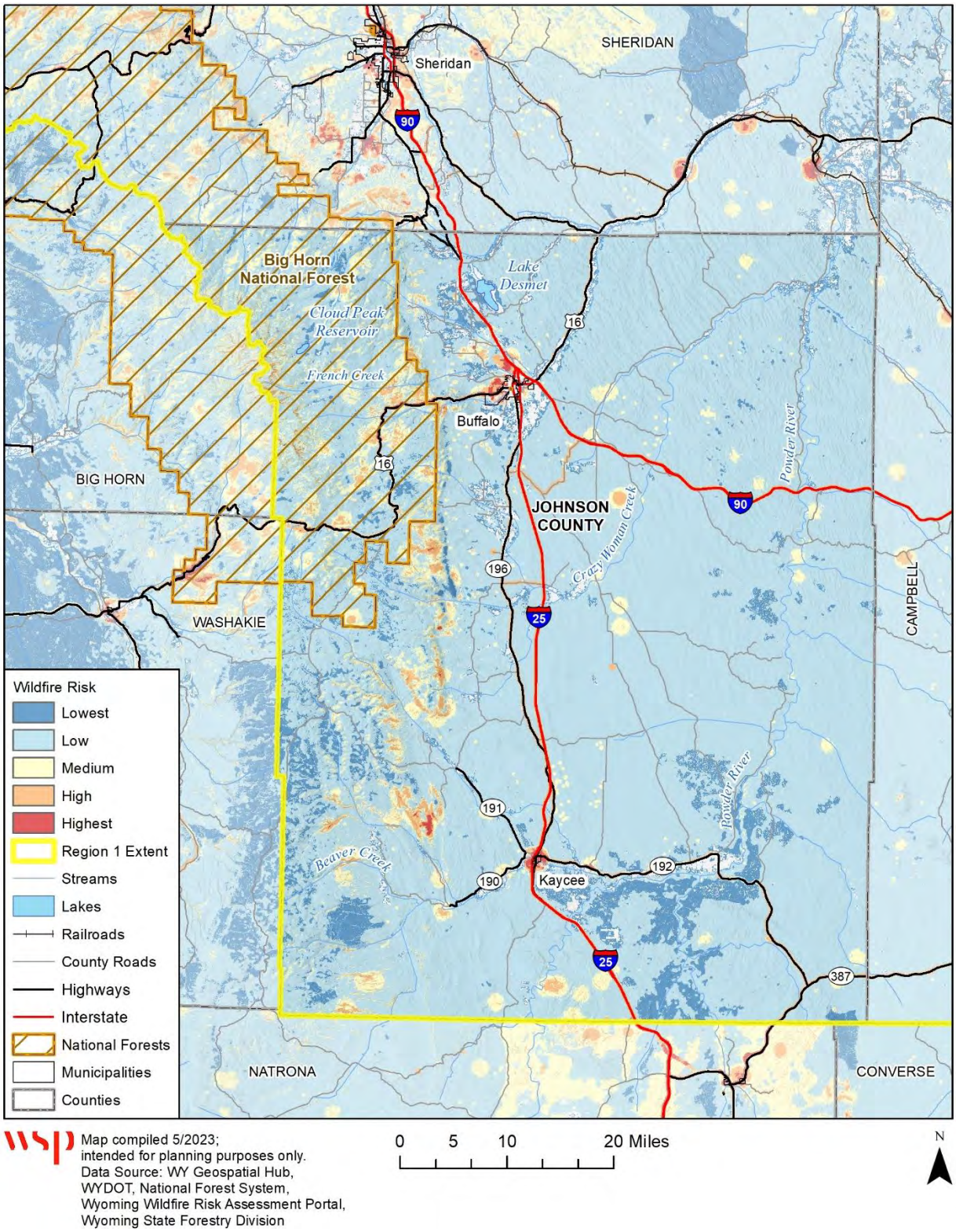


Figure 12 City of Buffalo Wildfire Risk

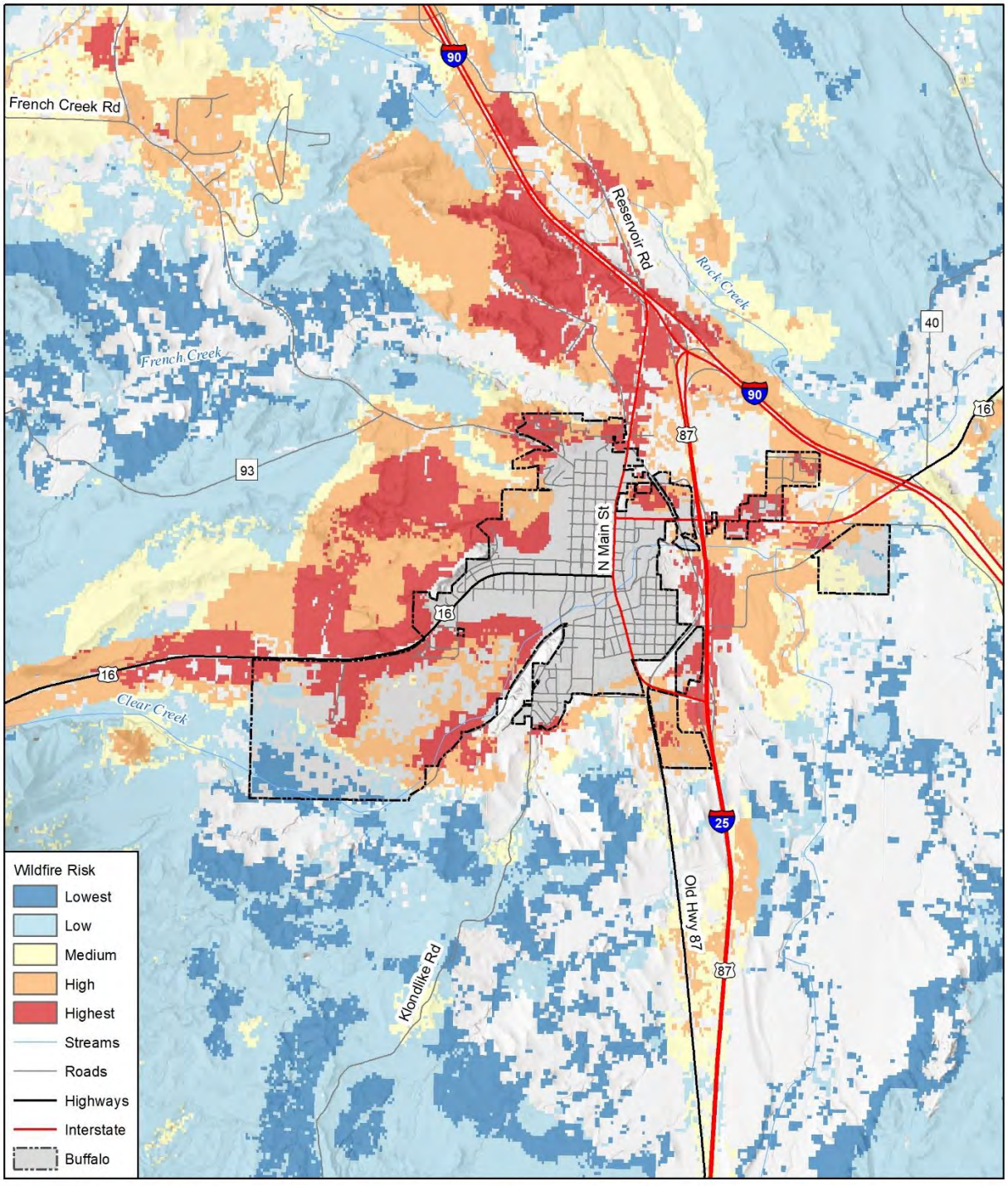


Figure 13 Town of Kaycee Wildfire Risk

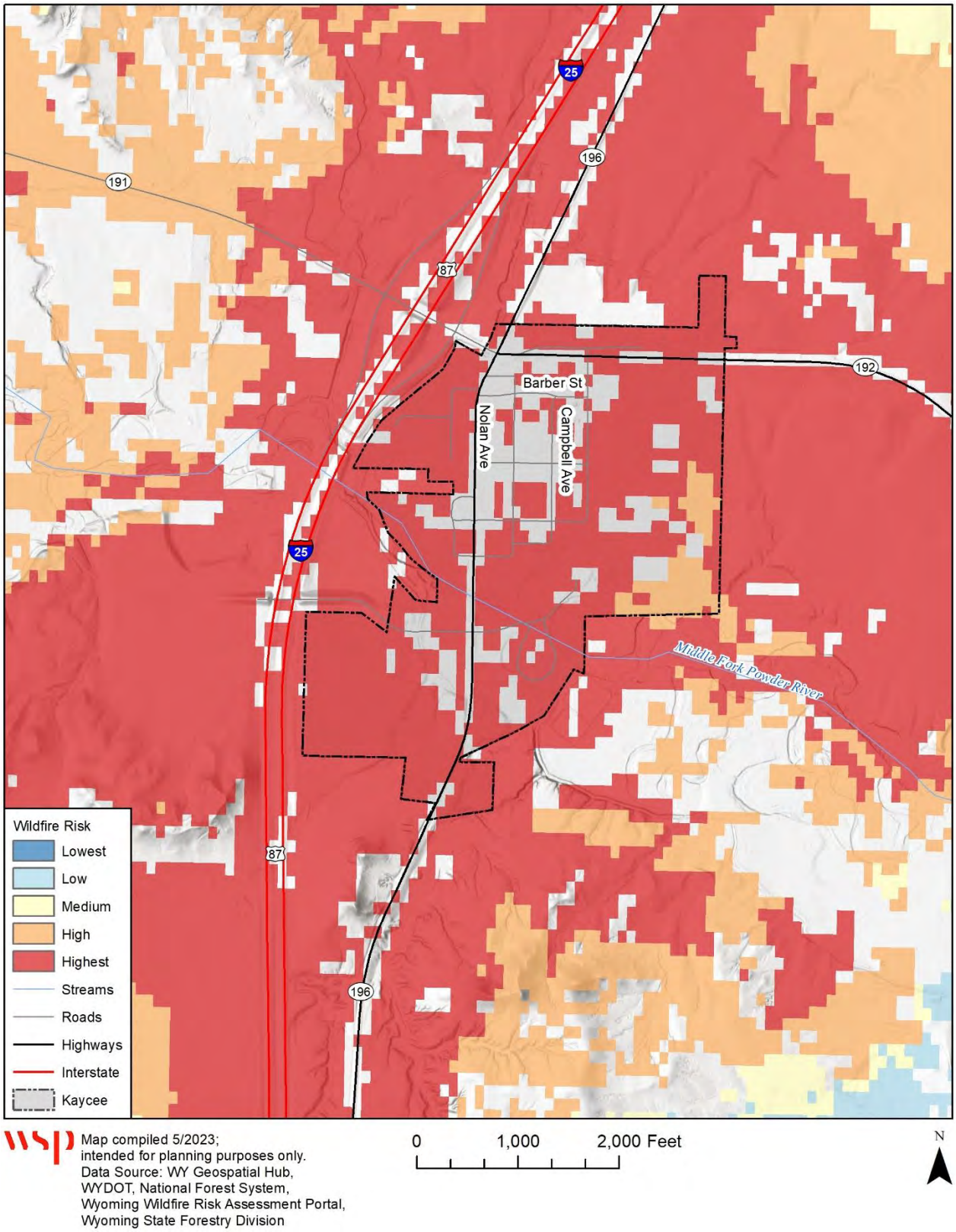


Figure 14 Johnson County WUI Risk

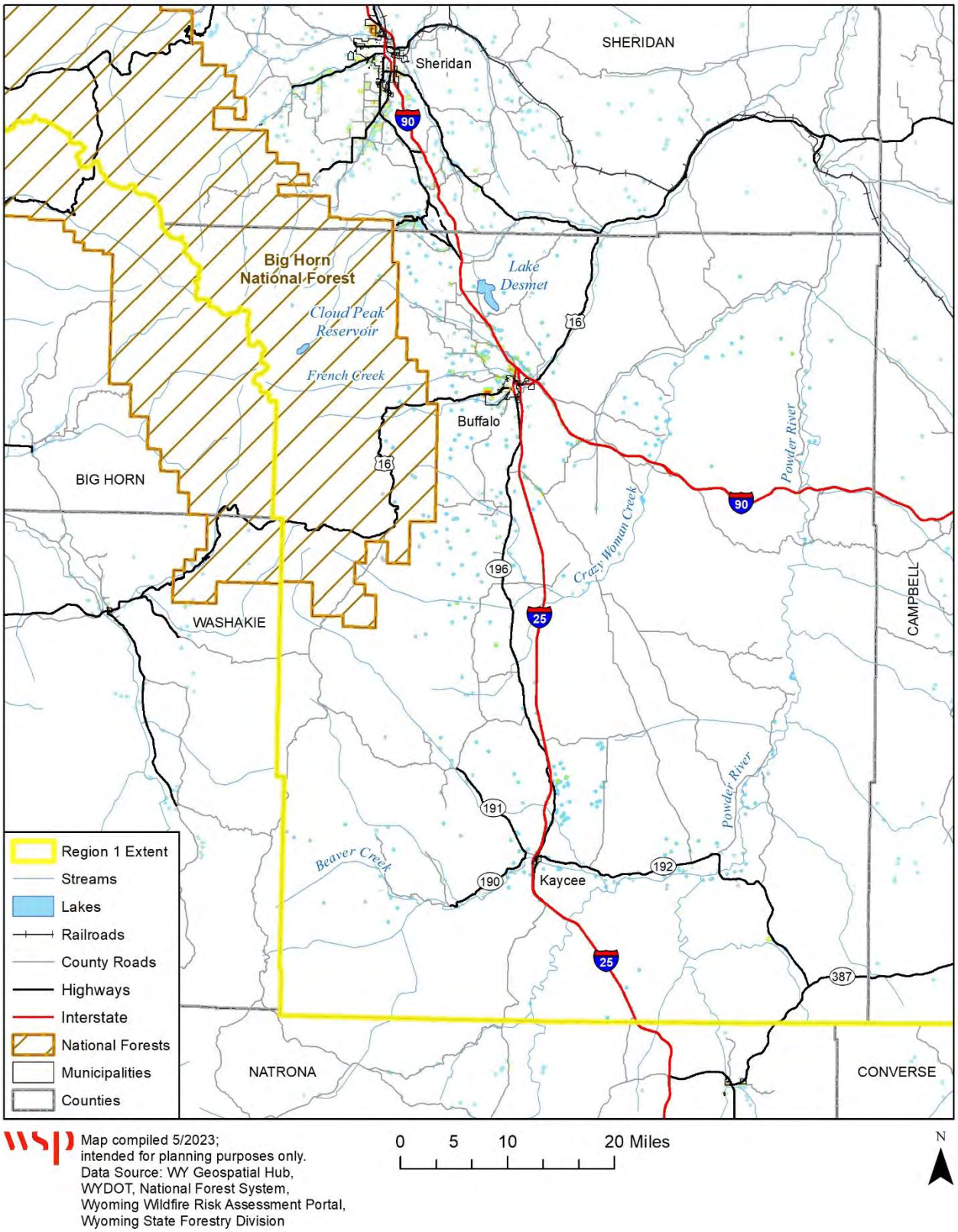
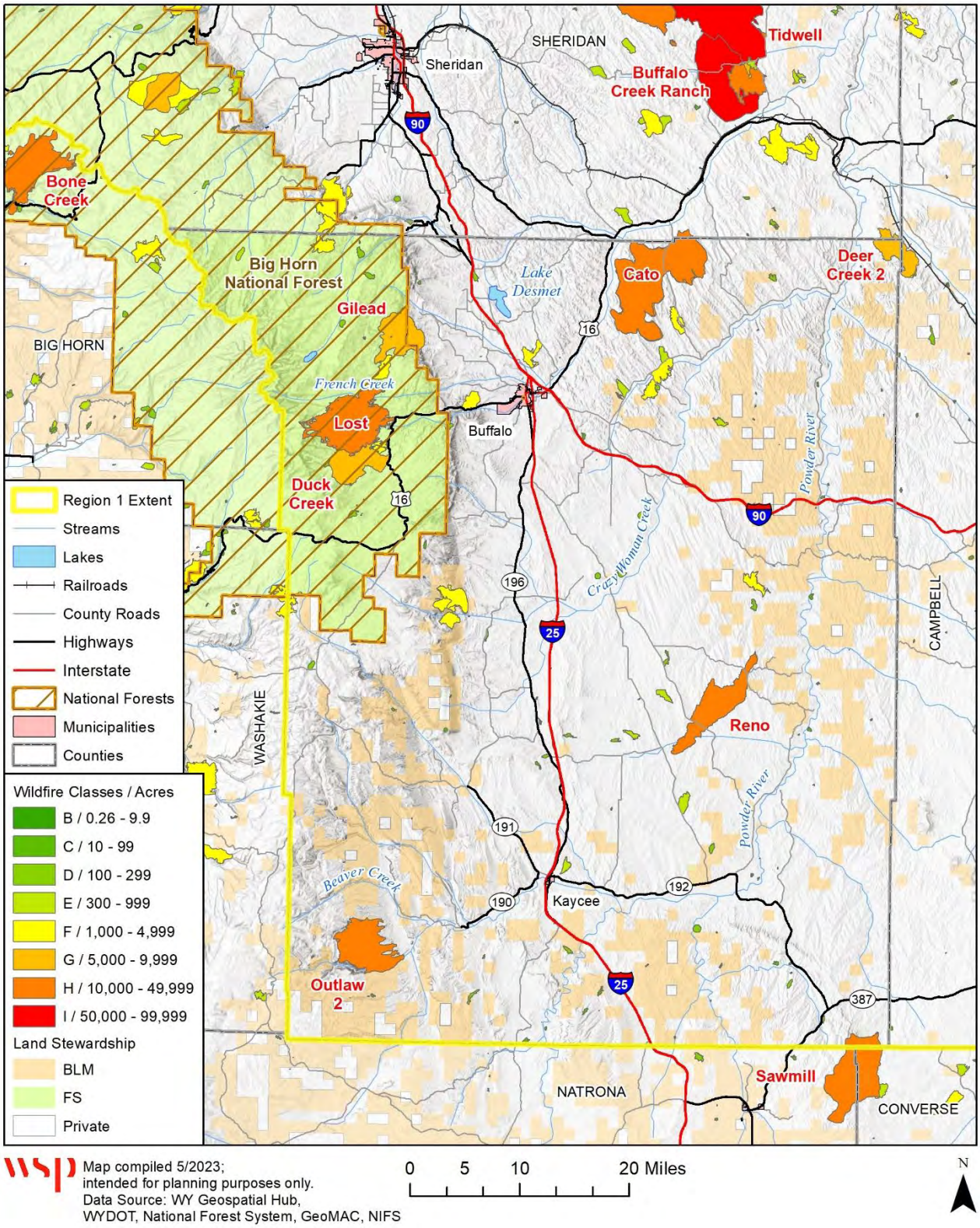


Figure 15 Johnson County Wildfire History, 1980-2023



6.3.14.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.15 Coal Seam Fire

The history of coal mining and coalbed methane extraction in Johnson County suggests that the County may have experienced coal seam fires during various times. However, research from E.L. Heffern (2013)[1] shows limited history of coal seam fires in the area and the HMPC determined that this hazard, while present in other parts of the Region, was not applicable within Johnson County.

7 Mitigation Capabilities Assessment

As part of the regional plan development, Region 1 and participating jurisdictions developed a mitigation capability assessment. Capabilities are those plans, policies and procedures that are currently in place and contribute to reducing hazard losses. Capabilities also include staffing and financial considerations, including the ability to leverage funding for mitigation projects. Combining the risk assessment with the mitigation capability assessment results in "net vulnerability" to disasters and more accurately focuses the goals, objectives, and proposed actions of this plan. The purpose of this effort was to identify policies and programs that were either in place or could be undertaken, if appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, projects, and programs to determine if they contribute to reducing hazard related losses.

7.1 Capability Summary

Table 7-1 provides an assessment of Johnson County's mitigation capabilities, based on input collected from the HMPC via data collection guides.

Table 7-1 Johnson County Capability Assessment

Element	Johnson County	City of Buffalo	Town of Kaycee	Clear Creek Cons. District	Powder River Cons. District
Planning Capabilities					
Comprehensive Plan	Yes – 04-2005	Yes - 09-2007	No	N/A	N/A
Capital Improvement Plan	2017	2023 Capital Improvements Plan	No	N/A	N/A
Emergency Operations Plan	Under County Plan, 2016	Yes, for County	Yes, for County	N/A	Yes
Recovery Plan	No	No	No	N/A	N/A
Mitigation Plan	County Plan, 2013	City Plan: 9/4/16 – Resolution 1403.	Yes	N/A	N/A

1 *Known Historic Or Active Coal Fires In The Powder River Basin, Wyoming and Montana*, Compiled by E.L. Heffern, 2013; *Clinker Distribution and Age in the Powder River Structural Basin*, E. L. Heffern, P. W. Reiners, and C. A. Riihimaki, 2013

Element	Johnson County	City of Buffalo	Town of Kaycee	Clear Creek Cons. District	Powder River Cons. District
		County Plan: 3-12-13 – Resolution 1365			
Debris Management Plan	2017 Draft Form	No	Yes	No	No
Economic Development Plan	No	Kaycee Buffalo Johnson County Economic Development JPB	Kaycee Buffalo Johnson County Economic Development JPB	N/A	N/A
Transportation Plan	No	No	No	N/A	N/A
Land-use Plan	Yes, 2012	City code chapters 21 and 29	Yes	No	No
Flood Mitigation Assistance (FMA) Plan	No	5/11/16 – Resolution 1398	Yes	N/A	N/A
Watershed Plan	No	City Code chapters 21, article 20	Yes	No	Yes
Community Wildfire Protection Plan or other fire mitigation plan	Yes, July 2017	Yes, County Plan	Yes, County Plan	No	No
Critical Facilities Plan (Mitigation/ Response/ Recovery)	Continuity of Operations Plan 2017	No	No	N/A	N/A
Floodplain Management Plan	No	No	No	N/A	N/A
Stormwater Program/Plan/Ordinance	No	No	No	N/A	N/A
Erosion / Sediment Control Program	No	No	No	Yes	Yes
Policies/Ordinance					
Zoning Ordinance	No	ORO 632. Chapter 29	No	N/A	N/A
Building Code (Provide Year)	No	Version 2018 – IBC, FRC/Impc/ NEC/IEBC/I P C/FGG	Version 2003	N/A	N/A
Floodplain Ordinance	Yes	Yes Date 3-12-90	Yes – 1/8/07	N/A	N/A
Subdivision Ordinance	Yes, county code Section 1-2	Chapter 21 city codes	Yes	N/A	N/A
Tree Trimming	No	Ordinance	Yes	N/A	N/A

Element	Johnson County	City of Buffalo	Town of Kaycee	Clear Creek Cons. District	Powder River Cons. District
Ordinance		1292			
Nuisance Ordinance	Yes – Part III Section 9	Yes – Chapter 15 city codes	Yes	N/A	N/A
Storm Water Ordinance	Yes – Part III Section 9	No	N/A	N/A	N/A
Drainage Ordinance	No	No	N/A	N/A	N/A
Site Plan Review Requirements	Yes	City code Chapters 21 and 29	No	N/A	N/A
Historic Preservation Ordinance	No	No	No	N/A	N/A
Landscape Ordinance	No	Yes – Chapters 21 and 29 City Code	Yes	N/A	N/A
Growth Management Ordinance	No	No	No	N/A	N/A
Elevation Certificates for Floodplain Development	No	No	No	N/A	N/A
Other Hazard Ordinance (Steep slope, wildfire, snow loads, etc.)	No	No	No	N/A	N/A
Program					
Zoning/Land-use Restrictions	Yes	Yes	No	N/A	N/A
Codes Building Site/Design	No	Yes	No	N/A	N/A
Hazard Awareness Program	No	No	No	N/A	N/A
National Flood Insurance Program	Yes	Yes	Yes	N/A	N/A
Community Rating System (CRS)	No	No	No	N/A	N/A
National Weather Service (NWS) Storm Ready Certification	Yes	No	No	N/A	N/A
Firewise Community Certification	No	No	No	N/A	N/A
Building Code Effectiveness Grading (BCEGs)	No	No	No	N/A	N/A
ISO Fire Rating	N/A	Yes – rating of 6	Yes – Rating of 7	N/A	N/A

Element	Johnson County	City of Buffalo	Town of Kaycee	Clear Creek Cons. District	Powder River Cons. District
Economic Development Program	No	No	No	N/A	N/A
Land-use Program	Yes	Yes	No	No	No
Public Education/Awareness	Yes	No	No	N/A	Yes
Property Acquisition	No	No	No	N/A	N/A
Planning/Zoning Boards	Yes	Yes	No	N/A	N/A
Stream Maintenance Program	No	No	No	N/A	N/A
Tree Trimming Program	No	Yes	Yes	N/A	N/A
Engineering Studies for Streams (Local)	No	Yes	Yes – County/ Regional	N/A	N/A
Mutual Aid Agreements	Yes	Yes	Yes – at the county level	N/A	N/A
Studies/Reports/Maps					
Flood Insurance Rate Maps (FIRM)	N/A	04/03/84	02/20/08	N/A	N/A
Hazard Analysis/Risk Assessment	THIRA/CPR – Yes	Yes, in HMP	Yes, in HMP	N/A	N/A
Evacuation Route Map	No	No	No	N/A	N/A
Critical Facilities Inventory	Yes	Yes, in HMP	No	N/A	N/A
Vulnerable Population Inventory	No	No	No	N/A	N/A
Land-use Map	Yes	Yes	No	N/A	N/A

Source: Data provided by jurisdictions

7.1.1 Land Use and Development Policies

Johnson County's approach to building regulations includes zoning. The County has not adopted building codes but is looking into this, as well as Kaycee. Buffalo has adopted a building code. All three entities have a subdivision ordinance. Additionally, zoning is absent in Crook County outside of the municipalities. The county has a Comprehensive/ Land Use Plan and was in the process of revising it in 2023.

7.1.2 Clear Creek Conservation District

The Clear Creek Conservation District was established in 1946 as the nation saw a need for conserving soil during the dust bowl era. Over the years the need of conservation of other natural resources grew as well and the CCCD responded. The district now includes watershed planning for improving water availability and quality, wildlife habitat enhancement, integrated pest management, land use management and conservation education.

The goals of the District are as follows:

- Operations: Be accountable for public funds. Ensure all District programs are carried out in a responsible manner.
- Information and Education: Expand and strengthen the Districts information and education program to enhance natural resource conservation through youth and adult education via workshops, tours and informational materials
- Tree Program: Encourage the planting of trees to aid in the conservation of natural resources.
- Watershed Planning: Work cooperatively with local landowners, resource agencies and groups to address water quality issues and concerns through watershed planning efforts.
- Special Projects: Provide information and technical assistance to northern Johnson County residents who have resource concerns that are not addressed through other District programs.

The Clear Creek Conservation District has several mitigation capabilities and programs, such as:

- 2022-2027 Long Range Plan
- Living Fence Snow Program
- Rural Living Guide
- Education and outreach programs and opportunities for residents

7.1.3 Powder River Conservation District

The mission of the Powder River Conservation District is as follows:

To provide education and leadership for the conservation of our natural resources, the wise use of Wyoming's waters, the improvement of our environment, and the preservation of our agricultural heritage, through a responsible conservation ethic.

The Powder River Conservation District has several mitigation capabilities and programs, such as:

- Powder River Watersheds Water Quality Management Plan
- An Emergency Operations Plan
- 2021-2025 Long Range Plan
- Cost Share Program's for large rural projects that make a positive impact on the land and for residents and businesses to conserve soil, water, and energy.

7.1.4 NFIP Participation and Continued Compliance

The National Flood Insurance Program (NFIP) Community Status Book outlines participation and flood map status for counties and jurisdictions across the country. Johnson County has a status of NSFHA, or No Special Flood Hazard Areas, but participates in the NFIP along with Buffalo and Kaycee.

Table 7-2 NFIP Status in Johnson County

Jurisdiction	Effective Map Status	Date Joined
Johnson County	NSFHA	07/21/98
City of Buffalo	04/03/84	05/15/78
Town of Kaycee	02/20/08	10/01/86

Source: NFIP Community Status Book

As participants since 1978 and 1986, respectively, the City of Buffalo and Town of Kaycee will continue to comply with the NFIP to reduce flood losses and increase flood resiliency, as will Johnson County, given its participation began in 1998. Continued compliance with the NFIP includes continuing to adopt floodplain maps when updated as well as implementing, maintaining, and updating floodplain ordinances. Actions related to continued compliance are summarized below:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- **Implementation of substantial improvement/substantial damage provisions**. After a flood event, or any event that may cause loss of a structure such as a fire or tornado, it is the role of the floodplain administrator to review and assess damaged structures located within the Special Flood Hazard Area. Substantial improvement/substantial damage occurs when the cost of restoring a structure exceeds 50 percent of its market value before damage occurred. Property owners are advised that structures experiencing substantial damage or undergoing substantial improvements must go through the floodplain application and permit process. Additionally, these structures must be upgraded during the repair or reconstruction process to meet the minimum building standards stipulated in the regulations. If it is determined substantial improvement/substantial damage has occurred, those structures must be brought up to current floodplain management standards. This ensures compliance with floodplain management measures and contributes to the overall safety and resilience of the affected structures. These provisions are common to the County, the Town of Kaycee, and the City of Buffalo, floodplain management ordinances. Additional items specific to these jurisdictions include:
    - County: The County Sanitarian as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions.
    - Kaycee: The Town Clerk as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions.
    - Sundance: The City Building Inspector as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions.
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

Also, to be considered are the flood mitigation actions contained in the base Regional Plan and this annex, to support the ongoing efforts by participating counties to

minimize the risk and vulnerability of communities to flood hazards, and to enhance their overall floodplain management programs.

7.2 Administrative/Technical Resources

The following table identifies the County and participating jurisdictions' personnel responsible for activities related to mitigation and loss prevention in Johnson County.

Table 7-3 Administrative/Technical Resources

Administrative/ Technical Resources	County	Buffalo	Kaycee	CCCD	PRCD
Building Code Official	No	Yes	Yes	No	No
Building Inspector	No	Yes	Yes	No	No
Mapping Specialist (GIS)	Yes	No	No	No	No
Engineer	No	No	No	No	No
Development Planner	Yes	Yes	No	No	No
Public Works Official	Yes	Yes	Yes	No	No
Emergency Management Coordinator	Yes	Yes (County)	Yes	No	No
NFIP Floodplain Administrator	Yes Planning Dept.; County Planner	Yes Planning Dept.; City Planner	Yes Town Administration	No	No
Bomb and/or Arson Squad	No	No	No	No	No
Emergency Response Team	Yes	No	Yes	No	No
Hazardous Materials Expert	No	No	No	No	No
Local Emergency Planning Committee	Yes	Yes	Yes	No	No
Sanitation Department	Yes	Yes – Public Works	Yes	No	No
Transportation Department	Yes – Road and Bridge	Yes – Public Works	No	No	No
Economic Development Department	No	No	No	No	No
Housing Department	No	Yes - Buffalo Housing Authority	No	No	No
Planning Board / Commission	Yes	Yes	No	No	No
Warning Systems / Services (Flood)	Yes	Yes – Sirens and Stream Gauges	Yes – Sirens and Stream Gauges	No	No
Warning Systems / Services (Other/multi hazard)	Yes	Yes	Yes	No	No

Administrative/ Technical Resources	County	Buffalo	Kaycee	CCCD	PRCD
Grant Writing/ Management	Yes	Yes	No	No	No
Non-Governmental Organizations (NGOs)	Yes	No	No	No	No
American Red Cross	Gillette – Yes	No	No	No	No
Salvation Army	Sheridan	No	No	No	No
Veterans Groups	Yes	Yes	No	No	No
Local Environmental Organization	Yes	No	No	No	No
Homeowner Associations	Yes	Yes	No	No	No
Neighborhood Associations	No	Yes	No	No	No
Chamber of Commerce	Yes	Yes	Yes	No	No
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	Yes	No	No

7.3 Financial Capabilities

Table 7-4 identifies the County and Town financial tools or resources that the jurisdictions have access to or are eligible to use and could potentially be used to help fund mitigation activities.

Table 7-4 Johnson County Jurisdiction Financial Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)					Has This Been Used for Mitigation in the Past?
	County	Buffalo	Kaycee	CCCD	PRCD	
Apply for Community Development Block Grants	Yes	Yes	Yes	No	No	No
Fund projects through Capital Improvements funding	Yes	Yes	Yes	No	No	No
Authority to levy taxes for specific purposes	Yes	Yes – Voted by taxpayers	Yes	No	No	No
Fees for water, sewer, gas, or electric services	No	Yes	Yes	No	No	No
Impact fees for new development	No	Yes	Yes	No	No	No
Incur debt through general obligation bonds	Yes	Yes	Yes	No	No	No

Financial Resources	Accessible/Eligible to Use (Yes/No)					Has This Been Used for Mitigation in the Past?
	County	Buffalo	Kaycee	CCCD	PRCD	
Incur debt through special tax bonds	Yes	Yes	Yes	No	No	No
Incur debt through private activities	N/A	Yes	No	No	No	No
Withhold spending in hazard prone areas	No	No	No	No	No	No
FEMA Hazard Mitigation Assistance Grants	Yes	Yes	Yes	No	No	Yes (City of Buffalo)
Other						

Source: Data provided by jurisdictions

7.4 Education and Outreach Capabilities

Table 7-5 shows the mitigation education and outreach capabilities the County and jurisdictions have in place now. It was noted by the HMPC that there is a need for the improvement of outreach and education.

Table 7-5 Johnson County Education and Outreach Capabilities

Education & Outreach	Yes/No				
	Johnson County	Buffalo	Kaycee	CCCD	PRCD
Public Education /Outreach Program	Yes (EM does monthly radio program and community outreach)	No	No	Yes	Yes
Local Citizen Groups That Communicate Hazard Risks	Yes (Conservation Districts)	No	No	Yes	Yes
Firewise	No	No	No	No	No
StormReady	No	Yes	Yes	No	No
Other?	No	No	No	No	No

Source: Data provided by jurisdictions

7.5 Opportunities for Enhancement

Based on the capabilities assessment, Johnson County and the municipalities have several existing mechanisms in place that already help to mitigate hazards. There are also opportunities for the jurisdictions to expand or improve on their policies, programs and fiscal capabilities and further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and Conservation Districts. Additional training opportunities will help to inform County and municipal staff members on how

best to integrate hazard information and mitigation projects into their departments. Continuing to train staff on mitigation and the hazards that pose a risk to the County will lead to more informed staff members who can better communicate this information to the public.

Johnson County:

- Consider implementing a community outreach program to educate residents about winter storm safety, weather-resistant building materials, best practices, and other emergency or disaster information.
- Consider updating the County Community Wildfire Protection Plan in tandem with incorporated jurisdictions to reflect changing environmental conditions.

City of Buffalo:

- Promote opting-in to CodeRED and utilize it to keep citizens informed of developing hazards such as tornados or transportation disruptions due to severe weather.

Town of Kaycee:

- Consider updating building codes to ensure new and historic buildings are able to withstand strong winds, blizzard conditions, and heavy snow loads.

Clear Creek and Powder River Conservation Districts

- Provide training for staff members related to hazards or hazard mitigation grant funding in partnership with the County.

8 Mitigation Strategy

This section describes the mitigation strategy and mitigation action plan for Johnson County. See Chapter 5 of the Base Plan for more details on the process used to develop and update the mitigation strategy.

8.1 Mitigation Goals

As part of the 2023 planning process, Johnson County reviewed their three previously identified goals and a number of objectives to guide the development of the Hazard Mitigation Strategy. The potential hazards, risks and vulnerabilities were also considered in the development and review of the goals. In 2018 the goals and objectives remained the same; only goal 3 was modified slightly to include private facilities and infrastructure as well. During the 2023 planning process, the HMPC reviewed these goals and objectives, and chose to retain them for the 2023 plan. The goals and objectives are as follows:

Goal 1: To protect life and property from hazards.

- Objective 1.1: To minimize loss of life and damage to property due to flooding of Middle Fork of Powder River through the Town of Kaycee
- Objective 1.2: To minimize loss of life and damage to property due to wildland fire throughout the county
- Objective 1.3: To minimize the potential for loss of life and damage to property by reducing the potential for accidental or intentional release of hazardous materials throughout the county

- Objective 1.4: To minimize the potential for loss of life and damage to property by being prepared to shelter travelers and residents during and after severe weather events
- Objective 1.5: To minimize the potential for loss of life and damage to property through an early warning system
- Objective 1.6: To minimize the potential for loss of life and damage to property by facilitating training of the Incident Command System (ICS) including an Emergency Operations Center
- Objective 1.7: To minimize the potential for loss of life and damage to property due to flooding of Clear Creek through the City of Buffalo
- Objective 1.8: To minimize the potential for loss of life and damage to property due to landslides

Goal 2: Increase public awareness and education about hazards.

- Objective 2.1: Provide resources for outreach and education programs to increase public and governmental awareness of risks associated with the identified hazards
- Objective 2.2: Provide information and education to the local city and county planning
- Objective 2.3: Provide education and assistance to rural areas about fire protection and fire safety

Goal 3: Strengthen and improve disaster resistance of public and privately owned facilities and infrastructure.

- Objective 3.1: To update facilities' capability to withstand identified hazards and risks
- Objective 3.2: To improve mapping of publicly-owned facilities
- Objective 3.3: To enhance mitigation project management

8.2 Mitigation Actions

This section provides updates on the actions identified in the 2018 Wyoming Region 1 Hazard Mitigation Plan and new actions identified during the 2023 Regional Plan update.

8.2.1 Progress on 2018 Actions

During the 2023 planning process the Johnson County Planning Team reviewed all the mitigation actions from the 2018 plan. Of the 36 mitigation actions from 2018, 28 of the county actions are continuing or are implemented annually, demonstrating ongoing progress towards building the community's resilience to disasters. These continuing actions are detailed in Section 8.2.2.

Three (3) actions have been completed since 2018 and five (5) have been deleted; each are detailed in Table 8-1 below.

Table 8-1 Completed and Deleted Mitigation Actions

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
2008-11	Conduct a commodity flow study. Minimize the potential for loss of life and property by reducing the potential for accidental or intentional release of hazardous materials	Hazardous materials, wildfire	Buffalo, Kaycee	High	Completed in 2019.
2013-06	Install backup generator for school facility (main kitchen). Update facilities' capability to withstand identified hazards and risks	All hazards	Johnson County	Medium	Deleted. Project terminated
4	Construct dike on north side of Powder River at Kaycee. Construct dike on north side of Powder River at Kaycee to help mitigate flood damage	Flood	Kaycee	Low	Deleted. Project terminated
5	Kaycee fire hall land subsidence mitigation. The Kaycee fire hall has issues with land subsidence that has required ~$250K/year in repairs.	Land subsidence	Kaycee	Low	Completed in 2022.
7	Lightning/ thunderstorm signage in conjunction with NWS. Reduce lightning impacts to people	Multi-Hazard: Lightning, Wind, Tornado, Hail,	Johnson County	Low	Completed in 2021.
10	Backup generator at county courthouse. Allow for continuity of government	Multi-Hazard: Lightning, Wind, Winter Storm, Tornado, Hail, Earthquake, Flood	Johnson County	Low	Deleted. Study completed, found not viable
12	Vegetation treatment and fuels mitigation around communication towers. Specific areas included Windy Ridge, Smith Ranch, Tisdale Mountain.	Wildfire	Johnson County	Low	Deleted. This action is a duplicate.

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
18	Flood protection project. 240' of flood wall and 4260' of levee to contain 100-year flood event. From Interstate 25 bridge through City Park and through Harold Jarrard Park. The Town of Kaycee would benefit from this project.	Flooding	Kaycee	High	Deleted. Project terminated

8.2.2 Identification and Implementation of Mitigation Measures

During the 2023 Regional Plan development, existing mitigation projects for Johnson County were assessed to determine whether the action was completed, deleted, or ongoing/continued. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources. The action plans were also shared amongst the regional plan participants to showcase progress and stimulate ideas amongst the respective planning committees in each county. The HMPC's evaluation of action items and goals also lead to the development of new strategies.

Table 8-2 details all continuing and new mitigation actions for the 2023 regional plan. Johnson County has developed nine (9) new mitigation actions in 2023 to accompany the 28 continuing mitigation actions from 2018, for a total of 37 mitigation actions.

Background information as well as information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and timeline also are described. Per the DMA requirement, actions have been identified that address reducing losses to existing development as well as future development.

The Cost Estimate column describes the estimated project costs using the following categories:

- Little to no cost
- Low: Less than $10,000
- Moderate: $10,000-$100,000
- High: $100,000-$1,000,000
- Very High: More than $1,000,000

The Timeline column describes the estimated time of completion for each project using the following categories:

- Short Term: 1-2 years
- Medium Term: 3-5 years
- Long Term: 5+ years
- Ongoing: action is implemented every year

The Status/Implementation Notes column describes the progress made on the actions so far using the following categories:

- Not Started: project is carried over from the previous Johnson County Plan; little to no work has been completed.

- In Progress: project is carried over from the previous Johnson County Plan; work has begun on the project and is proceeding.
- Annual: project is carried over from the previous Johnson County Plan and is implemented every year on an ongoing basis.
- New in 2023: The action is new to this plan update; little to no work has been completed.

Table 8-2 Mitigation Action Plan

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-1	Flood protection for Kaycee. Prevent/ minimize flooding hazards in Kaycee due to Middle Fork of the Powder River	Flood	Kaycee, Powder River Conservation District (PRCD)	PRCD, **Town of Kaycee**, NRCS, Elected Officials	Medium Term	Very High; County General Fund, Municipal Funds, FMA Grants	High	In Progress. Work on this action continues.
J-2	Adoption of International Building Codes and Zoning. Introduction of zoning and building codes to allow for better planning in the future, hazard mitigation and prevention, etc.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County	Elected Officials / **County Planning**	Medium Term	Moderate; County Operating Budget, BRIC, HMGP, PA	Medium	In Progress. Buffalo is completed; Kaycee and County are in process.
J-3	Early warning system. Minimize the potential for loss of life and damage to property through an early warning system	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	City, Town / **County Emergency Management**	Medium Term	Very High; County General Fund; Municipal General Funds; HMGP, FMA, NWS	High	In Progress. Alternative Power Sources for sirens. Add one siren to Kaycee and two more to Buffalo.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-4	Improve use of NOAA weather radio. Minimize the potential for loss of life and damage to property through an early warning system	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	**Emergency Management**	Medium Term	Moderate; County General Fund; Municipal General Funds; NWS	Low	In Progress. Fall of 2023 Johnson County Public Health will be distributing NOAA radios to AFN population
J-5	Work with FEMA to update FIRMs for the City of Buffalo. Minimize the potential for loss of life and property due to flooding of Clear Creek	Flooding	Buffalo, Johnson County	**Emergency Management**	Medium Term	High; County General Fund; Municipal General Funds; NFIP, Risk MAP	High	In Progress. FEMA Funding related.
J-6	Acquire properties to mitigate risk to flooding. Minimize the potential for loss of life and property due to flooding of Clear Creek	Flooding	Johnson County, City of Buffalo	City of Buffalo, **Emergency Management,** State of Wyoming	Ongoing	Very High; County General Fund; Municipal General Funds; FMA Grants, CAP Grants	High	In Progress. Dump Draw was completed. Continual evaluation of impacted areas.
J-7	Off channel storage site. Minimize the potential for loss of life and property due to flooding of Clear Creek	Flooding	Johnson County, City of Buffalo	City of Buffalo, Johnson County, **Wyoming Water Development Commission**	Long Term	High; County Capital Improvements Budget, City Capital Improvements Budget,	High	In Progress. Subject to funding.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
						USACE Small Flood Control Projects, NFIP, NFIP CAP		
J-8	Conduct monthly radio programs to inform and educate on identified hazards. Provide resources for outreach and education programs to increase public and governmental awareness of risks associated with various hazards	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	**Emergency Management**	Medium Term	Moderate; County Operating Budget	Medium	In Progress. 5 years. On-Going EM Coordinator participates in regularly scheduled radio programs.
J-9	Develop, Enhance, and Implement Education Programs Aimed at Mitigating Hazards for Private Property Owners and Retail/Commercial Businesses. Provide resources for outreach and education programs to increase public and governmental awareness of risks associated with various hazards	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	Elected Officials, Chamber of Commerce, **Emergency Management**	Medium Term	Moderate; County General Fund; Municipal General Funds; Staff Time	High	In Progress. 5 years. Deferred. Topics continues to be discussed.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-10	Enhance Public Awareness and Encourage Participation in the NFIP. Provide resources for outreach and education programs to increase public and governmental awareness of risks associated with various hazards	Flooding, all hazards	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	**County Floodplain Manager**, Elected Officials, Emergency Management, FEMA	Medium Term	Moderate; County General Fund; Municipal General Funds; NFIP, NFIP CAP	High	In Progress. 5 years. On-going- Continued participation in the NFIP and outreach efforts.
J-11	Encourage assembly of survival kits for home, business, and vehicle. Provide resources for outreach and education programs to increase public and governmental awareness of risks associated with various hazards while also considering equity, diversity, and inclusion.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	**Emergency Management**	Medium Term	Moderate; County General Fund; Municipal General Funds; Staff Time	Medium	In Progress. This continues to be an ongoing action.
J-12	Develop and Enhance Awareness of Training Opportunities (i.e. - EMI's ICS) s for the Private and Public Sectors of Communities. Provide resources for outreach and education programs to increase public and governmental awareness of risks associated with various hazards	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	**Emergency Management**, City & County Fire Depts., Regional Response Team, Public Health	Medium Term	Moderate; County General Fund; Municipal General Funds; Staff Time, USDA National Fire Plan, Forest Land Enhancement Program	Medium	Annual Implementation. This continues to be an ongoing action.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-13	Catalog Critical Facilities and structural conditions. Update facilities' capability to withstand identified hazards and risks	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County, Buffalo, Kaycee	**County GIS**, Buffalo Administration, Kaycee Administration, Emergency Management, Public Works, County Road & Bridge, Hospitals	Medium Term	High; County General Fund; Municipal General Funds; Staff Time	High	In Progress. JC Fairgrounds Assessment was completed by Cyber Infrastructure Security Assessments (CISA).
J-14	Develop a Data Collection Plan for Inspection Process of Critical Infrastructure. Update facilities' capability to withstand identified hazards and risks	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	**Emergency Management**, Buffalo Administration, Kaycee Administration, Public Works Depts.	Medium Term	Moderate; County General Fund; Municipal General Funds; Staff Time	Medium	In Progress. Dull Knife Reservoir spillway was rehabilitated. Tie Hack had a 5-year assessment completed. JC monitors wells on Lake DeSmet.
J-15	Map Locations of Public Facilities and Infrastructure in a GIS Database and Include Related Structure Information (i.e. - Replacement Value, Content Cost, etc.) to Allow for Improved Risk and Vulnerability Assessments. Improve mapping of publicly-owned facilities	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Johnson County	**Emergency Management**, All municipal departments	Medium Term	High; County General Fund; Municipal General Funds; Staff Time	High	In Progress. All entities have begun their mapping process.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-16	Determine if mitigation projects are needed for high risk dams. Enhance mitigation project management	Dam failure, flooding, wildfire	Johnson County, City of Buffalo, Town of Kaycee, CCCD, PRCD	**Emergency Management, Dam Owners**, County and Municipal Public Works Depts.	Ongoing	High; County General Fund; Municipal General Funds; HHPD Grants, BRIC	High	In Progress. Dull Knife Reservoir spillway was rehabilitated. Tie Hack had a 5 year assessment completed. DeSmet needs seep monitoring equipment needs repaired/replaced.
J-17	Alternative water source for Buffalo. Alternative water source for Buffalo is needed to extend available supplies	Drought	City of Buffalo	**City of Buffalo Public Works**	Medium Term	High; Public Works Operating Budget, USDA Rural Utilities Service (RUS) Grant, Watershed Processes and Water Resources Grant	Medium	In Progress. Bull Creek/Buffalo Wells ongoing; Lake DeSmet study possible

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-18	Stormwater drainage plan. A Stormwater drainage plan is needed to refine problem areas and evaluate mitigation alternatives	Flood	Buffalo	**City of Buffalo Public Works**	Medium Term	Very High; Public Works Operating Budget, USDA Rural Utilities Service (RUS) Grant, Watershed Processes and Water Resources Grant	High	In Progress. As streets are replaced storm drains have been replaced. North Main St. Storm Water Sewer extension has been engineered.
J-19	City of Buffalo water supply diversion landslide mitigation. Mitigation of landslide area at water diversion for City of Buffalo water supply	Landslide	Buffalo	**City of Buffalo Public Works**	Medium Term	High; Public Works Operating Budget, USDA Rural Utilities Service (RUS) Grant, Watershed Processes and Water Resources Grant	Medium	In Progress.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-20	Backup generator at radio station, at City of Buffalo Public Works Dept., and the City Hall/Clinic in Kaycee. Provide a backup generator at the radio station to be able to provide public communication. A backup generator at Public Works would enable City crews to fuel vehicles, repair vehicles and other equipment needed for the emergency. Provide a backup generator at the City Hall/Clinic in Kaycee to be able to provide medical services. This project would benefit Johnson County, the City of Buffalo and Town of Kaycee.	Multi-Hazard: Lightning, Wind, Winter Storm, Tornado, Hail, Earthquake, Flood	Johnson County, Buffalo	**Emergency Management Office**, City of Buffalo, Johnson County	Short Term	High; EMPG ARPA Grant	High	In Progress. Radio station generator has been installed. Others listed still need backup power
J-21	Backup generator at the school. Allow facility to function as a shelter	Multi-Hazard: Lightning, Wind, Winter Storm, Tornado, Hail, Earthquake, Flood	Johnson County	Emergency Management, Johnson County School District #1	Short Term	Moderate; EMPG ARPA Grant	Medium	Not Started. Backup generator for the school that runs the certified kitchen. This is necessary for a continued distribution of food during multiple hazard events.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-22	Vegetation treatment and fuels mitigation around critical infrastructure including electric substations. Reduce potential power outages and losses from wildfire	Wildfire	Johnson County	**County Fire Department**	Short Term	Moderate; Fire Department Operating Budget, Utility Company budgets, Rural Fire Assistance Grant, National Fire Plan Grant	Medium	Annual Implementation. This action needs to continue on an annual basis, if possible.
J-23	Watershed mitigation with the US Forest Service. Reduce impacts to watershed; reduced potential for flooding following fire.	Wildfire, drought	Johnson County, Buffalo	**County Fire Department**, City of Buffalo	Medium Term	High; USFS, Community Fire Protection Program, Emergency Watershed Protection (EWP) Grants, HMGP-Post Fire	Medium	In Progress. Watershed Study Completed

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-24	Tree management to reduce windstorm and other hazard damage in Buffalo. Tree management is needed to reduce windstorm damage in Buffalo; this would include assessing the oldest and most vulnerable trees and provide matching funds to private property owners for removal. In addition, general tree assessments are needed to determine what trees pose hazards and then prioritize for removal.	Wind, wildfire, flood	City of Buffalo	**City of Buffalo Public Works**, Tree Board	Short Term	High; City of Buffalo General Funds, USDA Urban and Community Forestry Grants	High	Annual Implementation. This project is still being addressed. A tree study is needed.
J-25	Early warning siren upgrade. Johnson County had a siren study completed in 2005. The study indicated to cover the City of Buffalo area effectively would require three sirens. Currently, Johnson County has two sirens, one in Buffalo and one in Kaycee. The project would encompass the installation of two additional sirens for the City of Buffalo and also replacement of existing siren equipment.	Dam Failure, Flood, Hail, Hazmat, High Winds, Landslide, Lightning, Severe Winter Weather, Tornado, Wildfire	Johnson County, Buffalo	**Emergency Management**, City of Buffalo, Johnson County, Buffalo Public Works	Medium Term	High; County-general fund, Next Generation Warning System Grant Program (NGWSGP)	Medium	In Progress. One additional siren is needed for complete coverage of the Town of Kaycee. Two additional sirens are needed for complete coverage of Buffalo. Updated siren study is needed.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-26	Reduction of vegetation around the communication tower sites. The sites have been threatened by wildfire in the recent past. Reduction of weeds and grasses surrounding the sites will mitigate the probability of burning the sites down. Each site has 1000-gallon propane tanks that could cause a wildland fire to be extremely dangerous and cover additional acres. These sites are the backbone for the county-wide public safety radio system. This project would benefit Johnson County, Buffalo, and Kaycee, including Law Enforcement, EMS, Fire, School District, Emergency Management, Road and Bridge, Search & Rescue, Public Works	Wildfire	Johnson County, Buffalo, Kaycee	Johnson County **Emergency Management**	Short Term	Moderate; Conservation Districts, HMGP-Post Fire, Community Wildfire Defense Grants	High	Annual Implementation. This action needs to take place annually.
J-27	Middle Fork Powder River Bank Stabilization. Bank improvement at the corner of Middle Fork of Powder River downstream of the Interstate 25 bridge. This is a problem area when Middle Fork Powder River reaches moderate to major flood stage. Historical data provides evidence of this happening the last four years and beyond. This project would benefit the Town of Kaycee	Flooding, Landslide	Kaycee, Johnson County, Powder River Conservation District	Kaycee, NRCS, NFIP, **Powder River Conservation District**.	Medium Term	Very High; NRCS, Town of Kaycee, PDM Grants, NFIP CAP, USACE Small Flood Control Projects	High	Annual Implementation. On going treatment

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-28	Bank stabilization around Clear Creek. Bank stabilization project to prevent landslides into Clear Creek, which would cut off the City of Buffalo's water supply for an undetermined amount of time, as well as dams (Hillside above diversion dam). The project is expected to cost over $100k (and over $1M), with potential funds from the County General Fund and other Municipal Funds.	Landslide, flooding	Buffalo, Clear Creek Conservation District	City of Buffalo, NRCS, NFIP, **Clear Creek Conservation District**	Medium Term	Very High; City of Buffalo Public Works, County General Funds, CCCD funds, PDM Grants, NFIP CAP, USACE Small Flood Control Projects	High	In Progress. A landside in this area could damage and/or completely stop the water supply flow to the city.
J-29	Find and create suitable safe room for tornado shelter in the Town of Kaycee.	Tornado	Town of Kaycee; Johnson County	**Town of Kaycee**, Johnson County Emergency Management	Medium Term	Very High; BRIC	High	New in 2023. Current shelter has health and safety issues.
J-30	Streambank Stabilization around the Town of Kaycee sewer lagoons and discharge location.	Flood; Public Health Hazards	Town of Kaycee; Powder River Conservation District	**Town of Kaycee Public Works**, Johnson County, Powder River Conservation District	Medium Term	Very High; PDM Grants, NFIP CAP, USACE Small Flood Control Projects, BRIC	High	New in 2023. Current streambank issue is a health, safety, and environmental issue.
J-31	Update weather tracking/surveillance for Johnson County.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Johnson County	**Johnson County**, Town of Kaycee, City of Buffalo, NWS	Medium Term	Very High; NWS STI Grants, County EM Budget	High	New in 2023. We cannot get accurate weather forecasting

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
								which could lead to loss of life.
J-32	Public Education/Training for hazardous materials	Hazmat	Johnson County	**Emergency Management & Fire**	Short Term	Low; Emergency Mgmt. Budget, Fire Dept. Budget, Staff Time	Medium	New in 2023. This will continue to happen annually
J-33	Retrofit existing water delivery system to the Town of Kaycee	Drought	Town of Kaycee	**Town of Kaycee Public Works**	Medium Term	Very High; USDA Rural Development Grants, USDA Rural Utilities Service Grants, Kaycee General Funds,	High	New in 2023. Current water delivery system is at the end of its live span.
J-34	Educate and promote equity, diversity and inclusion in all actions and the planning process	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	All Jurisdictions in Johnson County, Town of Kaycee, City of Buffalo, Conservation Districts	County and Municipal Administration, **Elected Officials**	Short Term	Low; Municipal General Funds, County Funds, Staff Time	High	New in 2023. This is integrated into all mitigation projects.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
J-35	Retrofit Bomber Mountain Shelter facility for a SafeRoom	Tornado	Johnson County, City of Buffalo	**Emergency Management,** County and Municipal Administration, Elected Officials	Medium Term	High; Municipal General Funds, EMPG, BRIC	High	New in 2023. The community does not have a place to go during tornadoes. Our downtown area/ business district is completely vulnerable
J-36	Electric power resiliency and redundancy to include revisiting the use of the hydropower plant as an alternative energy or backup supply	Earthquake, Flood, Hail, High Wind, Landslide, Lightning, Severe Winter Weather, Tornado, Wildfire	City of Buffalo	Elected Officials, **City administration, Rocky Mountain Power**	Long Term	High; Local, FEMA HMA, Rocky Mountain Power,	Medium	New in 2023
J-37	Upper Clear Creek area west of Buffalo fuels and vegetation treatment to prevent loss of life and property	Wildfire, High Winds	City of Buffalo	State land involved, **State Forestry**	Medium Term	High, State Forestry, FEMA HMA, HMGP-Post Fire, Community Wildfire Defense Grants	High	New in 2023

9 Implementation

Moving forward, the Johnson County HMPC and LEPC will use the mitigation action tables in the previous section to track progress on implementation of each project. Implementation of the plan overall is discussed in more detail under Chapter 6 of the Regional (Base) Plan.

The Johnson County HMPC formed during the 2023 Regional Plan update will be responsible for implementing and reviewing the plan action items. The HMPC will meet no less than semi-annually, or as time permits.

The Johnson County Commissioners and the Mayor of all cities and towns (except where noted in Section 1) in Johnson County will adopt the Region 1 Hazard Mitigation Plan and each jurisdiction will take responsibility for plan implementation of mitigation issues arising in their jurisdictions. Plan implementation and evaluation will be a shared responsibility among the HMPC. The Johnson County EM Coordinator will serve as a convener to facilitate the HMPC meetings and will assign tasks such as updating and presenting the Plan to the members of the group.

9.1 Incorporation into Existing Planning Mechanisms

Also, discussed in Chapter 6 of the base plan is the importance of implementation and incorporation of the principles of this plan into other planning mechanisms.

9.1.1 General Process

To determine if this plan is consistent with goals identified in other community plans, the members of the Johnson County Emergency Management Agency, along with the Hazard Mitigation Planning Team and LEPC, will meet with other agencies who have plans that address such issues as economic development, debris management, subdivision resolutions/ordinances, capital improvement, critical facilities, sustainability, environmental preservation, redevelopment, health and/or safety, or recreation. The process will provide an opportunity to integrate and/or correlate plans for the purpose of:

- Determining if the mitigation plan is compatible with goals stated in other plans.
- Identifying mitigation initiatives or proposed projects which serve multiple objectives for the communities and could be included in multiple plans.
- Identifying needs for revision or updating to the mitigation plan, or other plans, to provide a more comprehensive approach to hazard mitigation (including addition of new mitigation measures).

During the 2023 planning process, the HMPC discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. To date the plan has been integrated with other planning efforts that include:

- Cross referenced in 2017 Community Wildfire Protection Plan
- County or community comprehensive or land use plans, including cross referencing with the update of the County land use plan in 2023

9.1.2 Individual Process

The group discussed opportunities to cross reference the hazard mitigation plan in other upcoming planning efforts. As described in the capability assessment and **Error! Reference source not found.**, the County and municipalities already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and

recommends implementing actions, where possible, through these other program mechanisms. The list below show plans that are both common and/or unique to the participating jurisdictions that may have applicable goals, projects or actions related to mitigation and resilience. When these plans are updated identifying relevant cross-references to the hazard mitigation plan will foster resilience by factoring in hazard considerations into multiple planning mechanisms:

- County
  - Comprehensive Plan
  - Emergency Operations Plan
  - Mitigation planning efforts
  - Debris Management Plan
  - Johnson Land-Use Plan
  - Community Wildfire Protection Plan (CWPP)
  - Recovery Planning efforts
- Municipalities (City of Buffalo and Kaycee)
  - Comprehensive Plan
  - Capital Improvement Plan
  - Emergency Operations Plan
  - Debris Management Plan
  - Economic Development Plan
  - Land-use Plan
  - Community Wildfire Protection Plan (CWPP)
- Powder River Conservation District Long Range Plan
- Clear Creek Conservation District Long Range Plan and Watershed Plans

9.2 Funding Sources

Funding for mitigation projects may come from a variety of sources. Below is a partial list of possible sources of funding that could help fund the actions identified in Section 8.

Local Government

- General revenues in the form of matches.
- One Percent Sales Tax
- County and Municipal Utility Authorities

State of Wyoming

- Community Development Block Grant Program
- Federal Mineral Royalty Capital Construction Account
- Wyoming Water Development Program
- State and Community Highway Safety, Department of Transportation
- State Lands and Investments Board (SLIB) Grants and Loans
- Transportation Enhancement Activities Local (TEAL)
- Wildfire Mitigation Grant (State Forestry Division)

Federal Government Programs

- Federal Emergency Management Agency Hazard Mitigation Assistance Grants including:
  - Building Resilient Infrastructure and Communities (BRIC)
  - Pre-Disaster Mitigation (PDM)
  - Flood Mitigation Assistance Program (FMA)
  - Hazard Mitigation Grant Program (HMGP)
  - Notice of funding availability typically released in June with applications due in October/November of each year.
  - HMGP is dependent on federally declared disasters within the state and funding amount is based on a percentage of disaster relief costs.
  - FEMA Fire Management Assistance Grants – As of June 8, 2018 FEMA is making HMGP funds available for states, territories, and federally-recognized tribes that have a Fire Management Assistance Grant (FMAG).
  - USDA Environmental Quality Incentive Program
- USDA Conservation Reserve and Conservation Reserve Enhancement Program
- USDA Small Watersheds (NRCS)

There are many more potential funding opportunities available to the municipalities and county.

Funding research will be done during the scoping process for each project to determine what funding mechanisms are available and appropriate for that project. Funding cycles will be monitored to ensure there is adequate time to prepare grant applications.

9.3 Monitoring, Evaluating and Updating the Plan

Johnson County will follow the procedures to review and update this plan in accordance with Region 1 as outlined in Chapter 6 of the Base Plan. Johnson County realizes it is important to review and update this plan regularly. In addition to the procedures outlined in Chapter 6 the Johnson County Emergency Management Coordinator will attend the City of Buffalo and County Planning and Zoning Commission meetings for consideration of hazards in new development or redevelopment. This is especially important as the County receives additional information, which might change the risk analysis and resulting mitigation projects list.

Continued public involvement is imperative to the overall success of the plan's implementation. Johnson County will continue to solicit participation from the public in the following ways:

- Hard copies of the updated HMP will be available at the County Emergency Management office, with an electronic version available on the County website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions J-8, J-9, J-10, J-11, J-12, and J-32.
- The public will be invited to LEPC meetings where the HMP is discussed. The meetings will provide the public a forum for which they can express concerns, opinions, or ideas about the plan.
- The DES Coordinator will publicize meetings through public information channels including social media and web posting.

The City of Buffalo will:

- Post a link to the plan from the City's website.

- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions J-8, J-9, J-10, J-11, and J-12, as well as partnering with county-led initiatives such as action J-32.

The Town of Kaycee will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions J-8, J-9, J-10, J-11, and J-12, as well as partnering with county-led initiatives such as action J-32.

The Clear Creek Conservation District will:

- Post a link to the plan from the District's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions J-8, J-9, J-10, J-11, and J-12, as well as partnering with county-led initiatives such as action J-32.
- Leverage existing public conservation/educational programs to promote the plan and incorporate hazard information.

The Powder River Conservation District will:

- Post a link to the plan from the District's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions J-8, J-9, J-10, J-11, and J-12, as well as partnering with county-led initiatives such as action J-32.
- Leverage existing public conservation/educational programs to promote the plan and incorporate hazard information.

Wyoming Region 1
Regional Hazard Mitigation Plan
Sheridan County Annex

1 Mitigation Planning and Sheridan County Planning Team

This County Annex builds upon previous versions of the Sheridan County Multi-Hazard Mitigation Plan that were incorporated into the regional hazard mitigation plan completed in 2018. Prior to the Region 1 Plan, Sheridan County had a multi-jurisdictional Hazard Mitigation Plan approved in 2014. This updated plan is the result of a collaborative effort between Sheridan County Government, municipal governments, citizens, public agencies, non-profit organizations, and the private sector. Sheridan County Emergency Management was responsible for updating the plan in coordination with a multi-jurisdictional County Planning Team/Hazard Mitigation Planning Committee (HMPC) during the update of the 2023 Regional Plan. The following jurisdictions were provided the opportunity to participate in the planning process:

The following jurisdictions participated in the planning process:

- Sheridan County
- Town of Clearmont
- Town of Dayton
- Town of Ranchester
- City of Sheridan
- Sheridan School District #3

The Sheridan School District #3 is a new jurisdiction to the plan in 2023. More details on the planning process followed and how the counties, municipalities and stakeholders participated can be referenced in Chapter 3 of the base plan, as well as how the public was involved during the 2023 update.

2 Geography and Climate

The county of Sheridan covers about 2,524 square miles of land in north-central Wyoming, sharing a border with the State of Montana. The local geography includes high plains in the eastern portion, and high peaks from the Bighorn Mountains towards the western parts. Big Goose Creek originates west of Sheridan while Little Goose Creek originates south of Sheridan. These two creeks merge into Goose Creek in the City of Sheridan, which flows north into Tongue River. The Tongue River is approximately 265 miles long and originates in the Big Horn Mountains west of Sheridan County. It flows northeast into Montana, finally merging into the Yellowstone River. Another major tributary of the Yellowstone River, the Powder River, encompasses three main forks originating also on the Big Horn Mountains, and flows north and east of Johnson County and into Sheridan. Major tributaries flowing into the Powder River include Crazy Woman Creek, Nine-mile Creek, Salt Creek, Clear Creek, and Buffalo Creek.

The only major river within the Big Horn River Basin is the Little Big Horn River, which originates northwest of Sheridan County in the Big Horn Mountains, then flows north to join the Big Horn River on the Montana side. The Little Big Horn River is approximately 138 miles long.

Interstate 90 runs through the county in a northwest-southeast fashion, traversing Ranchester and the City of Sheridan. State highway 14 and 16 connect to I-90, running then in an east-west and central-south fashion, respectively.

The area played a crucial role as a staging ground for General Crook's campaign against the Lakota and Cheyenne in 1876. This paved the way for U.S. Army actions that

ultimately forced tribes onto reservations, opening up northern Wyoming for settlement.

Sheridan owes its existence to a Civil War veteran named John D. Loucks, who purchased 40 acres from trapper George Mandel. In 1882, Loucks envisioned and sketched out a town, which he named "Sheridan" in honor of the Union general he had served under. This marked the beginning of the town's formal establishment, with Loucks becoming its first postmaster and later, its first mayor.

In 1888, Johnson County residents north of Piney Creek moved to establish Sheridan County, solidifying Sheridan's role as a regional hub. The arrival of the Burlington & Missouri Railroad in 1892 further propelled Sheridan's growth, as the local economy surged, especially in the coal industry.

The 1910s saw Sheridan evolve into a cosmopolitan community, with a long-distance electric trolley line—the only one of its kind in the state. The mining industry attracted families from Poland, while hoboes frequented the town.

World War I led to a surge in agricultural investment, resulting in the establishment of flour mills, a sugar mill, and a brewery. Prohibition brought about a shift to soda production at the brewery and spurred a thriving underground economy.

Notably, John B. Kendrick, a prominent cattle rancher, left a lasting legacy with his Trail End mansion and Kendrick Park. He served as governor and U.S. Senator, leaving an indelible mark on the region.

The 1930s witnessed initiatives to boost tourism through the airport and the Sheridan WYO Rodeo. The founding of Sheridan College in 1948 and the growth of the coal-bed methane industry in the 1990s added new dimensions to the local economy.

In the 21st century, Sheridan stands as a thriving retail and service center, catering to Sheridan County, Johnson County, the southern part of Big Horn County, Montana, and Montana's Tongue River region (Wyoming Historical Society 2014).

The climate of Sheridan County is mainly semi-arid. Precipitation is about 13.3 inches per year, with an average temperature of 50 degrees Fahrenheit. Winters average an annual low of 29.9 degrees, and summers can average 89.3 degrees. Although little to some precipitation falls in the warmer months for adequate natural growth of crops, a large amount of precipitation is accumulated in the mountains in the form of snow.

3 Population Trends

As of the 2020 United States Census statistics, there were a total of 30,863 people living in Sheridan County. The population has remained relatively stable since 2010 with a growth of 5.8%. The county seat is the City of Sheridan. The Sheridan County Population Distribution is shown below in the following tables.

Table 3-1 Sheridan County Population Distribution

Jurisdiction	2020 Census Population	% of County Total
Total	**30,863**	**-----**
City of Sheridan	18,821	61.0%
Town of Clearmont	114	0.4%
Town of Dayton	813	2.6%
Town of Ranchester	1,062	3.4%
Unincorporated	10,053	32.6%

Source: US Census Bureau

Table 3-2 Sheridan County Population Change, 2010-2020

Jurisdiction	2010 Census	2015	2016	2017	2018	2019	2020	% change
Total	**29,148**	**29,925**	**30,027**	**30,222**	**30,277**	**30,597**	**30,863**	**5.8%**
City of Sheridan	17,487	17,832	17,837	17,891	17,866	18,011	18,821	7.63%
Town of Clearmont	146	151	151	152	153	155	114	-21.9%
Town of Dayton	759	802	818	821	825	829	813	7.1%
Town of Ranchester	871	946	950	983	1,014	1,048	1,062	21.9%
Unincorporated	9,885	10,194	10,271	10,375	10,419	10,554	10,053	1.7%

Source: US Census Bureau

Select Census demographic and social characteristics for Sheridan County are shown in the table below. The county's average age is 42.7 years old (about 5 years above the State's average, 37.7). The table also indicates some populations that may have special needs or prove vulnerable, such as 12.5% of people with.

Table 3-3 Sheridan County Demographic Profile

Population	
Population estimate, 2020	30,863
Population Growth, 1970-2020 (US average was 63.1%)	0.7%
Age and Sex	
Median Age (US median age is 38.8)	42.7
Percent of population under 18	21.3%
Percent of population 18-34	19.5%
Percent of population 35-44	11.8%
Percent of population 45-64	26.2%
Percent of population 65 and over	21.2%
Percent of population male	49.7%
Percent of population female	50.3%
Race and Hispanic Origin	
White alone, 2020	96.4%
White alone, not Hispanic or Latino	91.4%
Hispanic or Latino	4.4%
Two or More Races	2.1%
American Indian and Alaska Native alone	1.8%
Black or African American alone	0.3%
Asian alone	0.7%
Native Hawaiian and Other Pacific Islander alone	0.0%
Education	
High school graduate or higher, age 25 years+	95.5%
Bachelor's degree or higher, age 25 years+	30.6%
Vulnerable Populations	
Percent of population under 5 years old	4.9%
Percent of population 85 years and older	2.3%
Percent of population that speak English "not well"	0.7%
Percent of population with disabilities	12.5%
Percent of population without health insurance	11.4%
Percent of population below poverty level	8.4%
Percent of population in deep poverty (<1/2 federal poverty level)	4.4%
Percent of population 65 and over and in poverty	8.7%

Source: U.S. Census Bureau www.census.gov/
*Hispanic or Latino is considered to be an ethnicity and not a race. People who identify themselves as Hispanic or Latino can belong to one or more races. Therefore, the total percentage can be greater than 100%.

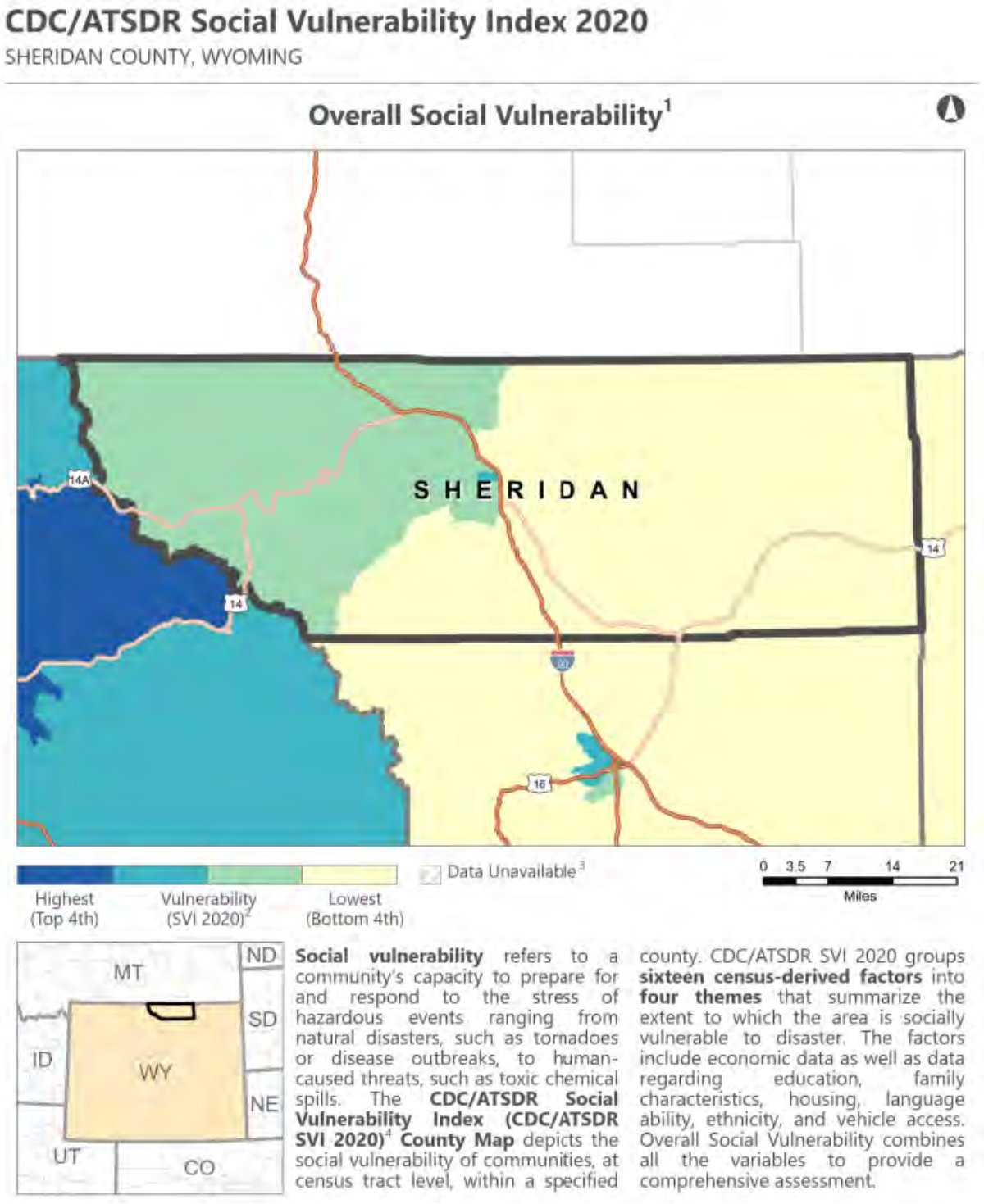
3.1 Social Vulnerability

Social vulnerability is broadly defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards. Additional details on social vulnerability, the Centers for Disease Control and Prevention (CDC) social vulnerability index (SVI), and community resilience ratings can be found in Section 4.1.4 of the Base Plan.

The SVI utilizes 16 demographic variables organized into four broader categories (Socioeconomic Status, Household Characteristics, Racial & Ethnic Minority Status, and Housing Type & Transportation) in order to determine the overall social vulnerability of a community at the census tract and county level. Figure 1 below displays the overall social vulnerability rating for Sheridan County at the census tract level, while Figure 2 details each of the four SVI themes. As a whole, Sheridan County has low social

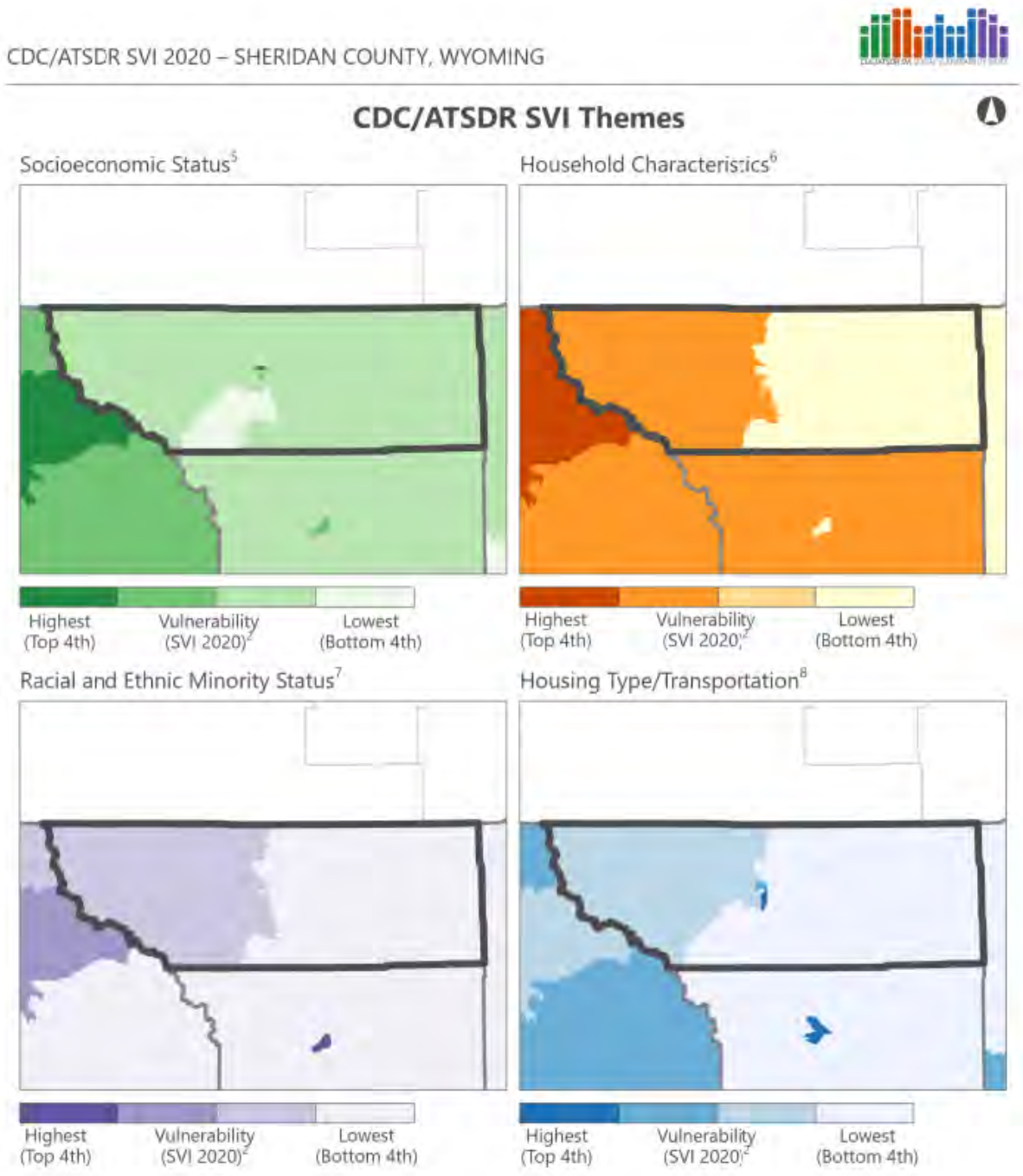
vulnerability according to the SVI. However, there is some variability in rating across the different SVI themes.

Figure 1 Sheridan County Overall Social Vulnerability



Source: CDC Social Vulnerability Index

Figure 2 Sheridan County SVI Themes



Source: CDC Social Vulnerability Index

4 Development Trends

Since 2008, significant changes have unfolded in Sheridan County, Wyoming's tenth largest county spanning 4,175 square miles. With about 60% of its population concentrated in and around the City of Sheridan, the 1982 comprehensive plan advocated for future development density around incorporated areas such as Dayton, Ranchester, and Clearmont. More recently, Big Horn and Story have emerged as

potential outposts for future growth, warranting increased development density. Notably, between 1990 and 2000, unincorporated areas experienced a decline in population, whereas incorporated areas, particularly around Sheridan and Dayton, saw substantial growth.

However, between 2010 and 2015, only about 20 percent of Wyoming's population growth occurred in rural areas, marking a decrease from the previous decade. Sheridan County closely mirrored this statewide trend, with approximately 1.5% of growth occurring in rural areas and 2.3% in urban, incorporated areas. Over the past decade, the countywide growth rate has maintained a steady, albeit low, pace. Additionally, the Coal Bed Methane (CBM) boom that characterized the early to mid-2000s gradually waned, bringing forth shifts in economic dynamics.

The region has also witnessed critical updates in its planning strategies. The Sheridan Joint Planning Area Plan underwent revisions and was officially adopted in 2017, reflecting a commitment to sustainable and balanced growth. Ensuring fiscal responsibility remains pivotal in development patterns and utilities. Moreover, addressing the pressing issue of affordable housing has become a priority, catering to diverse demographics including young families, new households, and senior citizens. Notably, the county's population has aged at a faster rate compared to the state as a whole.

Recreation and tourism have seen an upward trajectory, while the demand for trails, paths, and access to public lands has surged. All incorporated areas, except Clearmont, have experienced growth at a faster pace than the unincorporated county. New or expanded manufacturing ventures have positively impacted the local economy, contributing to a more diversified economic landscape. Additionally, tourism has emerged as a steady-growing sector, drawing visitors to the area's natural wonders.

For land use, private ownership encompasses the majority of land in Sheridan County, totaling approximately 1,622 square miles, or roughly 64% of the county's total land area. Meanwhile, public and trust ownership under local, state, or federal authority constitutes about 36 percent of the county's land area, amounting to 902 square miles. Agriculture reigns supreme as the largest existing land use, occupying over 988,747 acres, or approximately 62 percent. Public and trust lands, primarily dedicated to agricultural pursuits, encompass 558,734 acres, or roughly 35 percent. Residential land use covers 15,889 acres, equivalent to 1.3 percent, while non-residential uses like businesses, industry, and multi-use zones account for approximately 666 acres, or less than one percent of the overall land area.

In terms of zoning, agricultural districts dominate, encompassing over 97 percent of the zoned land area. This district includes lands managed by entities like the U.S. Forest Service, U.S. Bureau of Land Management, and most state lands. Residentially zoned lands account for slightly over 2 percent of the total zoned area, while non-residential zoning covers less than one percent. These dynamics, in tandem with the county's robust comprehensive plan, paint a dynamic picture of Sheridan County's evolving development landscape.

The Future Land Use Plan Map serves as a broad guide for the anticipated development of the unincorporated county over the next 10-20 years. The plan outlines a general vision for Sheridan County's future based on public input and an evaluation of changes since the 2008 plan. It aims to maintain the unique character of cities and towns by designating areas for different types of development and compatible activities. While the plan doesn't rigidly dictate specific land uses for individual parcels, it offers a framework for future development, encouraging diverse neighborhoods and mixed-use centers. This includes a range of housing types, denser near commercial hubs and

community facilities. In rural areas, the plan emphasizes low-density residential, agriculture, and conservation areas, aligning with existing patterns. The plan doesn't prescribe detailed land uses for unincorporated communities, leaving room for continued collaboration and local decision-making (Sheridan County 2020 Comprehensive Plan 2020).

Table 4-1 Sheridan County Housing Characteristics

	# Units	% of Units	US Average
Total Housing Units	14,344	------	134,054,899
Occupied	12,697	88.5%	87.8%
Rental Units	31.6%	31.6%	36.4%
Mobile Homes	9.4%	9.4%	5.7%
Vacant	1,647	11.5%	12.2%
For rent	156	1.1%	2.1%
Rented, not occupied	30	0.2%	0.5%
For sale only	20	0.1%	1.0%
Sold, not occupied	0	0.0%	0.5%
Seasonal, recreational, occasional use	978	6.8%	4.0%
For migrant workers	0	0.0%	0.0%
Other vacant	463	3.2%	4.1%
Year Built			
Built 2014 or later	47	0.3%	0.4%
Built 2010 to 2013	363	2.5%	1.9%
Built 2000 to 2009	2,100	14.6%	14.7%
Built 1990 to 1999	1,939	13.5%	14.0%
Built 1980 to 1989	1,970	13.7%	13.7%
Built 1970 to 1979	2,542	17.7%	15.6%
Built 1940 to 1969	2,792	19.5%	26.7%
Median year structure built	1977	-----	1977

Source: U.S. Department of Commerce; Census Bureau, American Community Survey

5 Economy

Table 5-1 below provides a brief overview of economic characters in Sheridan County. The following information is provided by the U.S. Census Bureau American Community Survey (ACS) 5-year estimates from 2016-2020.

Table 5-1 Sheridan County Basic Economic Profile

Economic Characteristics	**Sheridan** County
Families Below Poverty Level	3.3%
Individuals Below Poverty Level	22.1%
Median Home Value	$284,200
Median Household Income	$59,380
Per Capita Income	$34,495

Economic Characteristics	Sheridan County
Population > 16 Years Old in Labor Force	62.7%
Population Employed	60.4%

Source: U.S. Census Bureau www.census.gov/

The table below shows the breakdown of employment in Sheridan County by the industry sector. According to the ACS, the leading employment sectors in the County are "educational services, and health care and social assistance", which composes of nearly a quarter of the total employment in the County follows by "arts, entertainment, and recreation, and accommadation and food services".

Table 5-2 Sheridan County Occupation by Industry Profile

Industry	Population Employed	Percent of Labor Force
Agriculture, forestry, fishing and hunting, and mining	1,365	9.2%
Construction	1,505	10.1%
Manufacturing	710	4.8%
Wholesale trade	254	1.7%
Retail trade	1,182	7.9%
Transportation and warehousing, and utilities	696	4.7%
Information	324	2.2%
Finance and insurance, and real estate and rental and leasing	724	4.9%
Professional, scientific, and management, and administrative and waste management services	1,368	9.2%
Educational services, and health care and social assistance	4,214	28.3%
Arts, entertainment, and recreation, and accommodation and food services	1,516	10.2%
Other services, except public administration	599	4.0%
Public administration	428	2.9%

Source: U.S. Census Bureau ACS 5-year estimates, 2016-2020

The influx of visitors traveling to Wyoming plays a pivotal role in the state's economic framework, a trend that extends to Sheridan County. Both domestic and international framework travel serves as a catalyst for robust business sales, payroll, employment opportunities, and tax revenues, benefitting not only the state but also local jurisdictions.

6 Hazard Identification and Risk Assessment

6.1 Identified Hazards

The HMPC reviewed the hazards from the 2018 Regional Hazard Mitigation Plan for inclusion in the 2023 update. The hazards list was also compared with the hazards list found in the State of Wyoming's hazard mitigation plan, updated and adopted in 2021. Coal Seam Fire was added as a hazard for the Region in 2023. The following table notes the summary of significance for each jurisdiction in the county based on a combination of geographic extent, potential magnitude/severity and probability as defined below. Hazard significance is rated as High, Medium or Low.

Table 6-1 Overall Hazard Significance Summary Table

Hazard	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan County School District #3
Dam Failure	M	M	M	M	M	M
Drought	H	H	H	H	H	H
Earthquake	L	M	L	L	L	M
Expansive Soil	L	L	L	L	L	L
Flood	H	M	H	H	H	H
Hail	M	M	L	L	M	M
Hazardous Materials	M	L	L	L	M	M
High Winds and Downbursts	M	M	M	M	M	M
Landslide/Rockfall/ Debris Flow	M	L	L	L	M	L
Lightning	M	M	M	M	M	M
Mine and Land Subsidence	L	L	L	L	L	L
Severe Winter Weather	H	H	H	H	H	H
Tornado	M	L	L	L	M	L
Wildfire	H	H	M	M	H	H
Coal Seam Fire	L	L	L	L	L	L

Geographic Extent
Negligible: Less than 10 percent of planning area or isolated single-point occurrences
Limited: 10 to 25 percent of the planning area or limited single-point occurrences
Significant: 25 to 75 percent of planning area or frequent single-point occurrences
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Potential Magnitude/Severity
Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period or result in many permanent disabilities and a few deaths.

Probability of Future Occurrences
Unlikely: Less than 1 percent probability of occurrence in the next year or has a recurrence interval of greater than every 100 years.
Occasional: Between a 1 and 10 percent probability of occurrence in the next year or has a recurrence interval of 11 to 100 years.
Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Highly Likely: Between 90 and 100 percent probability of occurrence in the next year or has a recurrence interval of less than 1 year.

Overall Significance
Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.
Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
High: The criteria consistently fall along the high ranges of the classification and the event exerts

Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

6.1.1 Hazards Considered but Not Profiled

Though noted in other relevant plans such as the Wyoming State Multi-Hazard Mitigation Plan from 2016, this plan does not further evaluate the following hazards:

- Avalanche
- Pandemic
- Space weather
- Volcanism

It is important to be aware of the probability of these events and the associated impacts for Sheridan County. However, the hazard identification described in Chapter 4 omits these hazards due to the limited relevance in the regional context of this plan or being sufficiently addressed in other planning mechanisms. Some of the above listed hazards are acknowledged to some degree under other hazard profiles, such as deposits carried by wind that could be part of a debris flow event.

6.2 Building Inventory and Assets

In addition to people, structures, and critical facilities and infrastructure, other important assets exist in Sheridan County that are potentially exposed to hazards identified in this plan. Table 6-2 summarizes the property inventory for the county and each participating jurisdiction, based on the improvement value and includes the building count and value grouped by parcel type and jurisdiction. This as an assessment of the overall property exposed within the county and by jurisdiction.

Assets inventoried to determine vulnerability include people, structures, critical facilities, and natural, historic, or cultural resources. For the regional planning process, locally available GIS databases were utilized. Parcel and assessor data was obtained through sources such as the Wyoming Property Tax Division's Assessor's Portal. This information provided the basis for building exposure and property types. The focus of the analysis was on "improved," or developed, parcels. These parcels were identified based on an improvement value greater than zero. Abstract Codes were used to identify occupancy type as shown in the following table, which includes summations of total improved value for the various property types and jurisdictions, and the population exposed in each.

Table 6-2 Sheridan County Building Inventory and Value by Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Clearmont	Commercial	6	$651,967	$651,967	$1,303,934
	Residential	44	$4,566,386	$2,283,193	$6,849,579
	Total	**50**	**$5,218,353**	**$2,935,160**	**$8,153,513**
Dayton	Commercial	26	$4,536,954	$4,536,954	$9,073,908
	Residential	331	$73,447,319	$36,723,660	$110,170,979
	Total	**357**	**$77,984,273**	**$41,260,614**	**$119,244,887**
Ranchester	Commercial	36	$8,875,018	$8,875,018	$17,750,036
	Residential	327	$73,015,951	$36,507,976	$109,523,927
	Total	**363**	**$81,890,969**	**$45,382,994**	**$127,273,963**

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Sheridan	Commercial	837	$486,165,921	$486,165,921	$972,331,842
	Industrial	10	$35,959,042	$53,938,563	$89,897,605
	Residential	6,449	$1,501,334,897	$750,667,449	$2,252,002,346
	Total	**7,296**	**$2,023,459,860**	**$1,290,771,933**	**$3,314,231,793**
Unincorporated	Commercial	261	$63,952,124	$63,952,124	$127,904,248
	Industrial	2	$1,306,452	$1,959,678	$3,266,130
	Residential	4,320	$1,477,541,884	$738,770,942	$2,216,312,826
	Total	**4,583**	**$1,542,800,460**	**$804,682,744**	**$2,347,483,204**
	Grand Total	**12,649**	**$3,731,353,915**	**$2,185,033,444**	**$5,916,387,359**

Source: Wyoming CAMA 2022, WSP GIS Analysis

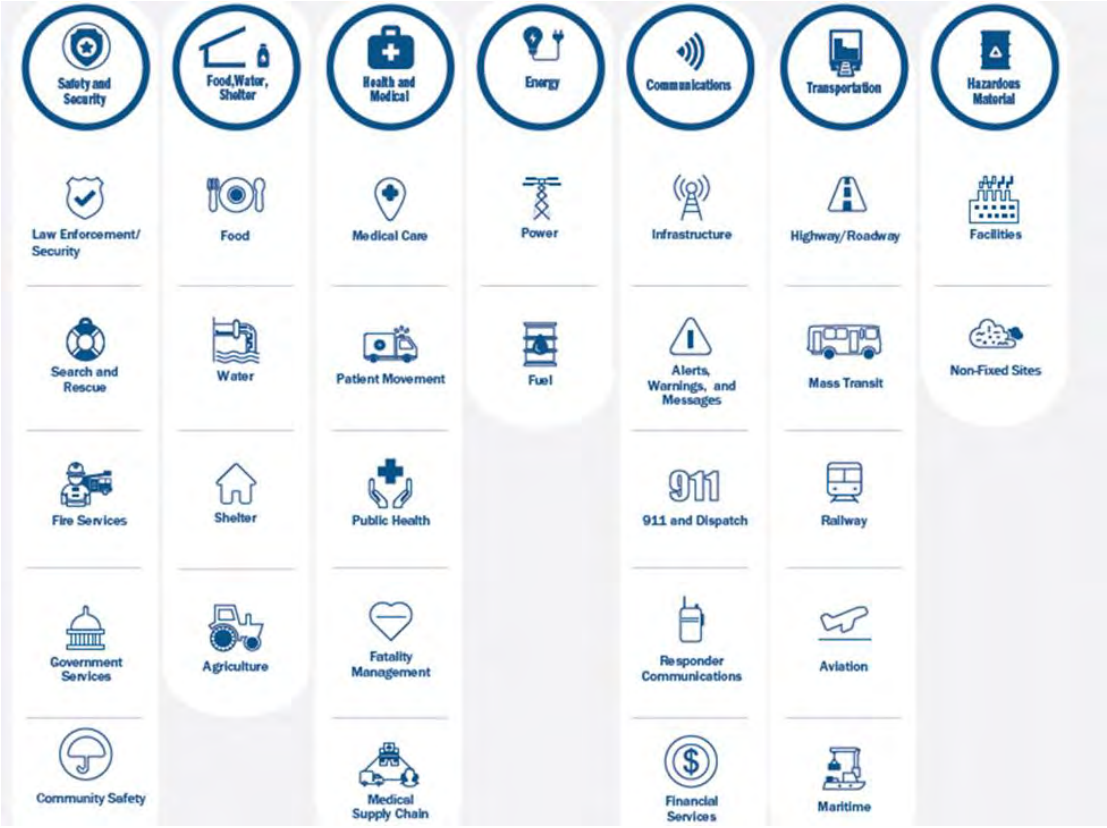
6.2.1 Critical Facilities, Infrastructure, and Other Important Community Assets

A critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Much of this data is based on GIS databases associated with the 2022 Homeland Infrastructure Foundation-Level Data (HIFLD) and the 2023 National Bridge Inventory (NBI). Where applicable, this information was used in an overlay analysis for hazards such as dam failure, expansive soil, flood, landslide, and wildfire.

FEMA organizes critical facilities into seven lifeline categories as shown in Figure 3. These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

Figure 3 FEMA Lifeline Categories



Source: FEMA

Table 6-3 summarizes critical facility counts in Sheridan County and the jurisdictions, which examines the distribution of critical facilities across each individual jurisdiction. Critical facilities were based on the databases from Homeland Infrastructure Foundation-Level Data (HIFLD) and the National Bridge Inventory (NBI). The primary assets of the Sheridan County School District #3 are the two public school buildings the district owns and operates, both located in the Town of Clearmont. According to the 2022 HIFLD database, there are also a total of 19 critical facilities located within school district property.

Table 6-3 Sheridan County Critical Facility Summary

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Clearmont	1	-	-	-	-	1	-	**2**
Dayton	1	1	-	-	1	3	2	**8**
Ranchester	3	-	2	-	-	7	2	**14**
Sheridan	16	5	-	-	8	31	20	**80**
Unincorporated	77	9	6	2	3	20	146	**263**

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Sheridan County School District #3	7	-	-	-	-	7	5	**19**
Total	**105**	**15**	**8**	**2**	**12**	**69**	**175**	**386**

Source: HIFLD, National Bridge Inventory, WSP GIS Analysis

6.2.2 Natural, Historic, and Cultural Assets

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

- The community may decide that these types of resources warrant more protection due to their unique and irreplaceable nature as well as contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Historic and Cultural Resources

By definition, a historic property not only includes buildings of other types of structures, such as bridges and dams, but also includes prehistoric of Native American sites, roads, byways, historic landscapes, and many other features. Given the history of the County, these types of historic properties exist in the planning area.

Table 6-4 lists the properties and districts in Sheridan County that are on the National Register of Historic Places, which is the Nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.

Table 6-4 Sheridan County Historic Properties

City	Historic Name
Arvada	CKW Bridge over Powder River
	EAU Arvada Bridge
Big Horn	Johnson Street Historic District
	Odd Fellows Hall
	Quarter Circle A Ranch

City	Historic Name
Clermont	Clearmont Jail
Dayton	Dayton Community Hall
	Dayton Mercantile
	Wissler, Susan, House
Leiter	EBF Bridge over Powder River
Monarch	ECR Kooi Bridge
Ranchester	Connor Battlefield
Sheridan	Big Goose Creek Buffalo Jump
	ECS Bridge over Big Goose Creek
	Fort Mackenzie
	Holy Name Catholic School
	Mount View
	Robinson--Smith House
	Sheridan County Courthouse
	Sheridan County Fairgrounds Historic District
	Sheridan Flouring Mills, Inc.
	Sheridan Inn
	Sheridan Main Street Historic District
	Sheridan Railroad Historic District
	St. Peter's Episcopal Church
	Trail End
Ucross	Big Red Ranch Complex

Sources: National Register of Historic Place Program, https://www.nps.gov/Nr/research/

Natural Resources

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

Wetlands

Wetlands are a valuable natural resource for communities, due to their benefits to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital.

Endangered Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is

in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

There are five federally-recognized, endangered, threatened, or candidate species present in Sheridan County according to the U.S. Fish and Wildlife Service. These species are listed in Table .

Table 6-5 Endangered and Threatened Species in Sheridan County

Common Name	Scientific Name	Type of Species	Status
Bald eagle	Haliaeetus leucocephalus	Birds	Recovery
Ute ladies'-tresses	Spiranthes diluvialis	Flowering Plants	Threatened
Gray wolf	Canis lupus	Mammals	Recovery
Canada Lynx	Lynx canadensis	Mammals	Threatened
North American wolverine	Gulo gulo luscus	Mammals	Proposed Threatened

Source: http://www.fws.gov/endangered/

6.3 Vulnerability to Specific Hazards

This section provides vulnerability to specific hazards, where quantifiable, to summarize the information of the Region and/or provide more detail at the county and jurisdictional level. The results of detailed GIS analyses used to estimate potential for future losses are presented here, in addition to maps of hazard areas and details by jurisdiction and building type in Sheridan County. For a discussion of the methodology used to develop the loss estimates refer to Chapter 4 of the base plan. In many cases, Chapter 4 contains information that differentiates the risk by county thus the information is not duplicated here. For most of the weather-related hazards the risk does not vary significantly enough from the rest of the Region and thus the reader should refer to Chapter 4.

6.3.1 Dam Failure

There are nine high hazard dams and one significant hazard dam located within close proximity to population centers in Sheridan County. These dams are listed in Table 6-6**Error! Reference source not found.** and shown in Figure 4 below. There are also many other dams in the county rated as low hazard, which are not shown. There are also dams in adjacent Johnson County that could affect Sheridan County; these are also shown on Figure 4.

Table 6-6 High and Significant Level Dams in Sheridan County

Hazard Level	Dam Name	Normal Capacity (AF)	Nearby Jurisdiction/Populated Area
High	BEAR CLAW LOVE NO. 1	248	DAYTON
High	BIG GOOSE PARK MAIN DAM	10,362	BECKTON
High	DOME LAKE NO. 1	1,506	BECKTON
High	PADLOCK NO. 1 A FIVE MILE	536	RANCHESTER
High	SAWMILL	1,275	BECKTON

Hazard Level	Dam Name	Normal Capacity (AF)	Nearby Jurisdiction/Populated Area
High	SIBLEY	379	DAYTON
High	WAGNER	3,411	RANCHESTER
High	TWIN LAKES NO. 1	884	SHERIDAN
High	WINDY DRAW	533	ACME
Significant	WESTON	370	BECKTON

Source: National Inventory of Dams

There has been one recorded dam failure in the county:

- In 1978 the Reynolds #1 Dam partially failed. Although this structure is rated as a Low hazard (and hence not summarized in the table above), the earthen dam had its base keyed into the foundation. The breach resulted from overtopping and subsequent erosion. There was no property damage or loss of life, however.

6.3.1.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

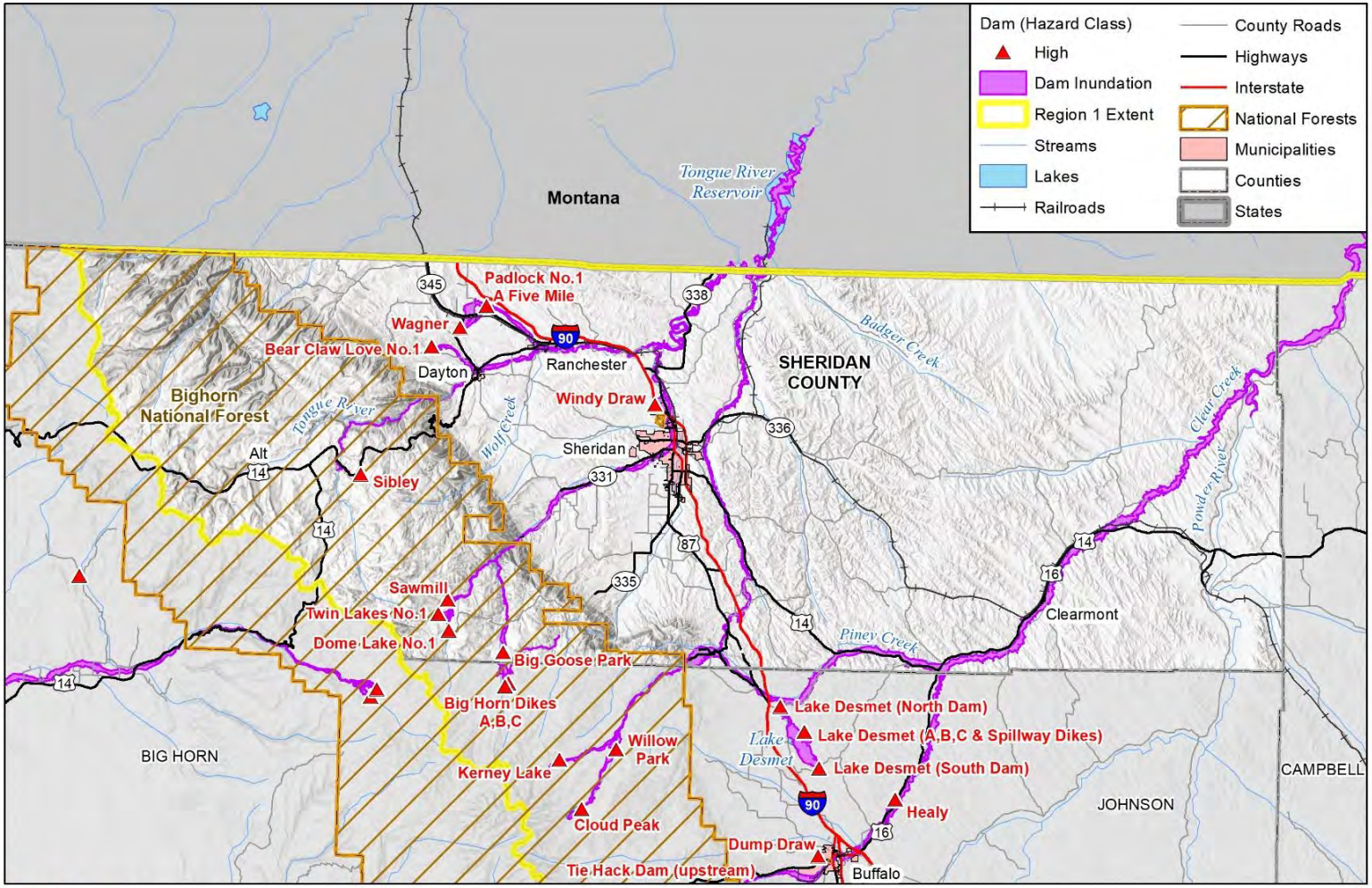
While it is not considered likely, there is a possibility of structure failure-based flooding in the future. The overall risk of dam failure across Sheridan County and its jurisdictions is **medium**. Each of the incorporated communities and the School District have risk to at least one High hazard dam.

Based on the GIS analysis summarized in Section 4.2.2 in the base plan there are a total of 1,881 structures in the inundation zones of High Hazard dams. The unincorporated area has 690 structures within inundation zones. Sheridan has 874 structures, Ranchester 261, and Dayton 51; most of these are residential but includes 184 commercial structures in Sheridan. An estimated 3,640 people reside in these inundation zones countywide. Those at greatest risk are those in affected areas who have access and functional needs, such as those with disabilities, injuries, limited access to transportation or financial resources, the elderly, and people experiencing homelessness. School-aged populations could also be affected including those based in School District #3 buildings in Clearmont.

Based on the critical facility inventory and dam inundation extents available, 82 critical facilities were found to be at risk (see Section 4.2.2); the majority of which are bridges but also includes 12 lifelines classified as Safety and Security facilities. Businesses may suffer damage or destruction, leading to income losses and reduced economic activity. Long-term loss of water in a reservoir, which may be critical for potable water needs, can interrupt the water supply, affecting drinking water availability, agricultural needs, and industrial water usage.

The environment would be vulnerable to a number of risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways, potentially causing the destruction of downstream habitats. No cultural resources are known to be at risk.

Figure 4 Dam Inundation and High Hazard Dams in Sheridan County



6.3.1.2 Development Trends

As noted in Sections 3 and 4, population and development trends may result in some increases in this exposure to this hazard particularly for the City of Sheridan, Dayton, and Ranchester which has been experiencing modest population growth. It is not known if new development is occurring in inundation zones.

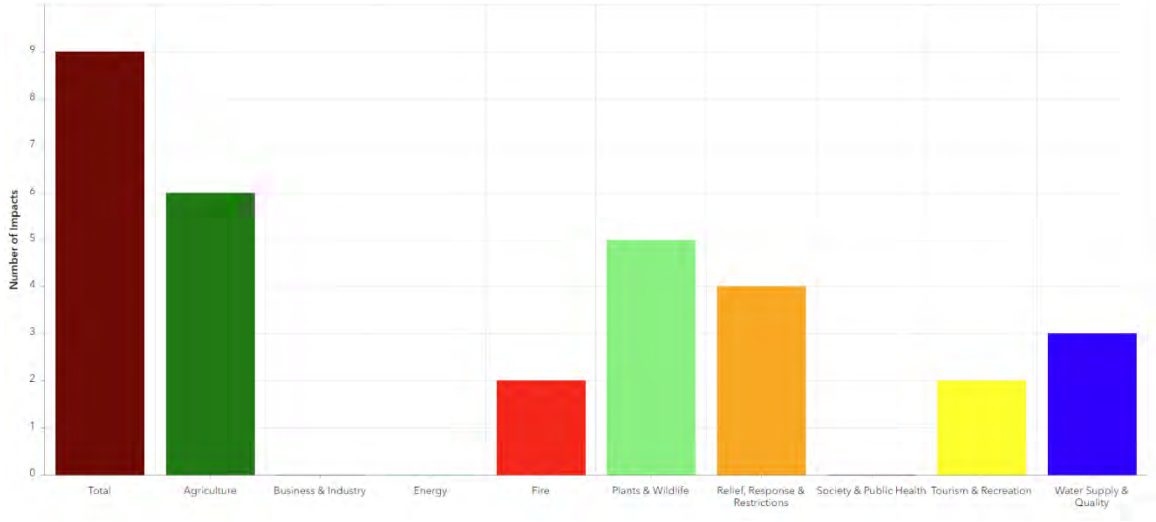
6.3.2 Drought

6.3.2.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Drought is a high significance hazard across all jurisdictions in the County. Drought-related impacts to the local economy can be extensive, affecting the water supply and quality, plants and wildlife, relief response efforts, and even the tourism and recreation industries (e.g., due to increased wildfire danger, forest closures, and fire bans). The most affected sector in Sheridan County, however, is agriculture, as crops and livestock cannot thrive during longer warmer seasons when there is a continued lack of precipitation, in turn causing farmers and growers to experience sales declines and increased management costs. The other highly affected sector impacts are plants and wildlife, as drought can have far-reaching and detrimental effects on ecosystems, including the loss of biodiversity, habitat degradation, and increased stress on wildlife and their environments.

Since 2005, Sheridan County has received nine reports of countywide impacts to the various sectors due to drought. The figure below summarizes the number and type of reports that have been made at the county level, from 2005 to the end of 2022. These reports were submitted to indicate negative effects to the economic sectors and local industries due to drought events. Refer to Chapter 4 in the Base Plan for additional discussion of drought risk related to the region and the county.

Figure 5 County-Level Drought Reports in Sheridan County, 2005-2022



Source: https://www.drought.gov/data-maps-tools/drought-impact-reporter-dir

Table takes the impacts of drought on crop production detailed in Table 4-17 of the base plan and breaks out the losses specific to Sheridan County.

Table 6-7 Indemnities Paid for Commodities that Suffered from Drought in Sheridan County, 2007-2021

Commodity	Acres Damaged	Indemnity Amount
All Other Crops	5,579.0	$227,509
Barley	13.7	$399
Forage Production	622.4	$8,280
Wheat	636.1	$8,174
Grand Total	6,851.1	$244,362

Source: USDA – Risk Management Agency

Drought can stress water supply systems, including reservoirs, water treatment plants, and pipes. Specific water system vulnerability has not been identified during the planning process.

Vulnerable populations that may be affected by drought may include ranchers and farmers as well as those dependent on recreation and tourism. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a prolonged period of drought.

Natural resources include forests and native grasslands, which could be more susceptible to wildfire impacts during droughts. No historic resources are expected to be vulnerable to drought.

6.3.2.2 Development Trends

Recent and future development in the County, districts and municipalities is not anticipated to change vulnerability to drought in a significant way.

6.3.3 Earthquake

Sheridan County has experience four seismic events in the past 100 years. These earthquakes ranged from intensity III-IV and did not result in any damages or injuries. They are identified in the table below and described further in the following text. There have been no further recorded seismic events greater than a magnitude 3.0 in Sheridan County since 2018. It is important to note that earthquakes originating outside of Sheridan County may still lead to impacts in the county.

Table 6-8 Sheridan County Seismic Events, 1923 – 2023

Location	Date	Magnitude/Intensity	Damage or Injuries
6.5 Miles Southwest of Sheridan	1/17/1923	III	No
3 Miles East-Northeast of Sheridan	4/26/1953	IV	No
6 miles Southwest of Big Horn	3/24/1977	3.6	No
Northeastern Sheridan County	2/25/1993	3.9	No

Source: http://earthquake.usgs.gov and Wyoming Geological Survey

The following excerpts are from a report published for the Wyoming State Geological Survey in 2002 entitled “Basic Seismological Characterization for Sheridan County, Wyoming.”

Only one earthquake occurred in Sheridan County during the 1920s. On January 17, 1923, an intensity III earthquake occurred 6.5 miles southwest of Sheridan. No damage was reported from this event. Sheridan County did not experience another earthquake until the mid-1900s. On April 26, 1953, an intensity IV earthquake was reported approximately 3 miles east-northeast of Sheridan. Area residents reported that some beds were rocked, dishes were rattled, and some electrical wires swayed (Murphy and Cloud, 1955).

A magnitude 3.6, intensity IV earthquake was reported on March 24, 1977, approximately 6 miles south-southwest of Big Horn. No damage was associated with this event.

More recently, a 3.9 magnitude earthquake occurred in northeastern Sheridan County on February 25, 1993. This earthquake was centered approximately 19 miles north-northeast of Arvada. No damage was reported.

Several earthquakes have also occurred near Sheridan County. An intensity IV earthquake was felt in the Sheridan area on September 6, 1943, causing beds and chairs "to sway" (Casper Tribune-Herald, September 7, 1943). The epicenter of this earthquake was later found to be near Buffalo, approximately 21 miles south-southeast of Story (Reagor, Stover, and Algermissen, 1985). On September 2, 1962, an earthquake was recorded in Big Horn County, approximately 12.5 miles south-southwest of Burgess Junction. No one reported damage or feeling this event. (U.S.G.S. National Earthquake Information Center). Two earthquakes were recorded near Sheridan County in 1976.

On August 8, 1976, a magnitude 3.4 earthquake occurred in southern Montana, approximately 25 miles northeast of Sheridan. A few months later, on October 8, 1976, a magnitude 3.5 earthquake was detected in the same area. According to the U.S.G.S. National Earthquake Information Center, no one reported feeling either event. A magnitude 5.1, intensity V earthquake occurred in Johnson County on September 7, 1984, approximately 32 miles southeast of Clearmont. The earthquake was felt throughout northeastern Wyoming, including Buffalo, Casper, Kaycee, Linch, and Midwest, and in parts of southeastern Montana. No significant damage was reported (Laramie Daily Boomerang, September 8, 1984).

6.3.3.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Based on the Level 1 HAZUS-MH analysis conducted for the State of Wyoming in 2020, Sheridan County had the highest projected losses in Region 1 under a 2,500-Year Probabilistic event scenario, with $83 million in projected damages and 45 casualties, one of which is fatal. Vulnerable populations may include school-aged children and the elderly. HAZUS-MH classifies the vulnerability of critical facilities to earthquake damage in two categories: at least moderate damage or complete damage. The analysis did not indicate any damages in these categories to specific facilities. Damage to the transportation system and utility lifelines is possible; specific loss numbers were not available at county levels from the Hazus analysis done for the Wyoming State Hazard Mitigation Plan. There is not risk to natural resources within the County and jurisdictions of note.

Overall earthquakes are a **low** significance hazard in the county. Clearmont and the Sheridan School District #3 have rated it **medium** due to historic building stock and the potential for damage in unreinforced masonry school buildings.

6.3.3.2 Development Trends

Recent and future development in the County, district and municipalities is not anticipated to change vulnerability to earthquake in a significant way beyond a slight increase in population exposed.

6.3.4 Expansive Soils

6.3.4.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Sheridan County classifies expansive soils as posing a moderate and low risk for within the County. In the Hazard Analysis and Risk Assessment chapter, section 4.2.5, there is a regional map illustrating soil types and the corresponding risk of expansive soil. The tables provided below summarize the analysis overlaying parcels and facilities, calculating the potential loss and impact of expansive soils.

There were no known historic or current issues of expansive soils in Sheridan County, but based on the figure above there are areas where expansive soils are present. These areas are located along a northwest to central- and south-west corridor in the county, running parallel, but to the left of, Interstate 90. The approximate area of the county affected by expansive soils is estimated to be 2.66%. Potential for swelling is predominantly low for the County, and associated impacts negligible. Areas to the southwest of Dayton are slightly more vulnerable to this hazard. Chapter 4 of the Base Plan includes more information on the location of various soil types, probability of expansion, and exposed building values for both Sheridan County and Region 1.

The tables provided below summarize the analysis overlaying parcels and facilities, calculating the potential property exposure potentially on expansive soils. An estimated 126 people reside on areas of expansive soils, all in unincorporated areas. However, no direct impacts on people are anticipated. Should an impact occur, it is anticipated to be localized. Social vulnerability is not considered a factor. Natural and historic resource impacts are not considered to be a concern.

Table 6-9 Building/Structure Exposure to Moderate Expansive Soil in Sheridan County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Unincorporated	Commercial	2	$1,441,698	$1,441,698	$2,883,396
	Residential	57	$30,044,578	$15,022,289	$45,066,867
	Total	**59**	**$31,486,276**	**$16,463,987**	**$47,950,263**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-10 Building/Structure Exposure to Low Expansive Soil in Sheridan County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Unincorporated	Residential	12	$5,269,085	$2,634,543	$7,903,628
	Total	**12**	**$5,269,085**	**$2,634,543**	**$7,903,628**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-11 Sheridan County Critical Facilities Exposure to Moderate Expansive Soil by Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Unincorporated	2	-	-	1	-	-	1	4
Total	**2**	**0**	**0**	**1**	**0**	**0**	**1**	**4**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

6.3.4.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Modern construction techniques typically account for and mitigate this hazard.

6.3.5 Flood

6.3.5.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

As of 2023, Sheridan County has partial coverage for digital floodplains mapped by FEMA's National Flood Insurance Program and a Hazus flood model was utilized for mapping and analysis to create a comprehensive flood risk assessment. Figure 6 through Figure 10 show the FEMA and Hazus modeled floodplains.

Table 6-12 summarizes the building counts and improved value of parcels in the County, broken out by jurisdiction, that fall within the 1% chance floodplains. Additionally, the table also summarizes loss estimate values, which are calculated based upon the improved value and estimated contents value and assumes a two-foot deep flood which usually results in 25% of the total value, based on FEMA depth-damage curves. Table 6-13 summarizes improved properties at risk to the 0.2% flood hazards where mapped within Sheridan County.

Table 6-12 also indicates the estimated flood losses in each applicable jurisdiction in Sheridan County. The unincorporated areas of the County have the largest number of properties at risk to the 1% annual chance flood. The majority of the properties are residential with a total value of $81.5 million in improved values and $30.5 million in total estimated losses. Note that the City of Sheridan has a significant amount of structures in the 0.2% floodplain. Thus a more rare but large flood event could have signficant consequences.

Table 6-12 Sheridan County Parcels at Risk to 1% Flood Hazard (FEMA & Hazus) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Dayton	Residential	17	$2,534,480	$1,267,240	$3,801,720	$950,430	38
	Total	**17**	**$2,534,480**	**$1,267,240**	**$3,801,720**	**$950,430**	**38**
Ranchester	Commercial	5	$1,314,544	$1,314,544	$2,629,088	$657,272	
	Residential	12	$3,316,338	$1,658,169	$4,974,507	$1,243,627	27
	Total	**51**	**$9,699,842**	**$5,507,193**	**$15,207,035**	**$3,801,759**	**102**
Sheridan	Commercial	3	$1,344,239	$1,344,239	$2,688,478	$672,120	
	Residential	29	$7,817,024	$3,908,512	$11,725,536	$2,931,384	64
	Total	**32**	**$9,161,263**	**$5,252,751**	**$14,414,014**	**$3,603,504**	**64**
Unincorporated	Commercial	12	$9,217,342	$9,217,342	$18,434,684	$4,608,671	
	Residential	283	$81,584,205	$40,792,103	$122,376,308	$30,594,077	625
	Total	**295**	**$90,801,547**	**$50,009,445**	**$140,810,992**	**$35,202,748**	**625**
	Grand Total	**395**	**$112,197,132**	**$62,036,629**	**$174,233,761**	**$43,558,440**	**829**

Source: Sheridan FEMA NFHL 1/16/2014 & Hazus-MH MR2, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-13 Sheridan County Parcels at Risk to 0.2% Flood Hazard (FEMA) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Ranchester	Commercial	1	$501,017	$501,017	$1,002,034	$250,509	
	Total	**1**	**$501,017**	**$501,017**	**$1,002,034**	**$250,509**	**0**
Sheridan	Commercial	71	$20,644,654	$20,644,654	$41,289,308	$10,322,327	
	Industrial	1	$1,624,270	$1,624,270	$3,248,540	$812,135	
	Residential	395	$74,381,430	$74,381,430	$148,762,860	$37,190,715	873
	Total	**467**	**$96,650,354**	**$96,650,354**	**$193,300,708**	**$48,325,177**	**873**
Unincorporated	Commercial	2	$1,271,830	$1,271,830	$2,543,660	$635,915	
	Residential	63	$19,961,853	$19,961,853	$39,923,706	$9,980,927	139
	Total	**65**	**$21,233,683**	**$21,233,683**	**$42,467,366**	**$10,616,842**	**139**

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
	Grand Total	**533**	**$118,385,054**	**$118,385,054**	**$236,770,108**	**$59,192,527**	**1,012**

Source: Sheridan FEMA NFHL 1/16/2014, Wyoming CAMA 2022, WSP GIS Analysis

Sheridan County has a total of 74 critical facilities located in the 1% annual chance floodplain and 6 within the 0.2% floodplain. Sixty one (61) of the 74 facilities are transportation lifelines and these consist of non-scour bridges in varying degrees of condition ranging from poor, fair, or good condition. This is shown in the following tables.

Table 6-14 Sheridan County Critical Facilities at Risk to 1% (FEMA & Hazus) Flood Hazards Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Dayton	-	-	-	-	-	-	2	**2**
Ranchester	-	-	2	-	-	-	-	**2**
Sheridan	-	-	-	-	-	-	7	**7**
Unincorporated	-	-	2	-	-	-	61	**63**
Total	**0**	**0**	**4**	**0**	**0**	**0**	**70**	**74**

Source: Sheridan FEMA NFHL 1/16/2014 & Hazus-MH MR2, HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 6-15 Sheridan County Critical Facilities at Risk to 0.2% (FEMA) Flood Hazards Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Sheridan	-	-	-	-	-	1	-	**1**
Unincorporated	-	2	-	-	-	-	3	**5**
Total	**0**	**2**	**0**	**0**	**0**	**1**	**3**	**6**

Source: Sheridan FEMA NFHL 1/16/2014, HIFLD, National Bridge Inventory, WSP GIS Analysis

Figure 6 Sheridan County FEMA and Hazus Flood Hazards

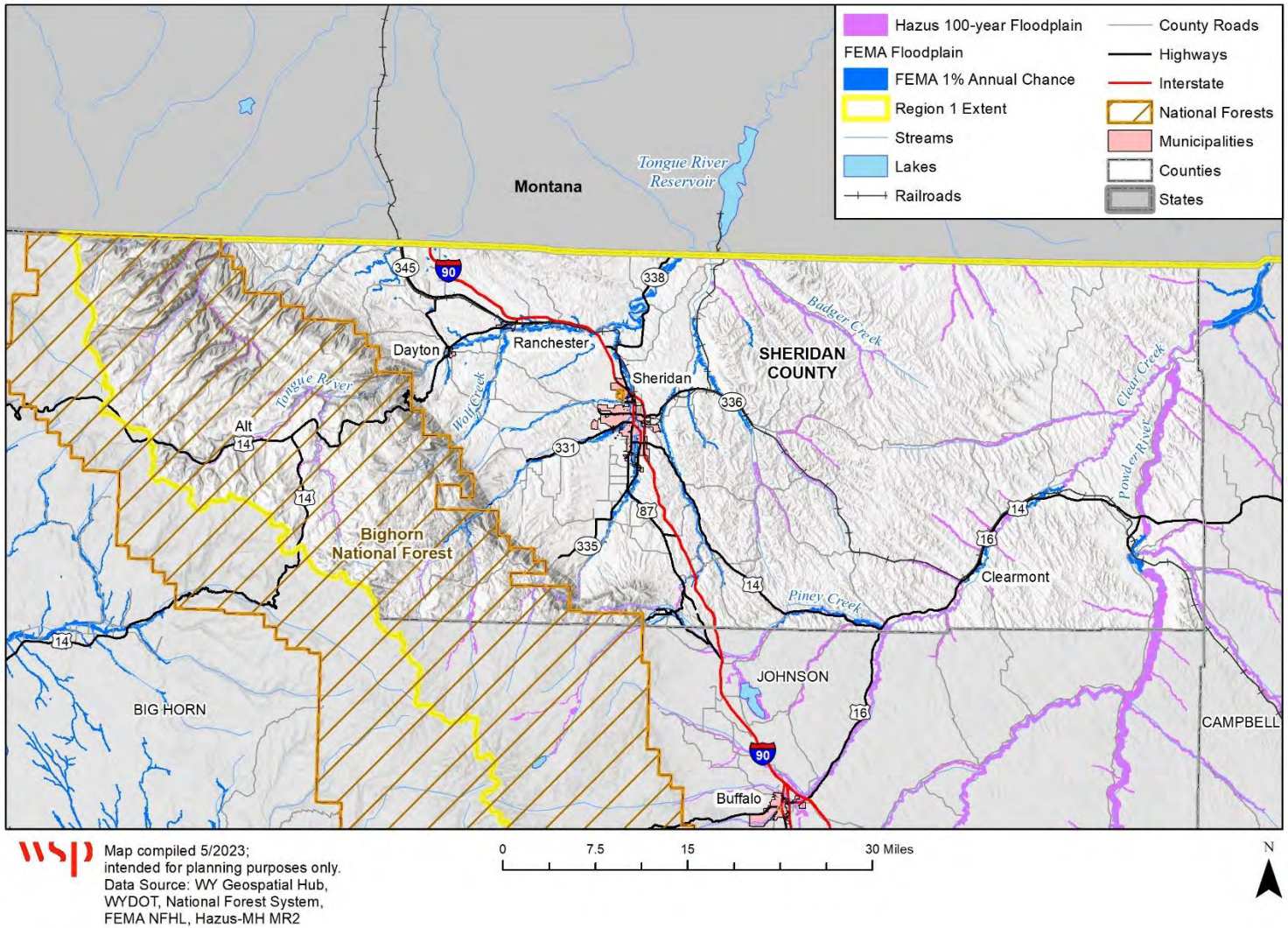


Figure 7 Clearmont FEMA and Hazus Flood Hazards and Structures at Risk

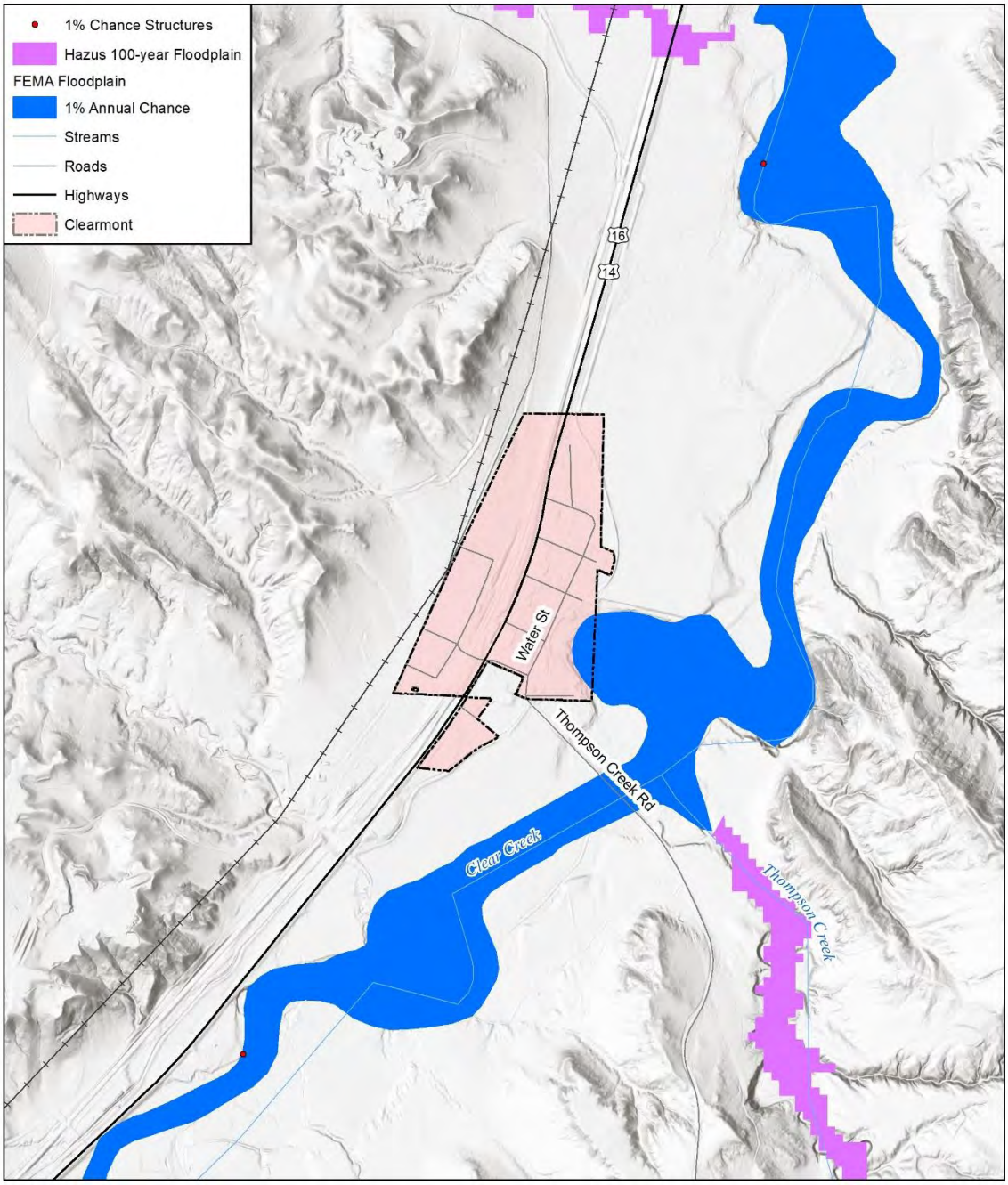


Figure 8 Dayton FEMA and Hazus Flood Hazards and Structures at Risk

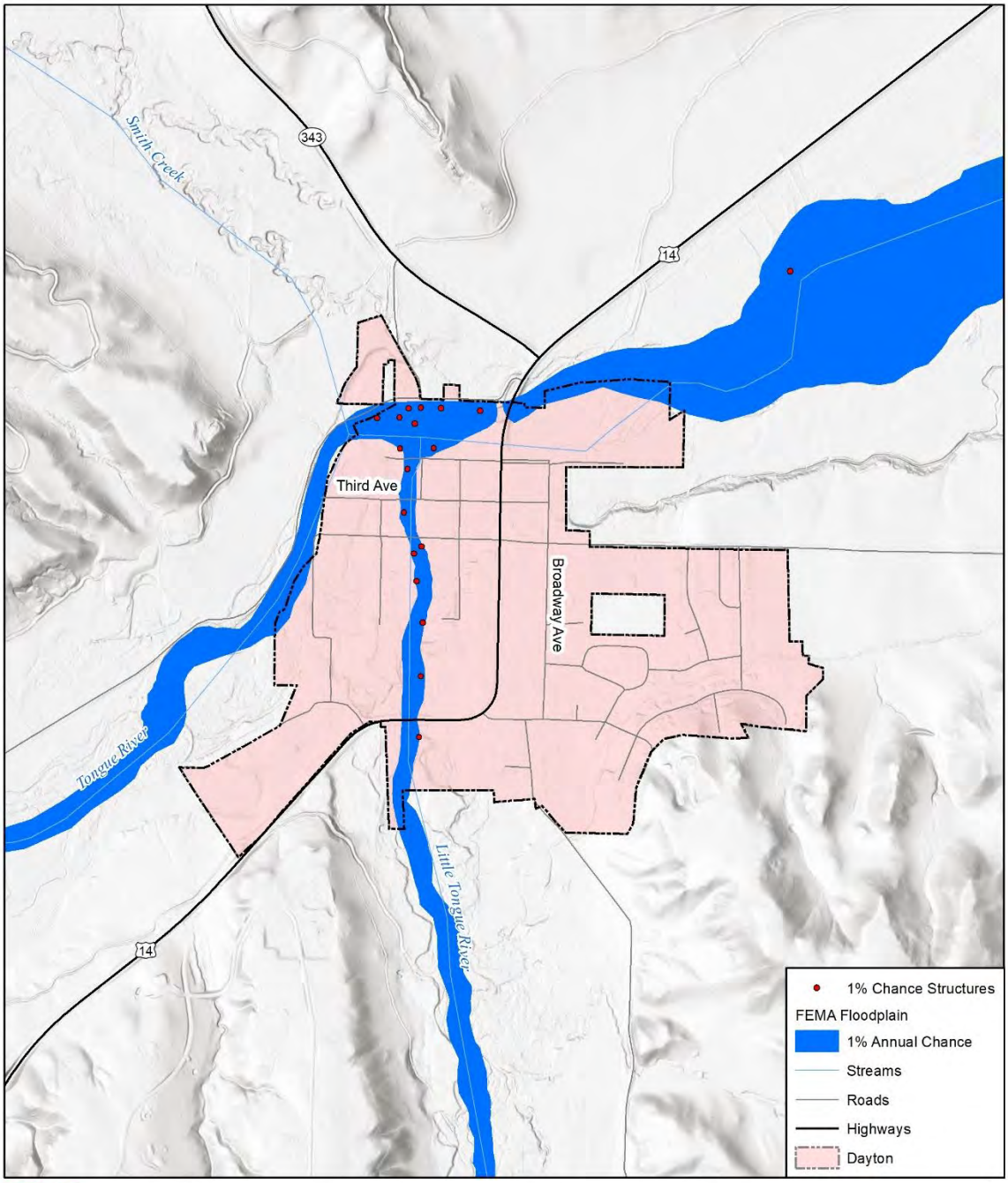


Figure 9 Ranchester FEMA and Hazus Flood Hazards and Structures at Risk

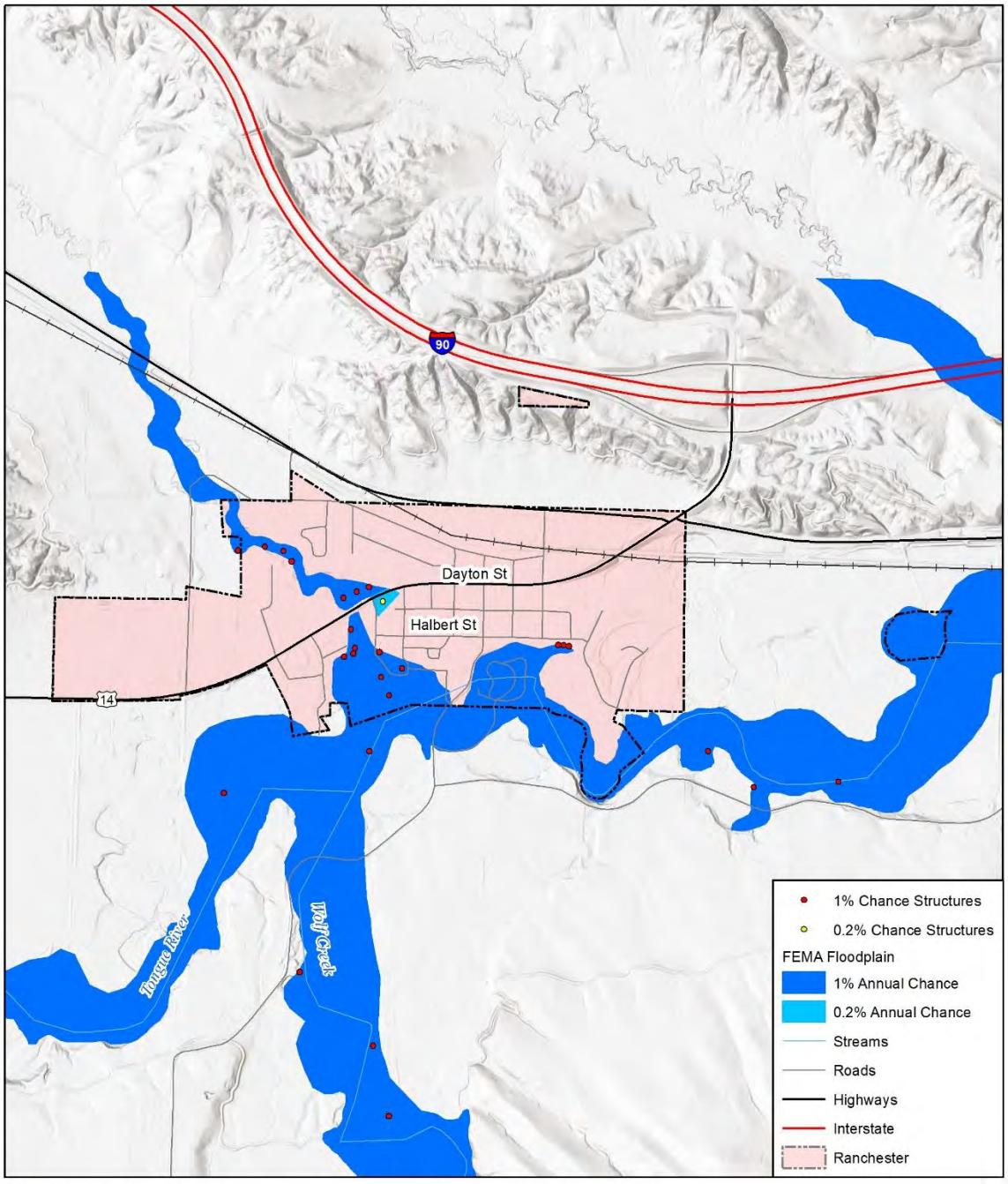
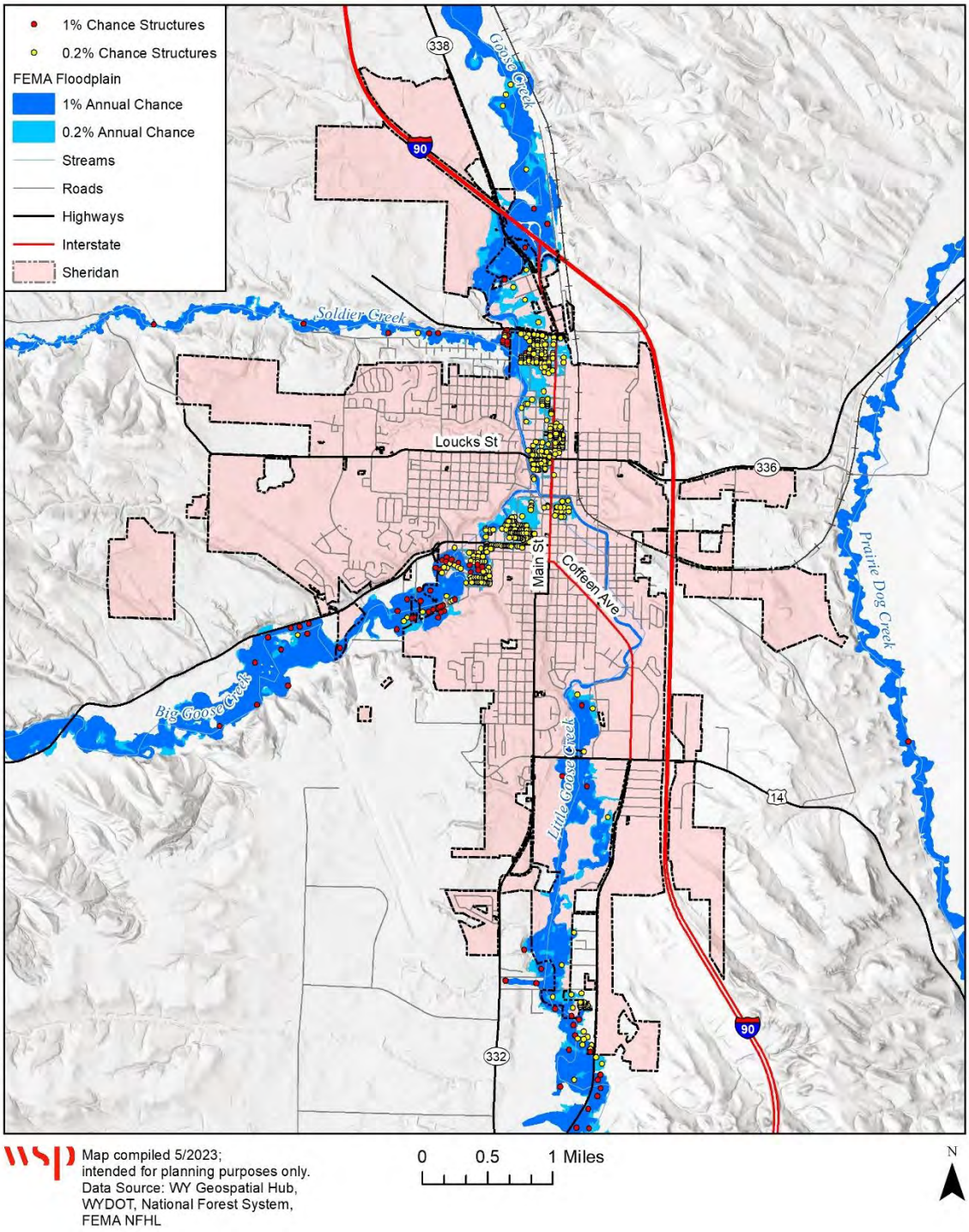


Figure 10 Sheridan FEMA and Hazus Flood Hazards and Structures at Risk



NCEI recorded 25 riverine and flash flood events reported in Sheridan County since 1996, totaling $665,000 in reported damages. Areas most affected were the Cities of Ranchester and Sheridan. The unincorporated community of Parkman has been hit with the costliest flood related damages, amounting to $520,000. This event began on May 20 of 2011, due to heavy rains of 3 to 5 inches near the Big Horn Mountains. The downpours caused streams and creeks to rise, resulting in localized riverine flooding and closing of county roads. Flooding was reported along the Tongue River and Little

Goose Creek, leading to some culverts being washed out. The main sources of flooding within Sheridan County include Thompson Creek, the Tongue River, Big Goose Creek, Little Goose Creek, Soldier Creek, Dry Creek, Wolf Creek, and the Powder River.

Table 6-16 summarizes significant flood events that occurred between 1996 and 2023 in Sheridan County, as reported to the NCEI National Centers for Environmental Information system.

Table 6-16 Flood Events in Sheridan County, 1996-2023

Type	Location	Date	Property Damage	Crop Damage
Flash Flood	SHERIDAN	6/15/1996	$0	$0
Flood	SHERIDAN	8/19/1998	$20,000	$0
Flash Flood	SHERIDAN	7/14/2001	$0	$0
Flash Flood	SHERIDAN	8/21/2002	$0	$0
Flood	SHERIDAN FOOTHILLS (ZONE)	5/7/2005	$0	$0
Flood	SHERIDAN FOOTHILLS (ZONE)	5/8/2005	$0	$0
Flood	SHERIDAN FOOTHILLS (ZONE)	5/11/2005	$0	$0
Flash Flood	SHERIDAN CO AIRPORT	6/6/2007	$0	$0
Flood	SHERIDAN CO AIRPORT	6/6/2007	$0	$0
Flood	SHERIDAN	6/7/2007	$0	$0
Flash Flood	SHERIDAN	7/7/2007	$0	$0
Flash Flood	SHERIDAN CO AIRPORT	6/22/2010	$0	$0
Flood	PARKMAN	5/20/2011	$520,000	$0
Flash Flood	FT MACKENZIE	5/24/2011	$0	$0
Flash Flood	FT MACKENZIE	5/24/2011	$0	$0
Flood	DAYTON	5/25/2011	$0	$0
Flood	RANCHESTER	6/8/2011	$0	$0
Flood	CLEARMONT	2/22/2012	$0	$0
Flash Flood	FT MACKENZIE	6/11/2013	$0	$0
Flood	SHERIDAN CO AIRPORT	5/24/2015	$0	$0
Flash Flood	SHERIDAN CO AIRPORT	6/5/2015	$0	$0
Flash Flood	BIG HORN	6/10/2015	$0	$0
Flood	FT MACKENZIE	5/29/2018	$0	$0
Flood	SHERIDAN CO	5/28/2019	$125,000	$0
Flash Flood	LARIAT	7/15/2019	$0	$0
TOTAL			**$665,000**	**$0**

Source: NOAA NCEI

According to the statistics from the National Flood Insurance Program, there have been a total of 75 flood insurance claims since the County joined the program. The total payments made on these claims in the County is $298,233 and there were 62 flood insurance policies in force in the Sheridan County for a total of $18,545,000.

Table 6-17 NFIP Policy and Insurance Claim Data for Sheridan County

Sheridan County	Policies	Coverage "Insurance in Force"	# of Claims "Closed Paid Losses"	Paid Losses "$ of closed paid losses"	# of Policies in A Zones
Dayton, Town of	4	$1,023,000	0	$0	1
Ranchester, Town of	6	$1,539,000	7	$68,918	3

Sheridan County	Policies	Coverage "Insurance in Force"	# of Claims "Closed Paid Losses"	Paid Losses "$ of closed paid losses"	# of Policies in A Zones
Sheridan, City of	18	$5,728,000	27	$68,488	13
Sheridan County	34	$10,255,000	41	$160,817	5
Total	**62**	**$18,545,000**	**75**	**$298,233**	**22**

Source: FEMA Policy and Claim Statistics http://www.fema.gov/policy-claim-statistics-flood-insurance and State of Wyoming Department of Homeland Security, NFIP Coordinator as of 11/13/2023

6.3.5.2 Development Trends

For NFIP participating communities such as the County and all the municipalities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. The lack of comprehensive flood hazard mapping in certain parts of the unincorporated areas of Sheridan County makes floodplain management challenging. The City of Sheridan has a significant amount of structures in the 0.2% floodplain, which is typically not regulated. It is not clear if the growth in Sheridan is occurring in the 0.2% floodplain. No other major growth or development in the County or jurisdictions is expected to significantly alter the general area flood risk, but good planning, zoning, and general hazard mitigation practices are always necessary to prevent future development from being heavily impacted by flooding.

6.3.6 Hail

6.3.6.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Hailstorms are intermittent in Region 1, typically occurring in conjunction with severe summer storms. They mainly impact buildings and agriculture. Crop damage accounts for the majority of the harm, although there's the potential for significant structural damage caused by exceptionally large hailstones. The likelihood of future hail events in Sheridan County is moderate, but the scale of these incidents tends to be relatively minor. Although, hail presents a moderate threat throughout the County and remains consistent across jurisdictions. However, it is important to note that property damage is more likely in urban areas (due to exposed infrastructure and vehicles), whereas potential harm to crops and livestock is concentrated in rural areas and unincorporated areas.

No specific natural, cultural, or historical resources are at risk.

Vulnerable populations that may be affected by drought may include mine workers, ranchers and farmers that work outdoors. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a major hail event.

See Section 4.2.7 for more information on the previously recorded hail events and associated damages, and to revisit the hail map found on Figure 4-37. The total property damage recorded for the County since 1950 due to this hazard is $50,000, with no crop damages on file. (Source: NOAA's NCEI database.)

6.3.6.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.7 Hazardous Materials

As further discussed at a regional level in the Base Plan, since 2007 Sheridan County has been exposed to at least 10 hazardous materials incidents that were significant enough to be recorded in the U.S. Coast Guard's National Response Center (NRC) database and Risk Management Plans (RMP) network; more information can be obtained at http://www.rtk.net/#rmp. Sheridan County contains 2 RMP facilities: The Big Goose Water Treatment Plant and the Sheridan Water Treatment Plant, both of which handle and treat chlorine. The table below summarizes the number of hazardous materials events that have occurred from 2007-2022 in Sheridan County.

Table 6-18 NRC-Reported Incidents in Sheridan County: 2007-2022

Year	Sheridan County
2007	1
2008	0
2009	1
2010	0
2011	0
2012	1
2013	1
2014	0
2015	0
2016	1
2017	1
2018	0
2019	0
2020	0
2021	0
2022	0
Yearly Average	0.3
Total	**6**

Source: http://www.rtk.net/#rmp

The 2013 Local Emergency Response Planning Team for Sheridan County indicated a general observation of increased transport of hazardous materials by train through the County. The Burlington Northern Santa Fe railroad is a heavy rail line that runs through much of Sheridan County and serves principally as a coal-hauling route. The railroad links Sheridan County directly with Billings (Montana) and Gillette (Campbell County); it also indirectly links to both the Denver and Salt Lake City major metropolitan areas. There is a concern regarding the potential increase hazardous materials through the county and population centers and the potential of dangerous and harmful spills. According to the HMPC County, Clearmont and Ranchester received a medium ranking while the City of Sheridan was classified as high risk. There is a historical record of train derailments, and both concerns and preparedness exercises have been scheduled to

address the possibility of a hazardous spill occurring in downtown Sheridan. The overall significance of this hazard to the county is medium.

6.3.8 High Winds and Downbursts

6.3.8.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Wind is a persistent force in Wyoming, and the Sheridan HMPC has observed that high winds consistently pose a challenge for the County. Assessing vulnerability based on location is challenging since damaging winds have occurred throughout the entire region. The primary risk associated with high winds include damage to inadequately constructed buildings, the potential for flying debris, car accidents, and harm to electrical and power infrastructure. High winds are typically unpredictable, and the resulting damages are often discussed in a regional context, even though downbursts can affect smaller areas.

Wind damage report in Wyoming Region 1 has totaled approximately of $165,163 indemnity payments for a total 1,814 acres lost to wind events. Additionally, the NCEI reported a total of $13,000 in property damages between both types of wind events since 1950 in Sheridan County. According to the USDA Bighorn National Forest website, a major wind event on June 25, 1991, led to the trees in this area toppling in what meteorologists define as a “traveling Microburst.” Approximately 1,100 acres were affected along an 8-mile path. This microburst began on Highway 14 near Granite Pass and extended northeast to a point just west of the Black Mountain Fire Lookout. High winds lasted only fifteen minutes, but toppled enough trees to build 350 homes.

Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out. It is not uncommon for residents living in more remote areas of the county to be isolated after such events.

Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support.

High winds can cause significant damage to trees (including those in the National Forest) and power lines, blocking roads with debris, incapacitating transportation, isolating populations, and disrupting ingress and egress. Cascading hazards caused by high winds can result in power loss; depending on the time of year, winds can also exacerbate snow and blizzards by creating deep snow drifts over roads and affecting the normal flow of traffic.

The probability of future occurrence for this event is likely, but the magnitude of these events is negligible. Overall, high winds pose a medium threat across the County and do not vary between the jurisdictions. See Chapter 4 of the base plan for more information on wind zones, events, and impacts.

6.3.8.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.9 Landslide/Debris Flow/Rockfall

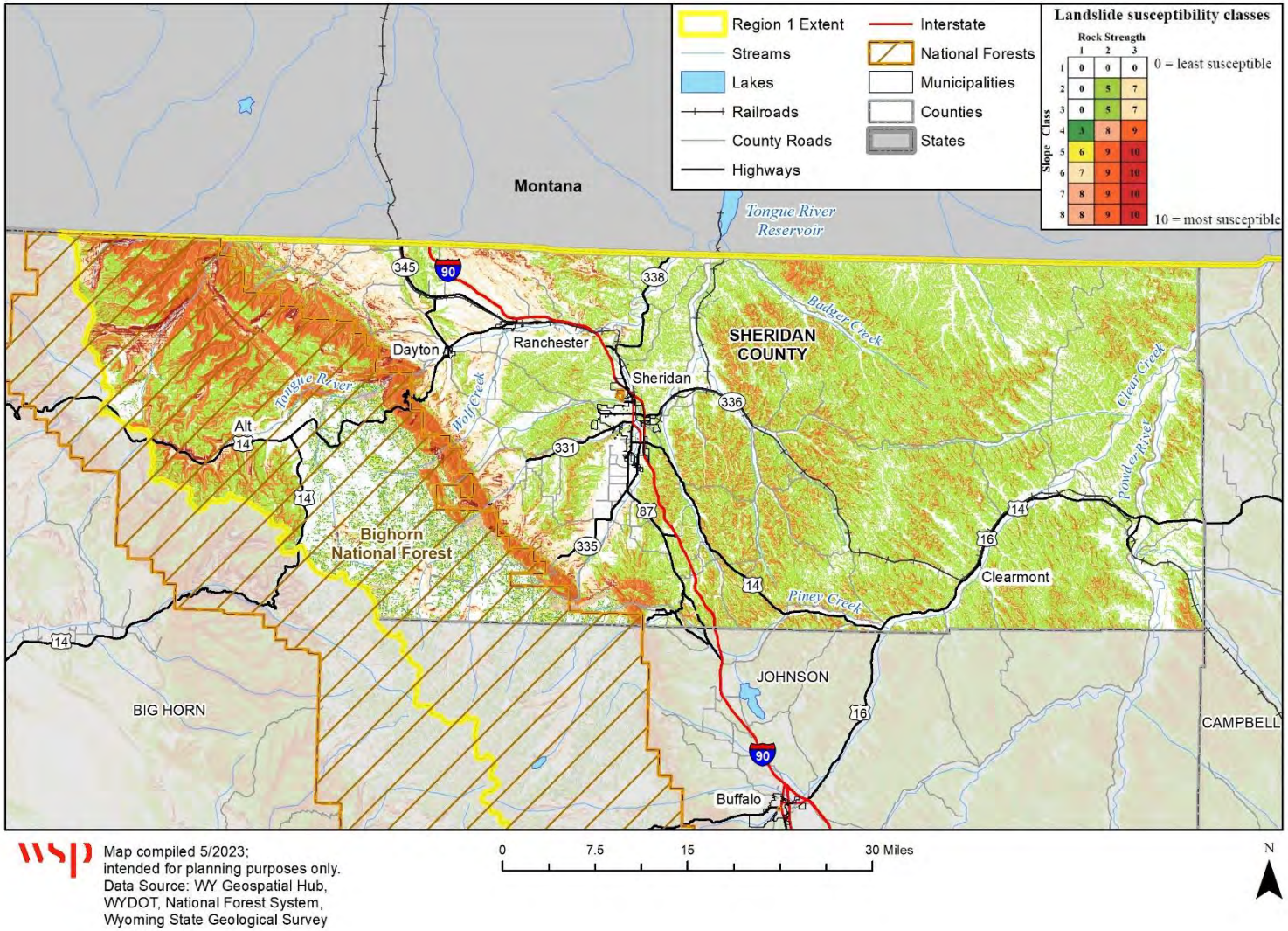
The geologic history and unique conditions of Wyoming make landslides one of the most common hazards. In Sheridan, landslide deposits are highly concentrated in the

northwestern portion of the county. Areas of prevalent complex slope movement, in particular, are located to the west and sprinkled throughout the middle of the county, along with some minor slump areas. Some slump and debris/earth flow areas can also be found nearing the edges of the Bighorn National Forest, running through the county in a northwest-southwest fashion. Some unstable rock areas can be seen near Highway 14, near the central-west portion of the county, on the boundary with the Bighorn National Forest, as well as Jim Creek Hill and the Soldier Creek drainage.

6.3.9.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The HMPC noted impacts on I-90 often leading to closures, particularly between Buffalo and Sheridan. The City of Sheridan has had several landslides in the city, particularly near the Junior High School, which has since been mitigated with a retaining wall and other improvements. The geospatial distribution of landslide susceptibility can be seen in the figure below.

Figure 11 Sheridan County Landslide Hazard



In terms of significance, landslides, debris flow, and rockfall vary based on the magnitude and the location. There is also a possibility that creeks or rivers within the county could become dammed by landslide activity, resulting in a flash flood hazard downstream if the landslide dam fails or is overtopped, or flood nearby developed areas as pooling behind the landslide dam occurs. While some events are small and have limited impact on people and infrastructure, other occurrences can involve large sections of earth and may obstruct major roadways, power line corridors, or gas lines.

On July 22, 2011, President Obama declared a major disaster for the State of Wyoming for emergency work and the repair or replacement of facilities damaged by the severe storms, flooding, and landslides in Albany, Big Horn, Carbon, Crook, Fremont, Goshen, Johnson, Lincoln, Platte, Sheridan, Sublette, Teton, Uinta, Washakie, and Weston Counties. This declaration made Public Assistance funding available.

During the development of this regional plan, a GIS analysis of exposure to landslide hazard areas and potential property losses was performed, with the resulted detailed for all the Region 1 counties in Section 4.2.10 of the Base Plan. To summarize Sheridan County's results, the table below is included.

The population column highlights the potential number of people that would be displaced and/or affected by a landslide event, based on the average household size per property.Based on the GIS analysis approximately 4,984 persons may reside on landslide susceptible areas, mostly in Sheridan and the unincorporated areas. Risk to populations is generally considered low as the landslides are commonly slow moving events in this part of the Region, and there are not any distinct social vulnerability aspects. No specific natural or cultural resources have been identified as at risk.

Sheridan County has a moderate degree of landslide vulnerability, with exposure to complex slope movement, debris or earth flow, and/or slump landslides. These structures are mostly located in the City of Sheridan, Dayton and unincorporated areas with the total exposure amounts being a little over $1.2 billion. Future impacts are likely to affect transportation corridors, rivers, lakes and reservoirs, transmission lines, campgrounds and the occasional structure or property in the county

Table 6-19 Landslide Hazards by Jurisdiction and Property Type in Sheridan County

Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Clearmont	-	-	-	**-**	-	-	-	-
Dayton	-	35	2	**37**	$11,970,186	$5,985,093	$17,955,279	82
Ranchester	-	-	-	**-**	-	-	-	-
Sheridan	10	164	705	**879**	$243,887,700	$140,354,283	$384,241,983	1,783
Unincorporated	163	450	843	**1,456**	$535,389,521	$277,488,335	$812,877,856	3,118
Total	**173**	**649**	**1,550**	**2,372**	**$791,247,407**	**$423,827,711**	**$1,215,075,118**	**4,984**

Source: WYGS Landslide susceptibility data, Wyoming CAMA 2022, WSP GIS Analysis

.

Table 6-20 Sheridan County Critical Facilities at Risk to Landslide

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Moderate Risk								
Sheridan	2	-	-	-	1	-	-	**3**
Unincorporated	33	2	2	-	-	1	12	**50**
Total	**35**	**2**	**2**	**0**	**1**	**1**	**12**	**53**
Moderately High Risk								
Sheridan	-	-	-	-	-	1	3	**4**
Unincorporated	4	-	-	-	-	6	11	**21**
Total	**4**	**0**	**0**	**0**	**0**	**7**	**14**	**25**
Highest Risk								
Sheridan	-	-	-	-	-	-	-	**0**
Unincorporated	17	-	-	-	-	-	1	**18**
Total	**17**	**0**	**0**	**0**	**0**	**0**	**1**	**18**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

Future impacts are likely to affect transportation corridors, rivers, lakes and reservoirs, transmission lines, campgrounds and the occasional structure or property in the county.

6.3.9.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Future planning in areas of steep slopes should consider the potential for slope failure/landslide hazards.

6.3.10 Lightning

6.3.10.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

All areas in western Wyoming are susceptible to lighting strikes. Impacts to persons and property are likely to remain isolated. Outdoor workers and outdoor enthusiasts and livestock will remain susceptible to lightning strikes. In Sheridan County, higher elevation/mountainous areas remain more susceptible. According to the NCEI, lightning has been responsible for 1 death in Sheridan County. On July 11, 2010, a 63-year-old man was struck by lightning in the Big Horn Mountains; he died from cardiac arrest the following day in a Billings hospital. Lightning caused wildland fires may result in more extensive and compound/secondary damages as well. The table below summarizes the recorded events from this hazard, as available in the 2023 Wyoming Multi-Hazard Mitigation Plan. Overall, lighting poses a medium significance hazard across all the jurisdictions.

Lightning caused wildland fires may result in more extensive and compound/ secondary damages as well, including to natural resources and watersheds. No specific cultural resources have been identified as at risk.

Sometimes, communications and infrastructure are interrupted by lightning strikes. These events raise the vulnerability of the essential functions by delaying response times, hindering interagency communication efforts, or endangering or damaging communication networks.

Table 6-21 Lightning Events in Sheridan County, 1950-2023

County	Number of Events	Injuries	Fatalities	Property Damage	Crop Damage	Total Damage
Sheridan	1	0	1	$ 0	$ 0	$ 0

Source: NOAA NCEI

6.3.10.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

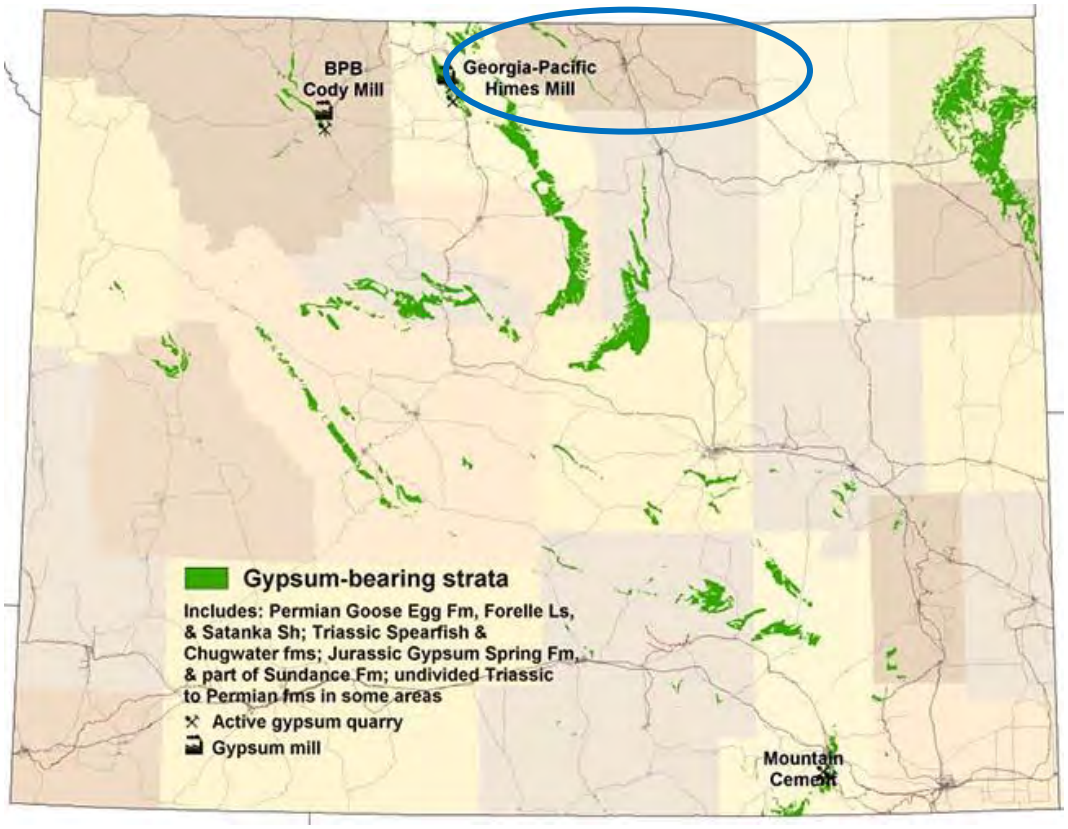
6.3.11 Mine and Land Subsidence

6.3.11.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

There are numerous abandoned mine sites with subsidence-prone underground workings in Sheridan County, especially areas close to Interstate 90 and other major highways. Mines across the county have been identified and there are mitigation projects designed to reduce the impacts from underground mining and subsidence, and to remove the threat they pose to the surrounding area. The unmitigated identified mines pose little to no threat to infrastructure in the surrounding area. Mine and general land subsidence events occur occasionally, and the degree of risk and impact varies based on the characteristics of each area. There have been events near the City of Sheridan, such as a fire at an underground coal mine in the Powder River Basin north of Sheridan. There has been property and infrastructure damage associated with coal-mine and general land subsidence in Sheridan communities too, but the dollar amounts of the damage are not readily available.

A layer of prehistoric rock known as the Triassic Spearfish Formation lies underneath part of Sheridan County. The formation is abundant with gypsum, a soluble mineral that dissolves as water infiltrates the ground. As the gypsum dissolves, caves form underground; sinkholes appear on the ground surface when the roof of an underground cave collapses. This type of landscape is referred to as “karst,” identified by the dissolution of layers of soluble minerals and bedrock. Karst landscapes may be marked by caves, sinkholes, cenotes, and other surface features. Figure 12 depicts known locations of gypsum-bearing strata in the State. Note the strands of gypsum in Sheridan County (circled in blue).

Figure 12 Gypsum-Bearing Strata in Wyoming



Source: Wyoming State Geological Survey, "Gypsum," accessed December 13, 2012.

The overall significance of this hazard is low across the County but does not largely vary between the jurisdictions. The voids created can be hazardous to humans, livestock and animals but within limited areas and not anticipated to have substantial effects on structures, populations, natural or cultural resources or variability across jurisdictions. Linear infrastructure in the unincorporated areas could be potentially vulnerable. Refer to Section 4.2.12 from the Base Plan for a more on the subsidence vulnerability assessment and location of abandoned mine sites, mine reclamation and abandonment programs, land subsidence information, and other details relevant to Sheridan County and Region 1.

6.3.11.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.12 Severe Winter Weather

6.3.12.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Winter storms are a yearly feature of the Wyoming climate and may occur anywhere in the state. Blizzard conditions bring the triple threat of heavy snowfall, strong winds, and low temperatures. Poor visibility and huge snowdrifts are major hazards caused by blowing snow. These storms disrupt work, make travel difficult or impossible, isolate communities, kill livestock by the hundreds or thousands, and sometimes leave human

fatalities in their wake. Higher elevation and mountainous areas tend to be more susceptible to severe winter weather events, however in Sheridan County there have only been $1,000 worth of reported property damage between 1996 and 2023. In this time period, 166 winter storm events took place (Source: NOAA's NCEI database.)

One of these events, which occurred in December of 2011, resulted in one reported fatality. According to the NCEI database, Icy roadways appeared to have played a role in a one-vehicle fatal crash two miles north of Ranchester on Interstate 90 in Sheridan County. According to Wyoming Highway Patrol, the victim died after being ejected from the vehicle she was in after the driver lost control of the car on the icy roadway.

The HMPCs reported that Interstate closures are common during winter storm events, which leads to the need to shelter stranded motorists, can create economic impacts, and can cause problems due to diverted semi-trucks on city and town streets. Access to rural homes can also become an issue, especially during prolonged storms; residents are encouraged to keep a 14-day supply of food, medication, and oxygen. Medically fragile persons and seniors can also be more vulnerable, especially during prolonged storms; residents are encouraged to keep a 3-day supply of food, medication, and oxygen. Impacts on livestock and wildlife are also a major concern. The Sheridan County HMPC reported that the county averages 73" of snowfall annually. Building collapses are common, especially during Fall and Spring snowstorms. In addition, ice jams pose a problem across the county; there was a major ice jam event near Dayton in 2016, for example. Winter storms do not have substantial impacts to natural or cultural resources.

Overall, this hazard is considered high significance in Sheridan County, and does not vary largely between jurisdictions. Refer to Section 4.2.13 of the Base Plan for more details, since winter storms and related weather are easier to describe regionally than on a county by county basis.

6.3.12.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.13 Tornado

Many documented tornadoes occurring in the counties in Region 1 are given low ratings on the Fujita Scale (F0s and F1s) simply because these tornadoes are often formed over open land and result in little or no damage. Sheridan County, however, has the least number of reported incidents of this kind from 1950-2023. The table below summarizes the tornado events in this time period:

Table 6-22 Tornado History in Sheridan County, 1950-2023

County	Total Incidents	Magnitude	Damage-Causing Incidents	Fatalities	Injuries	Property Damage	Crop Damage
Sheridan	10	F0-F1	5	0	0	$30,060	$0

Source: NOAA NCEI

6.3.13.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The overall significance is medium across all jurisdictions. Since 1950 there have been 10 recorded tornadoes, and of these events, there been no fatalities and relatively low

property and no crop damages. Region 1 tornado events are very small in terms of magnitude, with limited associated impacts, and the significance of this event does not largely vary across jurisdictions. There is not anticipated variation or specific vulnerabilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to tornado damage leading to periodic power outages. Refer to the map within the base plan for geospatially locations of NCEI-reported tornadoes across Wyoming Region 1.

6.3.13.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.14 Wildfire

Wildfire is considered a **high** significance hazard for Sheridan County. Sheridan County has seen the greatest number of acres burned in Region 1 by far, with a total of 439,595 acres burned in fires 1,000 acres in size or greater since 1980. The Tidwell Fire in 2017 was the largest, burning 90,957 acres. The fires affecting over 1,000 acres of land in the county are summarized on the table below.

Table 6-23 Wildfires over 1,000 acres in Sheridan County: 1980-2023

Name	Year	Acres Burned
Tidwell	2017	90,957
Buffalo Creek Ranch	2006	72,652
Brush Flat	2017	39,380
Buffalo Creek Complex	2006	37,416
Powder River Complex	2007	28,049
Waddle Creek	2021	25,634
Crow Res	1921	18,322
Bone Creek	2007	13,451
Buffalo Creek - Dooley	2006	11,981
Buffalo Creek - North Buffalo Creek	2006	11,002
Trailcreek	2007	9,843
Crater Ridge	2022	7,686
Little Horn II	2003	7,418
Border	2012	5,779
Bales	2015	5,724
Bales	2015	5,723
Black Mtn	1916	5,367
Buffalo Creek - Little Jacobs	2006	5,171
Thunderchild Cx	2001	4,800
Little Goose	2007	4,742
Pumpkin Creek	1970	4,598
Cottonwood One	2017	4,154
Cabin Creek Fire	2002	2,588
Little Tongue	1910	2,473
Lodge Grass Cr	1936	2,132
Whitmeyer Creek	2012	2,034
Mulldraw	2012	1,807

Name	Year	Acres Burned
Wolf Creek	1919	1,803
Buffalo Creek - Moore	2006	1,707
Sheep Creek	2015	1,656
Bonanza	1919	1,422
Half Ounce	1978	1,115
Seventy-Six	2020	1,008
TOTAL		**439,595**

Source: National Incident Feature Service (NIFS)

6.3.14.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

There have been no catastrophic urban fires documented in Sheridan County although large wildland fires become increasingly damaging as the population expands into the more rural areas. The method utilized for estimating potential future impact is to determine the value of structures that are located within Wildfire Risk Areas, or wildland fire building exposure values. Wildland fire building exposure value is the value of buildings that can be potentially damaged by wildland fire in an area. Building exposure values are based on assessor data. The methodology utilized is like that used to model flood exposure described in the flood chapter.

Table 6-24 summarizes the building counts, property value, and estimated population exposed to medium, high, or highest wildfire risk areas throughout Sheridan County. There are an estimated 3,439 improved parcels exposed to medium or higher wildfire risk areas, with a total exposure estimated at $1.7 billion in property value. Approximately $1.1 billion of this total located in the unincorporated areas of the county. An estimated 6,913 people in Sheridan County reside in these areas of medium wildfire risk or higher as well. Sheridan County has the second highest number of vulnerable residents and total exposed property value in Region 1. Vulnerable populations may include school-aged children and elderly populations, or those that may not have resources to evacuate. Refer to Section 4.2.15 of the HIRA for details on vulnerable critical facilities in Sheridan County.

Figure 13 through Figure 19 below display the areas of greatest wildfire risk, according to WYWRAP data, for the county and the City of Sheridan, and Towns of Clearmont, Dayton, and Ranchester, respectively. Generally, the areas of highest risk are concentrated in and around the municipalities of Sheridan County, with large pockets of high to highest wildfire risk dotted throughout the county. Extensive areas of medium wildfire risk are also spread throughout central Sheridan County. Figure 14 also displays the risk to WUI areas in Sheridan County, and Figure 15 illustrates the extent of areas burned by wildfire in the county from 1980 to 2023.

Table 6-24 Sheridan County Parcels and Population Exposure within Medium, High, and Highest Wildfire Risk Area

Jurisdiction	Parcel Count Highest	Parcel Count High	Parcel Count Medium	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Clearmont	36	-	-	**36**	$3,840,575	$1,988,041	$5,828,616	77
Dayton	169	59	15	**243**	$56,020,345	$28,722,525	$84,742,870	519
Ranchester	172	14	3	**189**	$41,923,489	$22,240,350	$64,163,839	396
Sheridan	246	191	166	**603**	$239,152,785	$156,506,231	$395,659,016	1,107
Sheridan Unincorporated	489	1,101	778	**2,368**	$728,541,894	$381,353,632	$1,109,895,526	4,813
Total	**1,112**	**1,365**	**962**	**3,439**	**$1,069,479,088**	**$590,810,778**	**$1,660,289,866**	**6,913**

Source: WYWRAP, Wyoming CAMA2022, WSP GIS Analysis

Figure 13 Sheridan County Wildfire Risk

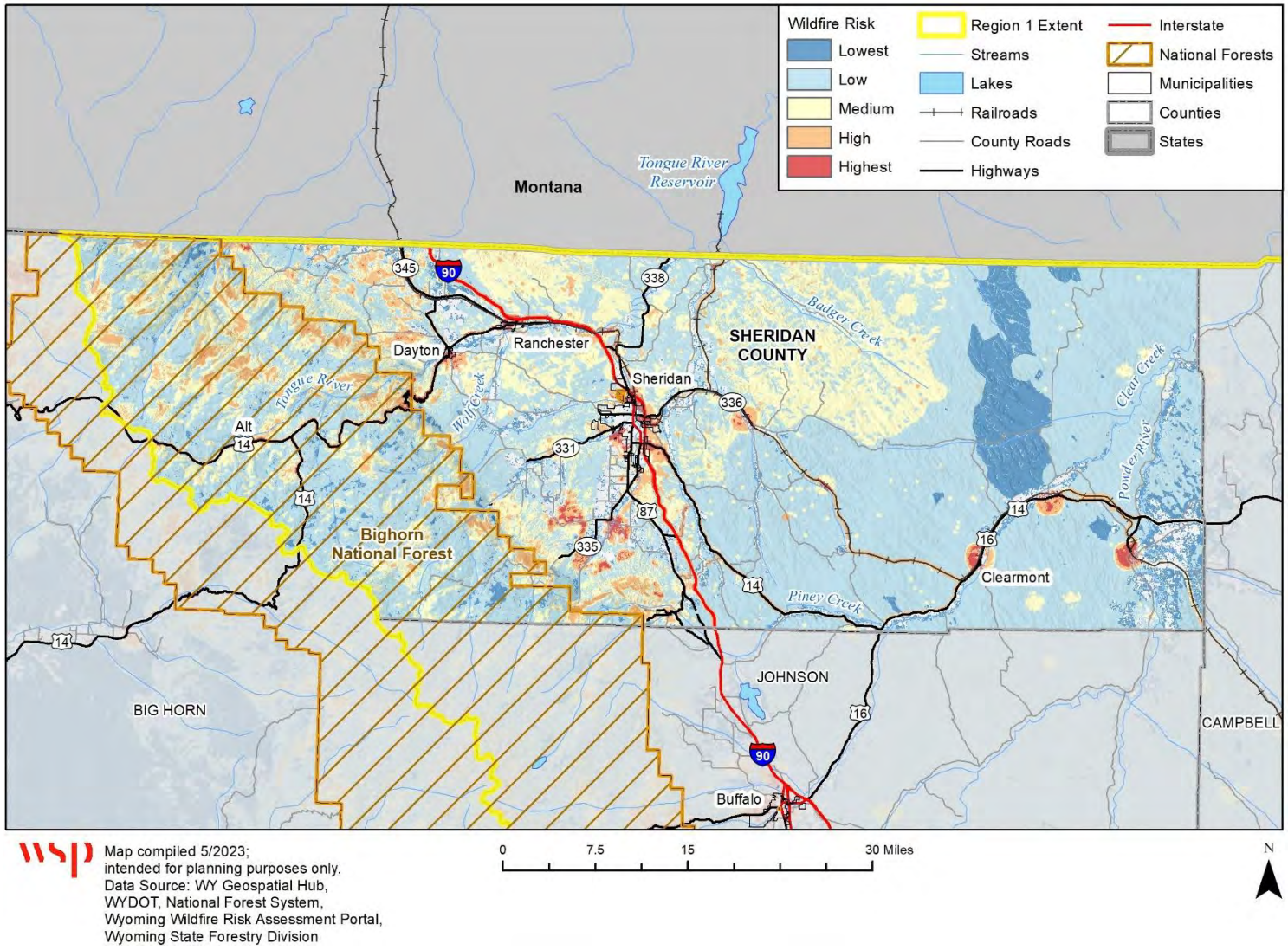


Figure 14 Sheridan County WUI Risk

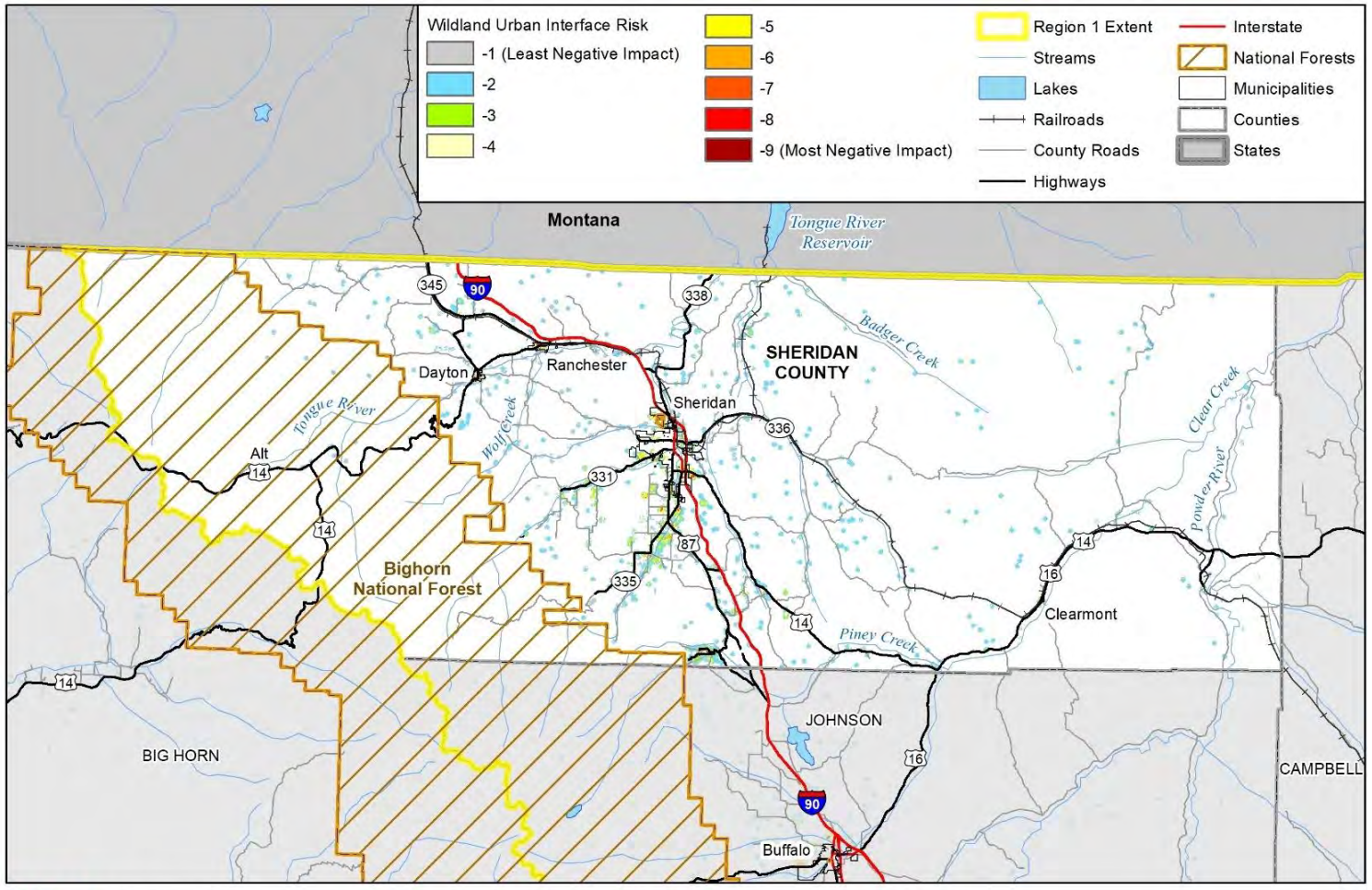


Figure 15 Sheridan County Wildfire History

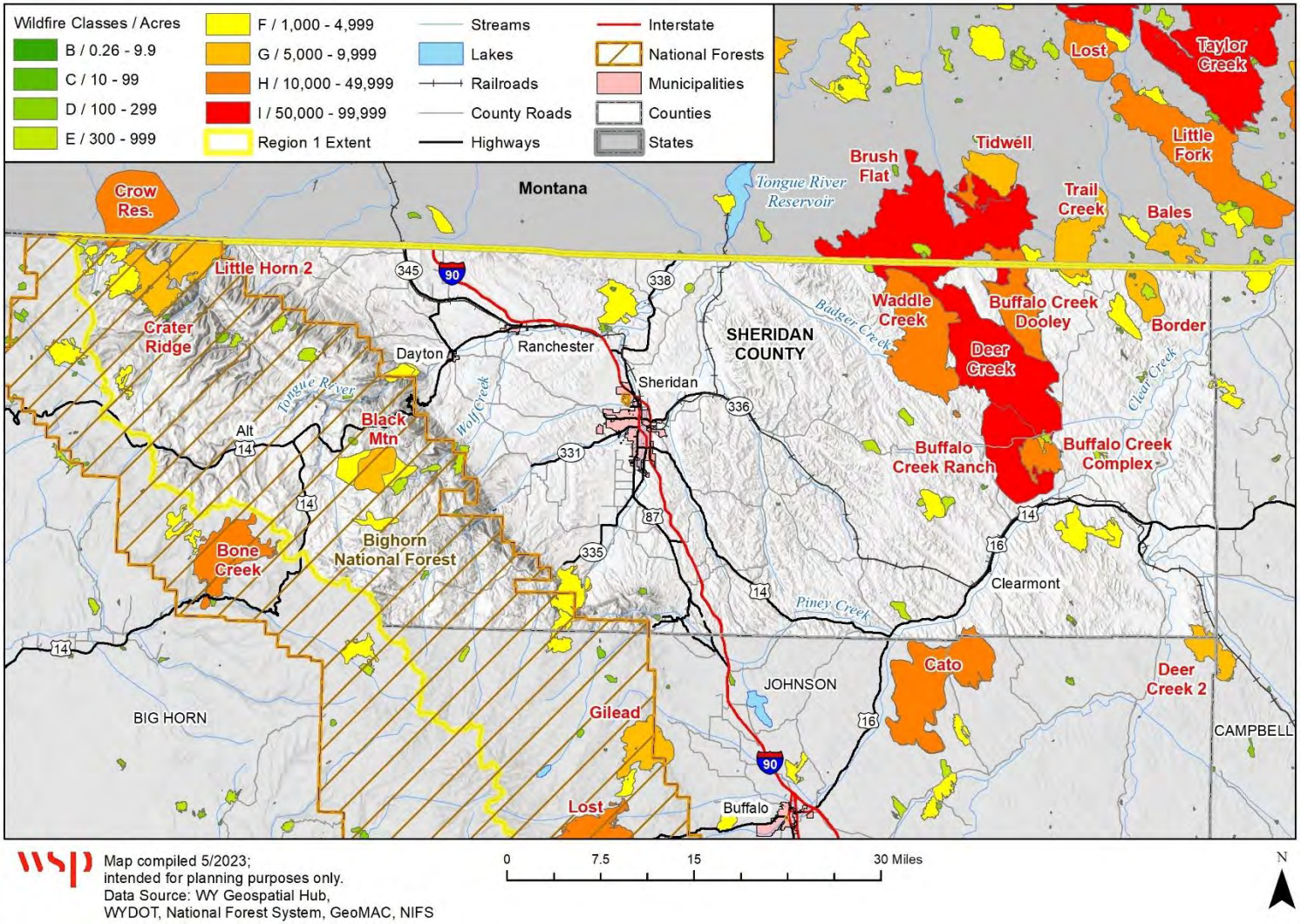


Figure 16 City of Sheridan Wildfire Risk

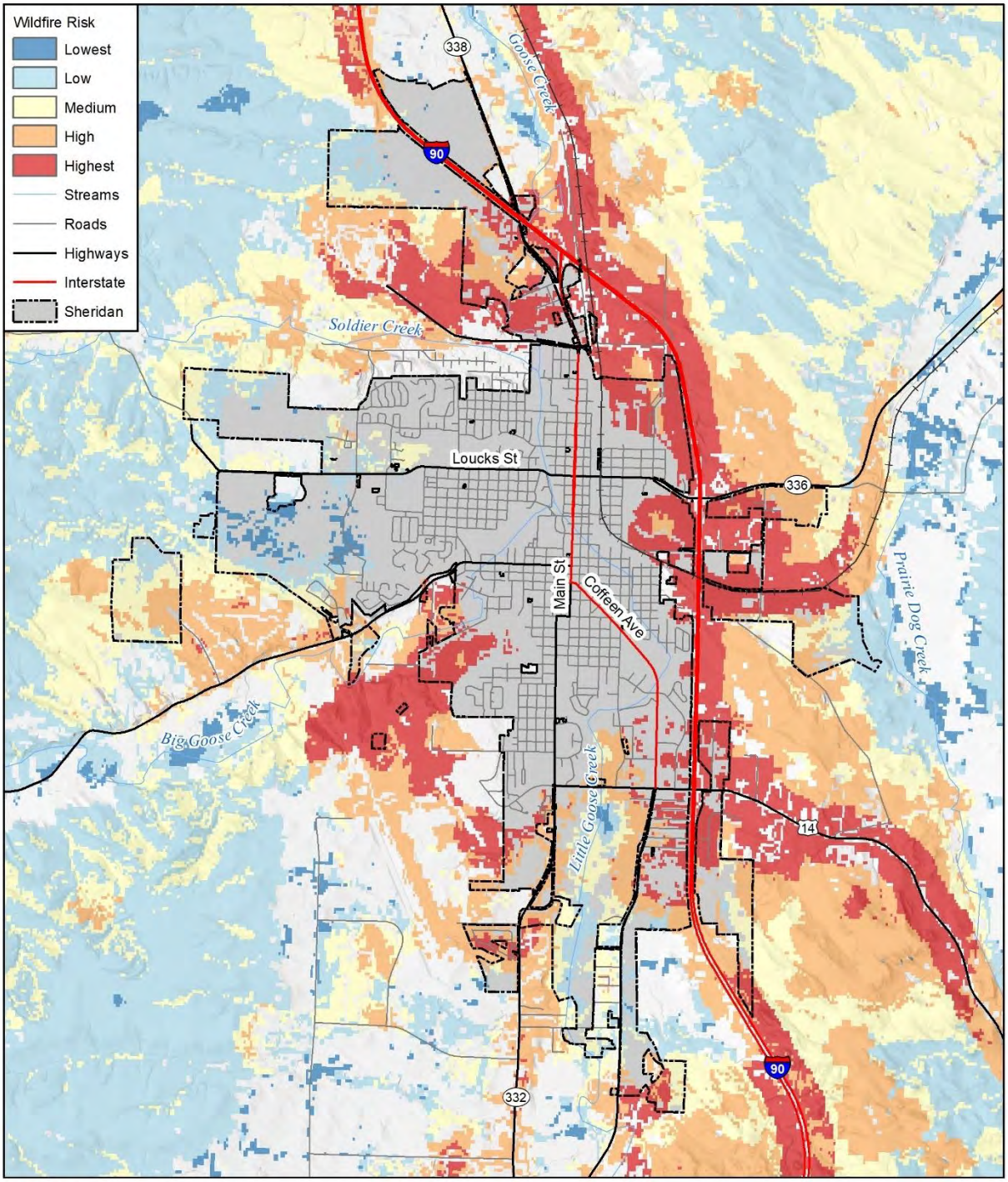
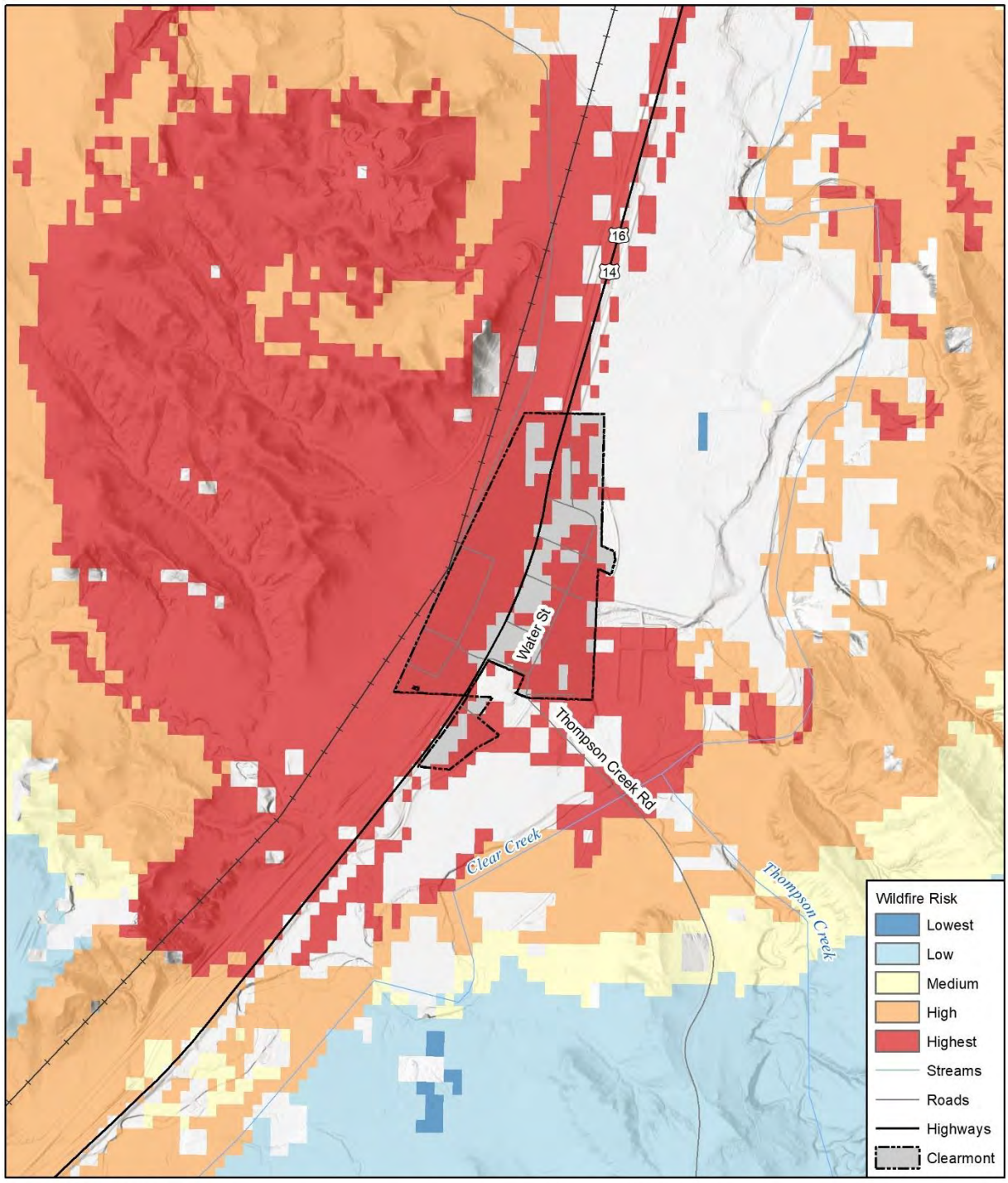


Figure 17 Town of Clearmont Wildfire Risk



Map compiled 5/2023;
intended for planning purposes only.
Data Source: WY Geospatial Hub,
WYDOT, National Forest System,
Wyoming Wildfire Risk Assessment Portal,
Wyoming State Forestry Division

Figure 18 Town of Dayton Wildfire Risk

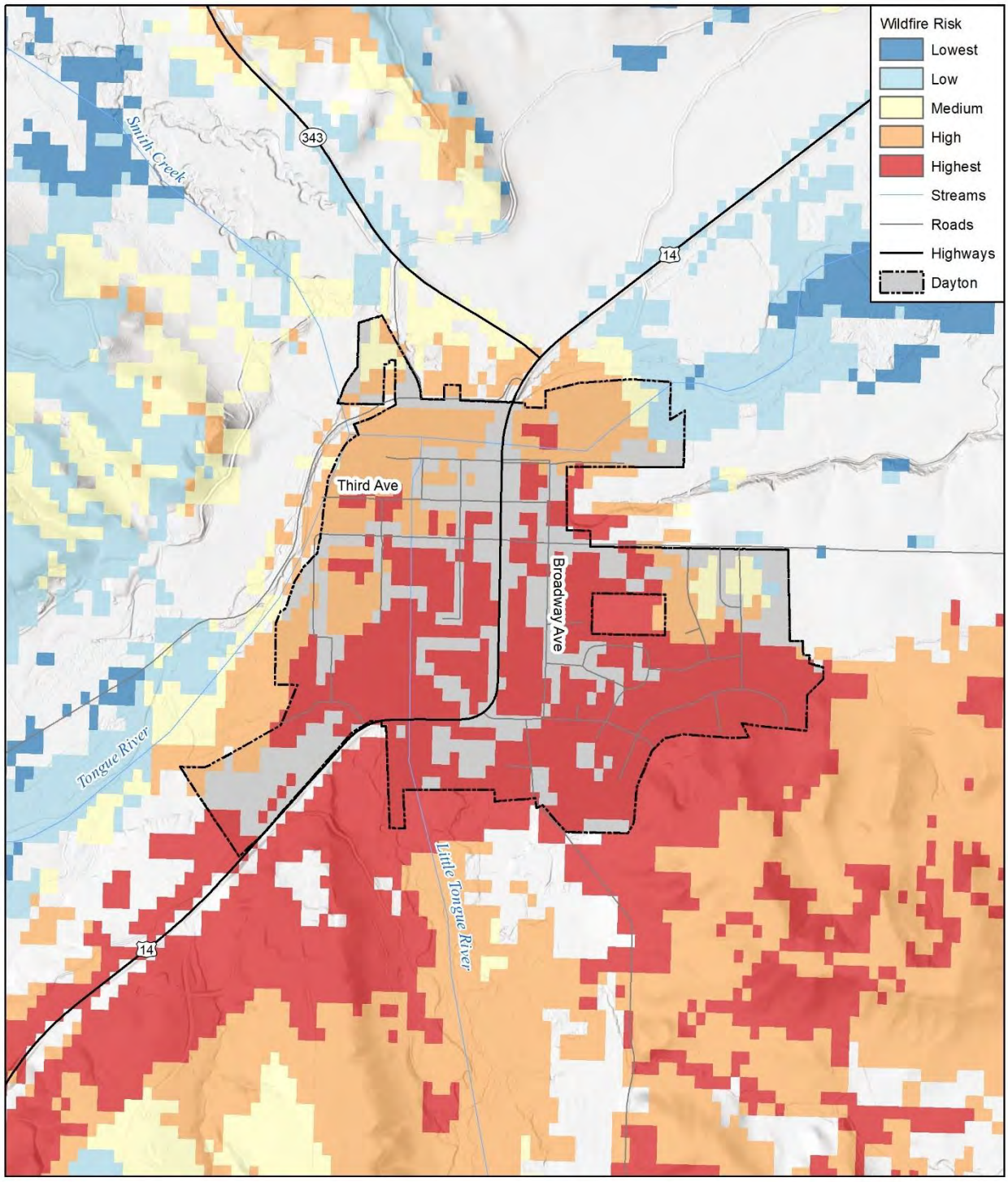
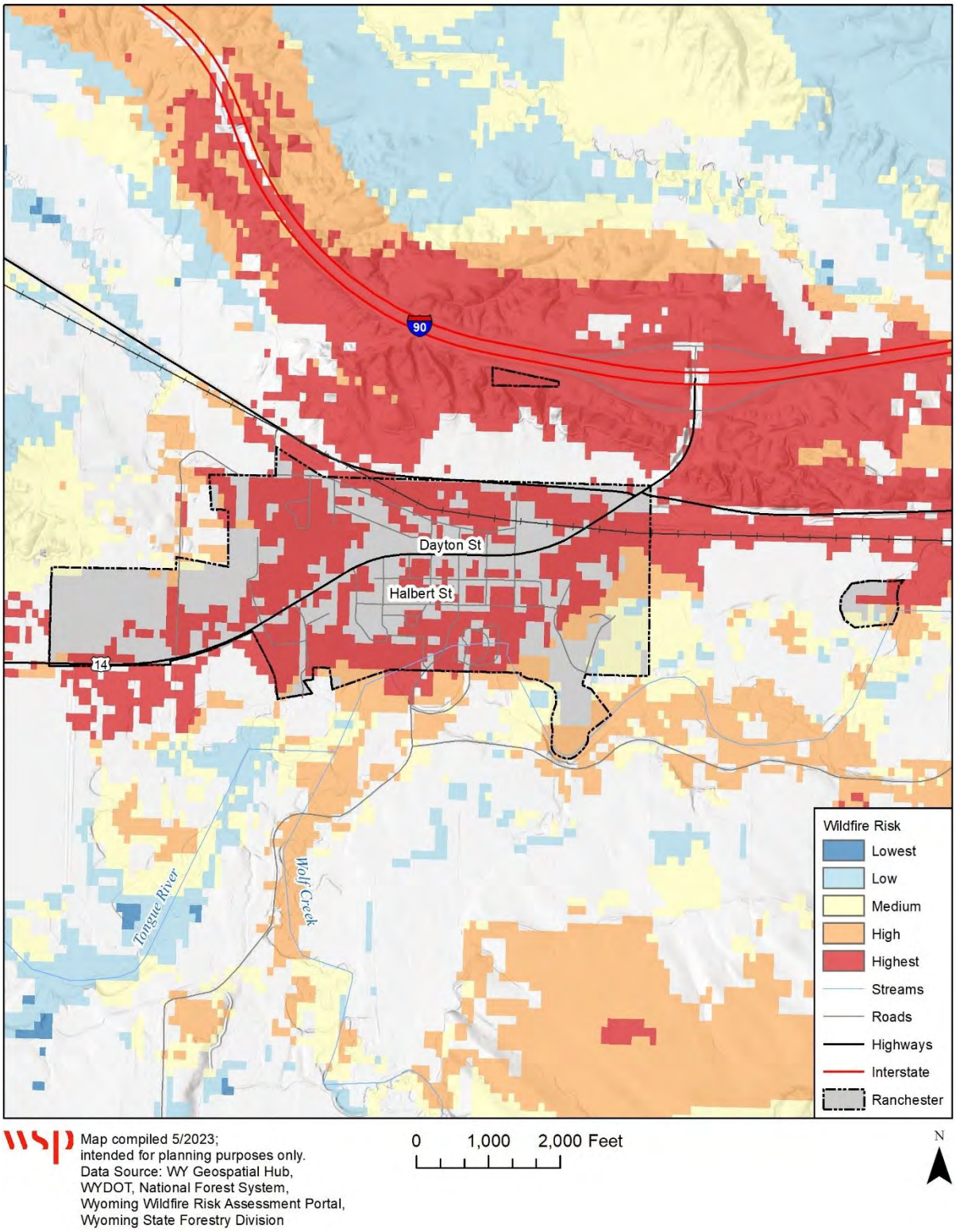


Figure 19 Town of Ranchester Wildfire Risk



Refer to Section 4.2.15 of the HIRA for details on vulnerable critical facilities in Sheridan County. Overall 148 critical facilities were identified in medium (42), high (55) and highest (51) wildfire risk areas respectively. The lifelines in areas of highest risk include communications (7), energy

(6), health and medical (1) and safety/security (10) and transportation (17) based on the GIS overlay analysis. A more site-specific analysis would be needed to further refine risk.

6.3.14.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Modest growth in unincorporated areas could result in more WUI structures.

6.3.15 Coal Seam Fire

Sheridan County has experienced numerous incidents involving coal seam fires. These slow-burning underground fires can be caused by numerous ignition sources, including the pyrophoric properties of coal (spontaneous ignition after prolonged exposure to oxygen), wildfires, and lightning; they are particularly prevalent during periods of drought. In 2013, E.L. Heffern compiled a list of the locations of known coal seam fires and clinker, the solid, fused mass of incombustible residue that forms during the combustion of coal. A summary of these results as they relate to Sheridan County is summarized in Table 6-25 below.

Table 6-25 Known Coal Seam Fires in Sheridan County

Fire Name	Size	Start Date (est.)	Status
Leiter	200' x 600'	before 1859	Active
Old Monarch Mine	40 acres	after 1910	Unknown
Hotchkiss Mine	73 acres mined; 5 ac active	after 1920	Active
Carney/Kleenburn Mines	475 acres mined; 1 ac active	after 1924	Active
Acme No. 1 Mine	870 acres mined; 25 ac active	since at least 1940	Active
SHER0027	1 acre	at least since early 1960s	Active
Plachek Mine	2 highwall fires; 1 ac active	after 1963; flared in 2005	Active
Welch Ranch (Acme 1N)	13 acres	since at least 2001	Active
Carney Slack	250' x 130' x 5' slack pile	July 2006	Reclaimed
Ankney Ranch	3.4 acres	within past two decades	Active
Belus Mine SHER1009	unknown	unknown	Extinguished
Big Horn Mine SHER0026	50 acres	unknown	Active
Coal Bank - PG Ranch	400' x 200'	unknown	Active

Source: https://mbmg.mtech.edu/pdf-publications/gm64-PRBcoalfires.xls

6.3.15.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Sheridan County and the participating jurisdictions ranked this hazard as low significance due to the location of coal seams and historic burn areas. The primary concern is the potential to spark wildfires/grass fires. The combustion of coal produces toxic gases which can contribute to poor air quality and pose health risks to nearby communities. The smoke and particulate matter emitted by the fires can also cause respiratory issues and exacerbate existing respiratory conditions. Those with respiratory issues could be more vulnerable. The runoff from coal seam fires can contaminate nearby water sources with pollutants and harmful substances. The leaching of chemicals from the burning coal and the ash can enter streams,

rivers, and groundwater, potentially affecting aquatic life and human water supplies. No issues with cultural resources have been identified.

6.3.15.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

7 Mitigation Capabilities Assessment

As part of the regional plan development, Region 1 and participating jurisdictions developed a mitigation capability assessment. Capabilities are those plans, policies and procedures that are currently in place and contribute to reducing hazard losses. Capabilities also include staffing and financial considerations, including the ability to leverage funding for mitigation projects. Combining the risk assessment with the mitigation capability assessment results in "net vulnerability" to disasters and more accurately focuses the goals, objectives, and proposed actions of this plan. The purpose of this effort was to identify policies and programs that were either in place or could be undertaken, if appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, projects, and programs to determine if they contribute to reducing hazard related losses. Opportunities to expand or improve upon these capabilities were considered during the development of the Regional Plan in 2023 and noted in the mitigation strategy where applicable.

7.1 Capability Summary

Table 7-1 Sheridan County Capability Assessment

Element	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan School District 3
Planning Capabilities						
Comprehensive Plan	Yes – 2020	No – County Plan	Yes – 2016	No	Yes – 2017	No
Capital Improvement Plan	Yes	No – County Plan	Yes	Yes – 1/14	Yes	Yes
Emergency Operations Plan	Yes – 2016	Yes – County Plan	Yes – County Plan	Yes – 1/17	Yes – 2017 ERM + Co. Pan	Yes
Recovery Plan	No	No – County Plan	No	No	No	No
Mitigation Plan	Yes	Yes – County Plan	Yes – County Plan	Yes – County Plan	Yes – County Plan	Yes – County Plan
Debris Management Plan	No	No – County Plan	Yes. Town provides service	Yes. Town provides service	Yes, City provides service	No
Economic Development Plan	Yes – 2015	No – County Plan	Yes	Yes – 2/2009	Yes	No
Transportation Plan	Yes – 2008	No – County Plan	No	No	Yes	Yes

Element	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan School District 3
Land-use Plan	Yes – 2020	No – County Plan	Yes	Yes – 1998. Zoning	Yes	Yes
Flood Mitigation Assistance (FMA) Plan	No	No – County Plan	No	No	Yes	No
Watershed Plan	Yes – 2015	No – County Plan	No	No	Follow Co. Plan	No
Community Wildfire Protection Plan or other fire mitigation plan	Yes – 2009	No – County Plan	No	No	Follow Co. Plan	No
Critical Facilities Plan (Mitigation/ Response/ Recovery)	N/A	No – County Plan	Yes	Yes – 1/17. Response	Yes, in the ERM + internal handbook	No
Floodplain Management Plan	No	No	No	No	No	No
Stormwater Program/Plan/ Ordinance	No	No	No	No	Yes – Sheridan Storm Drainage Design Criteria, 2006	No
Erosion / Sediment Control Program	No	No	No	No	Yes – Sheridan Storm Drainage Design Criteria, 2006	No
Policies/Ordinance						
Zoning Ordinance	Yes – 2017	Yes	Yes	Yes	Yes	N/A
Building Code	IBC 2021	107 – 2014	No	Version 1997 UBC. Fire, electrical, plumbing codes	Building permit system in place	N/A
Floodplain Ordinance	12/17/2013	1/13/2014	Yes	1/2014	Yes	N/A
Subdivision Ordinance	7/12/2023	No	Yes	Yes	Yes	N/A
Tree Trimming Ordinance	No	No	No	No	Yes	N/A
Nuisance Ordinance	No	No	Yes	Yes	Yes	N/A
Storm Water Ordinance	No	No	Have a water/ wastewater department	No	Yes	N/A

Element	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan School District 3
Drainage Ordinance	No	No	No	Yes	Yes	N/A
Site Plan Review Requirements	Yes	No	Yes	Yes	Yes	N/A
Historic Preservation Ordinance	No	No	No	No	Yes – rail and national/state	N/A
Landscape Ordinance	No	No	No	Yes	In primary corridors only	N/A
Growth Management Ordinance	No	No	No	No	No	N/A
Elevation Certificates for Floodplain Development	Yes	No	No	No	No	N/A
Other Hazard Ordinance (Steep slope, wildfire, snow loads, etc)	Yes – Steep Slopes, Stream Setbacks, Landslides	No	No	No	No	N/A
Program						
Zoning/Land-use Restrictions	Yes	No	Yes	Yes	Yes	N/A
Codes Building Site/Design	Yes	No	No	Yes	Yes	N/A
Hazard Awareness Program	Yes – fuels reduction and hazard awareness	No	No	No	Tier 2 reports	N/A
National Flood Insurance Program	Yes	Yes	Yes	Yes	Yes	N/A
Community Rating System (CRS)	No	No	Yes	Yes	No	N/A
National Weather Service (NWS) Storm Ready Certification	Yes	No	No	No	Yes	N/A
Firewise Community Certification	Yes	No	No	No	No	N/A
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	Yes	N/A
ISO Fire Rating		9	pending	5	3	N/A
Economic Development Program	Yes	No	No	No	Yes - SEEDA	N/A
Land-use Program	Yes	No	No	No	Yes - SCLT	N/A

Element	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan School District 3
Public Education/ Awareness	No	No	No	Yes	Yes	Yes
Property Acquisition	No	No	No	No	Yes	Yes
Planning/ Zoning Boards	Yes	No	Yes	Yes	Yes	N/A
Stream Maintenance Program	Yes	No	No	No	Yes	N/A
Tree Trimming Program	County trims tree in county ROWs	No	No	No	Yes	N/A
Engineering Studies for Streams (Local)	No	No	No	Yes	Yes	N/A
Mutual Aid Agreements	WOHS & WAHA, Co/Fire Districts Mutual Aid agreements	No	Yes	Yes	Yes	Yes
Studies/Reports/Maps						
Flood Insurance Rate Maps (FIRM)	Yes – 1/16/14	Yes – 1/16/14	Yes – 1/16/14	Yes. 1/16/14	Yes – 1/16/14	No
Hazard Analysis/Risk Assessment	Yes, in HMP, THIRA	Yes, in HMP	Yes, in HMP	Yes, in HMP	Yes, in HMP	Yes
Evacuation Route Map	Yes – in EOP	No	No	No	No	Yes
Critical Facilities Inventory	No - Virtually all CIKRs are private sector; SAWS water system is a joint powers board between city and county. City manages that operation.	No	No	No	Yes- ERM	Yes

Element	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan School District 3
Vulnerable Population Inventory	Yes	No	No	N/A	Yes	No
Land-use Map	Yes	Yes	Yes	Yes	Land Use Plan in place - 2017	Yes

Source: Data provided by jurisdictions

7.1.1 Land Use and Development Policies

Sheridan County's approach to building regulations includes zoning and building codes with review by a County Planning and Zoning Commission. The municipalities have adopted building codes with the exception of Dayton; Sheridan does not have a building code but has a permit system in place. All entities have a floodplain ordinance to manage and reduce flood risk to future and existing development. The county has a Comprehensive/ Land Use Plan that was updated in 2020. The Sheridan County Comprehensive Plan is a guide used by the Board of County Commissioners, County Planning and Zoning Commission, and local government staff during the decision-making process when considering capital improvements, zone changes and other land use determinations.

7.1.2 NFIP Participation and Continued Compliance

The National Flood Insurance Program (NFIP) Community Status Book outlines participation and flood map status for counties and jurisdictions across the country. Sheridan County and all of the municipalities are mapped and participate in the NFIP.

Table 7-2 NFIP Status in Sheridan County

Jurisdiction	Effective Map Status	Date Joined	Comments
Sheridan County	01/16/14	08/01/86	AE Zones on portions of Goose Creeks above Sheridan
Town of Clearmont	01/16/14	02/10/14	
Town of Dayton	01/16/14	08/1/08	No elevation determined – all zone A, C, X
Town of Ranchester	01/16/14	04/15/88	
City of Sheridan	01/16/14	09/01/78	

Source: NFIP Community Status Book

As participants since 1978 or later, the county and its jurisdictions continue to comply with the NFIP to reduce flood losses and increase flood resiliency. Continued compliance with the NFIP includes continuing to adopt floodplain maps when updated as well as implementing, maintaining and updating floodplain ordinances. Actions related to continued compliance are summarized below:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- floodplain management ordinances and rules;

- **Implementation of substantial improvement/substantial damage provisions**. After a flood event, or any event that may cause loss of a structure such as a fire or tornado, it is the role of the floodplain administrator to review and assess damaged structures located within the Special Flood Hazard Area. Substantial improvement/substantial damage occurs when the cost of restoring a structure exceeds 50 percent of its market value before damage occurred. Property owners are advised that structures experiencing substantial damage or undergoing substantial improvements must go through the floodplain application and permit process. Additionally, these structures must be upgraded during the repair or reconstruction process to meet the minimum building standards stipulated in the regulations. If it is determined substantial improvement/substantial damage has occurred, those structures must be brought up to current floodplain management standards. This ensures compliance with floodplain management measures and contributes to the overall safety and resilience of the affected structures. These provisions are common to the County, the Town of Clearmont, Town of Dayton, Town of Ranchester, and the City of Sheridan, floodplain management ordinances. Additional items specific to these jurisdictions include:
    - County: The County Engineer as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions. Prohibits substantial improvements in floodways.
    - Dayton: The Building Permit Administrator as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions.
    - Ranchester: The Building Inspector as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/ substantial damage provisions.
    - Sheridan: The City Engineer as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/substantial damage provisions. Prohibits substantial improvements in floodways.
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

Also, to be considered are the flood mitigation actions contained in this annex to support the ongoing efforts by participating counties to minimize the risk and vulnerability of communities to flood hazards, and to enhance their overall floodplain management programs.

7.2 Administrative/Technical Resources

The following table identifies the County and participating jurisdictions' personnel responsible for activities related to mitigation and loss prevention in Sheridan County.

Table 7-3 Sheridan County Administrative/Technical Resources

Administrative/ Technical Resources	County	Clearmont	Dayton	Rancheste r	City of Sheridan	Sheridan School District #3
Building Code Official	Yes	No	No	Yes	Yes	No
Building Inspector	Yes	Yes	No	Yes	Yes	No
Mapping Specialist (GIS)	Yes	No	Yes – GIS capabili ties	No	Have GIS capabiliti es under City Engineer ing Departm ent	No
Engineer	Yes	No	No	Yes	Yes	Yes
Development Planner	Yes	No	No	Yes	Yes	No
Public Works Official	Yes	Yes	Have a Mainten ance depart ment	Yes	Yes	No
Emergency Management Coordinator	Yes	No		No	No (County only)	Yes
NFIP Floodplain Administrator	Yes – Public Works county engineer	No	Yes - Admini stration/ Buildin g permit Admini strator	Yes – town engineer	Yes – Public Works city engineer	No
Bomb and/or Arson Squad	Not a resident resource; available from adjoining jurisdictio n(s) via mutual aid	No	No	No	Arson only	No
Emergency Response Team	Not a resident resource; available from adjoining jurisdictio n(s) via mutual aid	No	No	No	Yes	No
Hazardous Materials Expert	Not a resident resource; available from	No	No	No	Yes	No

Administrative/ Technical Resources	County	Clearmont	Dayton	Rancheste r	City of Sheridan	Sheridan School District #3
	adjoining jurisdictio n(s) via mutual aid					
Local Emergency Planning Committee	Yes	Yes	Yes	Yes	Yes	Yes
Sanitation Department	No	Yes	Yes	Yes	Yes	No
Transportation Department	Yes- County Road & Bridge Departme nt	No	No	Yes	Yes	Yes
Economic Development Department	Yes	No	No	Yes	Yes - SEEDA	No
Housing Department	No	No	No	N/A	Yes - Planning	No
Historic Preservation	No	No	No	N/A	No	No
Planning Board / Commission						No
Warning Systems / Services (Flood)						No
Warning Systems / Services (Other/multi hazard)						No
Grant Writing/ Management						No
Non-Governmental Organizations (NGOs)						
American Red Cross	No - Chapter is in Gillette	No	No	No	No	No
Salvation Army	Yes	No	No	Yes	Yes	Yes
Veterans Groups	Yes	No	No	No	Yes	No
Local Environmental Organization	Yes	No	No	No	Yes, DEQ	No
Homeowner Associations	Yes	No	Yes	Yes	Yes	No
Neighborhood Associations	Yes - Commun ity or topic- specific associatio ns	No	No	No	Yes	No
Chamber of Commerce	Yes	No	Yes	Yes	Yes	No
Community Organizations (Lions, Kiwanis, etc.)	Yes	No	Yes	Yes	Yes	No

7.3 Financial Capabilities

Table 7-4Table identifies the County and Town financial resources or tools that the jurisdictions have access to or are eligible to use and could potentially be used to help fund mitigation activities.

Table 7-4 Sheridan County Jurisdiction Financial Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)						Has This Been Used for Mitigation in the Past?
	County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan County SD #3	
Apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes	No	
Fund projects through Capital Improvements funding	Yes	Yes	Yes	Yes	Yes	Yes	
Authority to levy taxes for specific purposes	Yes	Yes	Yes	Yes	Yes	No	
Fees for water, sewer, gas, or electric services	Yes - Sheridan Area Water Supply joint powers board	Yes	Yes	Yes	Yes	No	
Impact fees for new development	Yes	Yes	Yes	Yes	Yes	No	
Incur debt through general obligation bonds	Yes	Yes	No	Yes	Yes	No	
Incur debt through special tax bonds	Yes	Yes	No	Yes	Yes	No	
Incur debt through private activities	No	Yes	No	No	No	No	
Withhold spending in hazard prone areas	No	Yes	No	Yes	No	No	

Financial Resources	Accessible/Eligible to Use (Yes/No)						Has This Been Used for Mitigation in the Past?
FEMA Hazard Mitigation Assistance Grants	Yes	Yes	Yes	Yes	Yes	No	Yes- County
Other							

The County has received FEMA Hazard Mitigation Grant Program funding for infrastructure protective measures (roads and bridges for a 2011 federal Disaster (DR-4007-0009-R) according to FEMA's OpenData website.

7.4 Education and Outreach Capabilities

Table shows the mitigation education and outreach capabilities the County and jurisdictions have in place now.

Table 7-5 Sheridan County Education and Outreach

Education & Outreach	Yes/No (And Briefly Describe)					
	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan County SD #3
Public Education /Outreach Program	Yes – EM attends numerous public events to provide outreach and education	No	No	No	No	No
Citizen Groups That Communicate Hazard Risks	Sheridan LEPC	No	No	No	No	No
Firewise	Yes – Firewise is active and attend community events around Sheridan County each year	No	No	No	No	No
StormReady	No	No	No	No	No	No
Other?	No	No	No	No	No	No

7.5 Opportunities for Enhancements

Based on the capabilities assessment, Sheridan County and the municipalities have several existing mechanisms in place that already help to mitigate hazards. There are also opportunities for the jurisdictions to expand or improve on their policies, programs and fiscal capabilities and further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and WOHS. Additional training opportunities will help to inform County and municipal staff members on how best to integrate hazard information and mitigation projects into their departments. Continuing to train staff on mitigation and the hazards that pose a risk to the County will lead to more informed staff members who can better communicate this information to the public.

Sheridan County

- Consider developing a Recovery Plan
- Consider updating the County 2009 CWPP
- Pursue all avenues to improve floodplain mapping

Town of Clearmont

- Adopt a Comprehensive Plan
- Consider implementing a community outreach program to educate residents about winter storm safety, weather-resistant building materials, wildfire risk mitigation strategies, and other emergency or disaster information.

Town of Dayton

- Consider adopting Building Codes

Town of Ranchester

- Adopt a Comprehensive Plan
- Develop a Recovery Plan

City of Sheridan

- Consider joining the NFIP Community Rating System (CRS) to lower the cost of flood insurance
- Explore adopting/updating building code regulations that would increase the resiliency of structures to damage from high wind, hail, and heavy snow loads.

Sheridan School District #3

- Construct community storm shelters at school facilities
- Develop hazard awareness education program for students and faculty

8 Mitigation Strategy

This section describes the mitigation strategy and mitigation action plan for Sheridan County. See Chapter 5 of the Base Plan for more details on the process used to develop and update the mitigation strategy.

8.1 Mitigation Goals

Sheridan County identified four main goals to guide the development of the Hazard Mitigation Strategy in prior iterations of the regional plan. As part of the 2023 planning process, Sheridan County reviewed these four goals, which provide a guide to help protect people and property in Sheridan County from natural and human-caused disasters. During the 2023 planning process the HMPC retained these goals for the 2023 plan. The goals are as follows:

- Goal 1: Mitigate the effects of hazards through education, ordinances, resolutions, and clear definition and implementation of mitigation projects to reduce the loss of property and enhance life-safety.
- Goal 2: Coordinate mitigation activities with all entities and stakeholders of Sheridan County to assess the hazards and take various actions to reduce or eliminate the risk factors of those hazards.
- Goal 3: Reduce the economic impact on the local economy caused by the effects of hazards in the communities.
- Goal 4: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

8.2 Mitigation Actions

This section provides updates on the actions identified in the 2018 Wyoming Region 1 Hazard Mitigation Plan, along with new actions identified during the 2023 Regional Plan update.

8.2.1 Progress on 2018 Actions

During the 2023 planning process the Sheridan County Planning Team reviewed all the mitigation actions from the 2018 plan. Of the 30 mitigation actions from 2018, 21 of the county actions are continuing or are implemented annually, demonstrating ongoing progress towards building the community's resiliency to disasters. These continuing actions are detailed in Table 8-2.

Nine (9) actions have been completed since 2018, which are detailed in Table 8-1 below, indicating there has been steady progress with the plan implementation towards meeting hazard mitigation goals. One duplicative action was deleted.

Table 8-1 Completed and Deleted Mitigation Actions

Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
Powder River stream stabilization	Floods	Sheridan County	Medium	Completed. Road work fixed. EAP completed.
Clear Creek – stream stabilization	Floods	Sheridan County, Clearmont	Low	Completed.
North Sheridan Interchange	Floods	City of Sheridan	Medium	Completed.
Loucks Street and Utility Project	Floods	City of Sheridan	Medium	Completed.
West Downtown Phase IV	Floods	City of Sheridan	Medium	Completed.
Commodity Flow Study and multiple projects identified at the State-Level	Hazardous Materials	County-wide	High	Completed in 2022.

Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
Tongue River Canyon Road Stream Stabilization - continuation. Tongue River Canyon Road – prepare a river bank/roadway bank stabilization project just upstream from where the shoulder washout is currently. As the river makes the big bend alongside the road in this area (local favorite fishing hole), a slope rebuild and bank stabilization project could be done here.	Flood	Sheridan County	Medium	Completed.
Commodity flow study. Commodity flow study to understand types of materials being transported through county.	Haz-mat	Sheridan County	High	Completed in 2022.
Lewis Street/Jr. High landslide mitigation. Lewis Street/Jr. High landslide mitigation engineering strategies	Geohazards: landslide, expansive soils, earthquake, subsidence	City of Sheridan	Low	Completed.
Weather Spotter Training	Hail	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan	High	Deleted as this action is covered by other continuing actions related to Weather Spotter Training

8.2.2 Identification and Implementation of Mitigation Measures

During the 2023 Regional Plan development, existing mitigation projects for Sheridan County were assessed to determine whether the action was completed, deleted, or ongoing/ continued. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources. The action plans were also shared amongst the regional plan participants to showcase progress and stimulate ideas amongst the respective planning committees in each county. The HMPC's evaluation of action items and goals also lead to the development of new strategies.

Table 8-2 details all continuing and new mitigation actions for the 2023 regional plan. Sheridan County has developed 10 new mitigation actions in 2023 to accompany the 21 continuing mitigation actions from 2018, for a total of 30 mitigation actions.

Background information as well as information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and timeline also are described. Per the DMA requirement, actions have been identified that address reducing losses to existing development as well as future development.

The Cost Estimate column describes the estimated project costs using the following categories:

- Little to no cost
- Low: Less than $10,000
- Moderate: $10,000-$100,000
- High: $100,000-$1,000,000
- Very High: More than $1,000,000

The Timeline column describes the estimated time of completion for each project using the following categories:

- Short Term: 1-2 years
- Medium Term: 3-5 years
- Long Term: 5+ years
- Ongoing: action is implemented every year

The Status/Implementation Notes column describes the progress made on the actions so far using the following categories:

- Not Started: project is carried over from the previous Sheridan County Plan; little to no work has been completed.
- In Progress: project is carried over from the previous Sheridan County Plan; work has begun on the project and is proceeding.
- Annual: project is carried over from the previous Sheridan County Plan and is implemented every year on an ongoing basis.
- New in 2023: The action is new to this plan update; little to no work has been completed.

Table 8-2 Mitigation Action Plan

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
S-1	Winter storm and hazardous weather awareness and warning. Pre-season meetings. Original (2014 plan) description encouraged individuals and business to obtain NOAA weather radios. There was a DHS grant program which furnished radios, at no costs, to eligible recipients; that program has long since expired. Social media and smart phones/smart phone apps have superseded or supplemented conventional news media driven weather alerts. SC Emergency Mgt. Coordinator will continue to expand use of social media and outreach to media outlets, as warranted, to increase awareness of hazardous weather and conditions.	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	**County Emergency Management Coordinator**, local government administration, school district administration	Ongoing	Low; funding from county and state. EMPG with free FEMA publication resources.	Medium	Annual Implementation. Yearly booths at 3rd Thursday, Story Days and County Fair
S-2	Public awareness program to include promotion of 3-day kits (for home, work, and car), and distribution of hazard information to residents and businesses (including emergency facilities, public buildings and campgrounds) via information booths, talks, videos, brochures, and telephone books. Two weeks ready.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	**County Emergency Management Coordinator**	Ongoing	Low; funding from county and state. EMPG with free FEMA publication resources.	Medium	Annual Implementation. Periodic PSAs for Code Red, Ready-Set-Go, 2 weeks ready

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
S-3	Education/Public awareness campaign for drought.	Drought	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	Planning, **Town and school administration,** NOAA, USDA, NRCS, NWS	Ongoing	Low; local NOAA office, County Planning Operating Budget, School Operating Budgets	Medium	Annual Implementation. Continuing/ongoing
S-4	Encourage water conservation projects and studies. Various projects in progress, including moving away from flood irrigation.	Drought	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	Planning, Town and school administration, **Conservation district**, NRCS	Ongoing	High; Grant funded, $300,000 per year USDA EQIP, clean water act, department of agriculture	High	In Progress. Continuing/ongoing. Various projects in progress, including moving away from flood irrigation.
S-5	Enhanced forecasting and data distribution. Need hardware, software, 6-stream gages county and city owned.	Drought	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	**County**, municipalities administration, **NOAA, NWS**, NRCS, USGS	Ongoing	Low; NOAA, Staff Time	High	Annual Implementation. National drought center NOAA
S-6	Little Goose Creek (Levee, widening channel)	Flood	City of Sheridan	**City of Sheridan/ US Army Corps of Engineers**	Short Term	Very High; Army Corp of Engineers funded 75%, other 25% by City of Sherian FEMA HMA Grants, BRIC	Medium	In Progress. Complete by end of year 2023
S-7	Piney Creek Flood Hazard Mapping	Flood	County, Story (unincorporated)	**Sheridan County/ US army Corps of Engineers**	Long Term	Very High; Army Corp of Engineers funded 75%, other 25% by City of Sherian FEMA HMA Grants, BRIC	High	Not Started. unknown funds, flood mapping needed

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
S-8	Colony South Water Line Replacement	Flood, Drought	City of Sheridan	**City of Sheridan Public Works**	Short Term	Very High; FEMA HMA Grants, BRIC	Medium	Not Started. Deferred, will release RFP soon for design
S-9	Big Goose Creek Storm Sewer Upsize	Flood	City of Sheridan	**City of Sheridan Public Works**	Short Term	Very High; FEMA HMA Grants, BRIC	Medium	Not Started. Deferred
S-10	East Downtown Phase I drainage improvements	Flood	City of Sheridan	**City of Sheridan Public Works**	Medium Term	Very High; FEMA HMA Grants, BRIC	Medium	Not Started. Deferred
S-11	Hazard awareness for residents of Story, and around the county.	Wildfire	County	Sheridan County **Fire Warden**, BLM, US Forest Service	Ongoing	Low; $3,000/yr., publications, outreach. Mitigation grant funding	High	Annual Implementation. Continued public awareness, grants for mitigation treatments
S-12	Countywide Fuels Reduction and Hazard Awareness through CWPP implementation	Wildfire	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	**County Fire Warden**; State Forestry	Ongoing	High; CAFA grants est. $300,000/project. CWPP revision CWDG possible $50-100,000 Secure Rural Schools and Community Self-Determination Act - Title III- County Fund; FEMA HMA grants	High	Annual Implementation. Ongoing efforts. Grants through Wy. State Forestry, Revise CWPP

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
S-13	Weather Spotter Training - education. Expand education & participation of public - school system, etc., of storm ready/wx spotter activities (logistics & timing, unnecessary travel of school buses, -2 hr delay)	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Sheridan County, Sheridan County School District #3	**Sheridan County Emergency Management**, National Weather Service-Billings, MT, first responders, law enforcement, EMS, fire services, Sheridan Media, Sheridan Press, Cloud Peak Radio Group (local HAM club)	Medium Term	Little to no cost; Staff time	High	Annual Implementation. Annually over next five years
S-14	Weather spotter training – public awareness and program promotion. Public awareness program, as resources permit, to include promotion of annual weather spotters/weather-ready/weather-wise community training each Spring. Conduct outreach to local media outlets, post training date to County's web site, social media, etc. Status for update: completed each year but continual refresher process. Benefits include: minimize/avoid injury to humans, provide cover/sheltering, minimize property damage. Potential funding sources: WOHS EMPG program which supports part of the County's emergency mgt. program. Project partners and related stakeholders: National Weather Service-Billings, MT, first responders, law enforcement, EMS, fire services, Sheridan Media, Sheridan Press, Cloud Peak Radio Group (local HAM club).	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	**Sheridan County Emergency Management**, National Weather Service-Billings, MT, first responders, law enforcement, EMS, fire services, Sheridan Media, Sheridan Press, Cloud Peak Radio Group (local HAM club), and related stakeholders.	Medium Term	Little to no cost; Staff time	High	Annual Implementation. Annually over next five years

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
S-15	Emergency Action Plan Inventory for Dams. Uncertainty exists regarding emergency action plans or dam failures and an updated inventory is needed, particularly for major reservoirs affecting drainages in Sheridan County.	Flood, Dam Failure	County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District #3	County EM, **State Engineer**, private dam owners/operators	Short Term	Little to no cost; Staff time	Medium	In Progress. State Engineers Office is assessing them.
S-16	New Story Area Floodplain Mapping. Existing FEMA floodplain maps are not sufficiently accurate to properly manage the local floodplain program. Flood elevations are needed to depict true filed conditions. Includes North, South Piney and Spring Creeks. Current maps (1990's) are inaccurate, incomplete and lack base flood elevations. Today, properties may be wrongly shown in special flood hazard areas that can result in burdensome technical studies or needless flood insurance requirements. Other properties may be developed assuming they are outside floodplains resulting in hazard exposure. Additional benefits of this project include avoiding placement of property and lives in the flood prone areas. More accurate FIRM determinations would assist.	Flood	County, Clearmont, Dayton, Ranchester, City of Sheridan	**County Public Works**; Sheridan County Commissioners, WYOHS	Medium Term	High; WOHS-FEMA RiskMAP	High	Not Started. Lacking grant funds to help pay for the high cost of the project. Changed priority from Medium to High in 2023
S-17	Acquisition of flood-prone homes in Ranchester. Removal of trailers and houses in Tongue River floodplain within Town of Ranchester. Investigate blighted property grants and acquisition of properties.	Flood, Dam Failure	Ranchester	**Town of Ranchester Engineer**, NFIP	Medium Term	High; FMA Grants, CAP Grants	Low	Not Started. Requires relocation of residents. No affordable housing to relocate trailers.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
S-18	New landslide hazard mapping. Sheridan County regulates development in landslide areas. Existing maps referenced in the county's zoning regulations, prepared by the Wyoming Geological Survey in the 1980's, are out of date. Development today is moving into vulnerable areas.	Landslide, Expansive Soils, Earthquake, Subsidence	Sheridan County	**County Public Works**, WYGS	Medium Term	Low; Existing Budgets, FEMA HMA Grants, WYGS	Medium	Not Started. Landslides are a very common problem. Funds needed to update the maps to help develop new zoning regulations.
S-19	Fire break maintenance and enhancement. Expand buy-in awareness of stakeholders regarding fire break maintenance and enhancement	Wildfire	County	**County Fire Warden**/County EM	Short Term	High; WY State Forestry Fire Mitigation Grants $50,000	High	Annual Implementation. Ongoing efforts.
S-20	Landscape level fuels reduction projects technical assistance. Expand landowner and community buy-in through education and on the ground technical assistance to encourage landscape level fuels reduction projects	Wildfire	County, Ranchester, Dayton	**County Fire Warden**	Short Term	Moderate; WY State Forestry Fire Mitigation Grants	Medium	Annual Implementation. As opportunities with partners and grants become available.
S-21	Work with other counties in the region to show support for addressing weather radar shadow/ gap with mobile radar units; project is being advocated by State Engineers Office (SEO); this would enhance visibility of storms tracking from the west.	Dam Failure, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Sheridan County, Clearmont, Dayton, Ranchester, City of Sheridan, Sheridan School District 3	**County EM and other EM coordinators in Region 1**; WY SEO; NOAA; town administrators, school administrator	Short Term	Moderate, SEO, NOAA	High	New in 2023
S-22	Dayton wastewater treatment plant stream stabilization project; streambank improvements are needed along the Tongue River to protect the plant from erosion during high river flow periods	Flood	Dayton	**Town Administration**	Short Term; First phase to begin in 2022	Very High; General Funds, Wyoming Wildlife and Natural Resource Trust, State Land and Investment Board, WY Department of Environmental Quality	High	New in 2023 (per Sheridan press article provided by Jesse L.)

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
S-23	Coal seam fire identification and mapping to inform risk and potential mitigation solutions	Coal Seam Fire	County	County EM, Planning, GIS, **State Abandoned Mine Land Program**	Short Term;	Moderate; State Abandoned Mine Land Program	Low	New in 2023
S-24	Water resource diversification and resiliency/redundancy to mitigate drought, including working with Wyoming Water Development Commission on potential options and alignment with Sheridan Area Water System (SAWS) Boundary Study action identified in the County Comprehensive Plan	Drought	County, City of Sheridan, Sheridan School District #3	**County Planning**, City Public Works, Utilities	Long Term	Very High; Wyoming Water Development Commission, USDA Rural Utilities Service (RUS) Grant, Watershed Processes and Water Resources Grant	Medium	New in 2023
S-25	Identify areas of landslide hazard that could result in landslide dams to prioritize for mitigation feasibility/need	Landslide	County	County EM, **Engineering**, Planning, **GIS**, WYGS	Short Term;	Moderate; FEMA HMA	Low	New in 2023
S-26	Big Goose Creek stream stabilization to reduce bank erosion and enhance natural beneficial functions of the stream corridor while reducing flood damage	Flood	City of Sheridan	City of Sheridan, **USACE**	Medium Term	High; General Funds, Natural Resources Conservation Service, State Land and Investment Board, PDM Grants, NFIP CAP, USACE Small Flood Control Projects	Medium	New in 2023
S-27	Rebuild Wolf Creek Road to enhance flood resilience	Flood	Ranchester	**Town Administration**	Medium Term	High; General Funds, Natural Resources Conservation Service, State Land	Medium	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
						and Investment Board		
S-28	5-mile Rd flood resilience and stream stabilization to reduce bank erosion and enhance natural beneficial functions of the stream corridor while reducing flood damage	Flood	County, Ranchester	**Town Administration**	Medium Term	High; General Funds, Natural Resources Conservation Service, State Land and Investment Board, PDM Grants, NFIP CAP, USACE Small Flood Control Projects	Medium	New in 2023
S-29	Enhance operational resilience to winter storms and flooding through pre-season planning and post-season debriefs	Flood, Severe Winter Weather	County	**County EM**	Short Term;	Low; Staff Time	Low	New in 2023
S-30	Coordinate with utility providers on grid resilience efforts that may include other mutual benefits such as fire breaks and vegetation treatments	Earthquake, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	County	County EM, Planning, **Utility providers**, State and US Forest Service	Short Term;	Low for coordination, High for fuel treatments; State Forestry, FEMA HMA, HMGP-Post Fire, Community Wildfire Defense Grants, Utility Companies	Medium	New in 2023

9 Implementation

Moving forward, the Sheridan County HMPC and LEPC will use the mitigation action tables in the previous section to track progress on implementation of each project. Implementation of the plan overall is discussed in more detail under Chapter 6 of the Regional (Base) Plan.

The Sheridan County HMPC formed during the 2023 Regional Plan update will be responsible for implementing and reviewing the plan action items. The HMPC will meet no less than semi-annually, or as time permits.

The Sheridan County Commissioners and the Mayor of all cities and towns (except where noted in Section 1) in Sheridan County will adopt the Region 1 Hazard Mitigation Plan and each jurisdiction will take responsibility for plan implementation of mitigation issues arising in their jurisdictions. Plan implementation and evaluation will be a shared responsibility among the HMPC. The Sheridan County EM Coordinator will serve as a convener to facilitate the HMPC meetings and will assign tasks such as updating and presenting the Plan to the members of the group.

9.1 Incorporation into Existing Planning Mechanisms

Also, discussed in Chapter 6 of the base plan is the importance of implementation and incorporation of the principles of this plan into other planning mechanisms.

9.1.1 General Process

To determine if the mitigation strategy identified in this plan is applicable to those identified in other community plans, the members of the Sheridan County Emergency Management Agency, along with the Hazard Mitigation Planning Committee and LEPC, will meet with other agencies who have plans that address such issues as comprehensive, capital improvement, economic development, transportation, land-use, watershed, or subdivisions resolutions/ ordinances. The process will provide an opportunity to integrate and/or correlate plans for the purpose of:

- Identifying mitigation initiatives or proposed projects which serve multiple objectives for the communities and could be included in multiple plans.
- Identifying needs for revision or updating to the mitigation plan, or other plans, to provide a more comprehensive approach to hazard mitigation (including addition of new mitigation measures).

During the 2023 planning process, the HMPC discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. To date the plan has been integrated with other planning efforts that include:

- Cross referenced in update of Emergency Operations Plan
- Risk Assessment informed Threat and Hazard Identification and Risk Assessments (THIRA)

9.1.2 Individual Process

The group discussed opportunities to cross reference the hazard mitigation plan in other upcoming planning efforts. As described in the capability assessment and Table 7-1, the County and municipalities already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. For example, vulnerability findings from the wildfire hazard profile can be leveraged to update Sheridan County's Community Wildfire Protection Plan. Findings related to vulnerable populations and hazard risks, including related mitigation

projects, can be used to enhance the City of Buffalo's Capital Improvement Plan. The list below show plans that are both common and/or unique to the participating jurisdictions that may have applicable goals, projects or actions related to mitigation and resilience. When these plans are updated identifying relevant cross-references to the hazard mitigation plan will foster resilience by factoring in hazard considerations into multiple planning mechanisms:

- County
  - County Comprehensive Plan
  - Emergency Operations Plan
  - Capital improvement plans and budgets including County Road/Bridge projects
  - Community Wildfire Protection Plan (CWPP)
  - Recovery planning efforts
  - River corridor and greenway planning efforts
  - Watershed planning efforts
  - Wildfire planning efforts on adjacent public lands
  - Firewise planning
  - Transportation plan
  - WYDOT rockfall and landslide mitigation efforts
  - Office of State Lands and Investments Drinking Water or Clean Water Intended Use Plan
- Municipalities (Clearmont, Dayton, Ranchester, City of Sheridan)
  - Capital improvement plans
  - Economic Development Plans
  - Emergency Operations Plans
  - Master planning efforts
  - River corridor and greenway planning efforts
  - Sheridan Land Use Plan
- Sheridan School District #3
  - Transportation Plan
  - Emergency Operations Plan/School Safety Plan
  - Facilities/Maintenance Plan

9.2 Funding Sources

Funding for mitigation projects may come from a variety of sources. Below is a partial list of possible sources of funding that could help fund the actions identified in Section 8.

Local Government

- General revenues in the form of matches
- One Percent Sales Tax
- County and Municipal Utility Authorities

State of Wyoming

- Community Development Block Grant Program

- Federal Mineral Royalty Capital Construction Account
- Wyoming Water Development Program
- State and Community Highway Safety, Department of Transportation
- State Lands and Investments Board (SLIB) Grants and Loans
- Transportation Enhancement Activities Local (TEAL)
- Wildfire Mitigation Grant (State Forestry Division)

Federal Government Programs

- Federal Emergency Management Agency Hazard Mitigation Assistance Grants including:
  - Building Resilient Infrastructure and Communities (BRIC)
  - Pre-Disaster Mitigation (PDM)
  - Flood Mitigation Assistance Program (FMA)
  - Hazard Mitigation Grant Program (HMGP)
  - Notice of funding availability typically released in June with applications due in October/November of each year.
  - HMPG is dependent on federally declared disasters within the state and funding amount is based on a percentage of disaster relief costs.
  - FEMA Fire Management Assistance Grants - As of June 8, 2018 FEMA is making HMGP funds available for states, territories, and federally-recognized tribes that have a Fire Management Assistance Grant (FMAG) declaration
- USDA Environmental Quality Incentive Program
- USDA Conservation Reserve and Conservation Reserve Enhancement Program
- USDA Small Watersheds (NRCS)

There are many more potential funding opportunities available to the municipalities and county.

Funding research will be done during the scoping process for each project to determine what funding mechanisms are available and appropriate for that project. Funding cycles will be monitored to ensure there is adequate time to prepare grant applications.

9.3 Monitoring, Evaluating and Updating the Plan

Sheridan County will follow the procedures to review and update this plan in accordance with Region 1 as outlined in Chapter 6 of the Base Plan. Sheridan County realizes it is important to review and update this plan regularly. This is especially important as the County receives additional information, which might change the risk analysis and resulting mitigation projects list.

Continued public involvement is imperative to the overall success of the plan's implementation. Sheridan County will continue to solicit participation from the public in the following ways:

- Hard copies of the updated HMP will be available at the County Emergency Management office, with an electronic version available on the County website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions S-1, S-2, S-3, S-11, S-13, and S-14.

- The public will be invited to LEPC meetings where the HMP is discussed. The meetings will provide the public a forum for which they can express concerns, opinions, or ideas about the plan.
- The DES Coordinator will publicize meetings through public information channels including social media and web posting.

The City of Sheridan will:

- Post a link to the plan from the City's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions S-1, S-2, S-3, and S-14, as well as partnering with county-led initiatives such as action S-11 and S-13.

The Town of Clearmont will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions S-1, S-2, S-3, and S-14, as well as partnering with county-led initiatives such as action S-11 and S-13.

The Town of Dayton will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions S-1, S-2, S-3, and S-14, as well as partnering with county-led initiatives such as action S-11 and S-13.

The Town of Ranchester will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions S-1, S-2, S-3, and S-14, as well as partnering with county-led initiatives such as action S-11 and S-13.

Sheridan County School District #3 will:

- Post a link to the plan from the District's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions S-1, S-2, S-3, and S-14, as well as partnering with county-led initiatives such as action S-11 and S-13.
- Leverage existing networks for disseminating information, such as PTA, to provide families with information about the plan.

Wyoming Region 1
Regional Hazard Mitigation Plan
Weston County Annex

1 Mitigation Planning and Weston County Planning Team

This annex was created during the development of the 2018 Region 1 Hazard Mitigation Plan. Prior to 2018 Weston County did not previously have a hazard mitigation plan in place. Weston County Emergency Management was responsible for updating the plan in coordination with a multi-jurisdictional County Planning Team/Hazard Mitigation Planning Committee (HMPC) during the update of the 2023 Regional Plan.

The following jurisdictions participated in the planning process:

- Weston County
- City of Newcastle
- Town of Upton

More details on the planning process followed and how the counties, municipalities and stakeholders participated can be referenced in Chapter 3 of the base plan, as well as how the public was involved during the 2023 update.

2 Geography and Climate

Weston County, Wyoming, with an area of about 2,400 square miles, is the 18th largest among Wyoming's 23 counties. The county comprises two towns, Upton and the county seat, Newcastle, along with unincorporated communities like Hill View Heights, Osage, and Four Corners.

The County is bordered by Campbell County to the west, Crook County to the north, Niobrara and Converse Counties to the south, and to the east by Custer, Lawrence & Pennington Counties in the State of South Dakota.

The land area is categorized as a Plains Grassland ecosystem, or Great Plains. Weston County is divided into four dominant land categories. The Pierre Shale Plains and Badlands, characterized by clay soil and gently rolling divides and hills around creeks and river valleys, make up about a quarter of the county. The Black Hills and Black Hills foothills, with steep-sided ridges, rocky hills and plateaus make up another quarter. The remaining half of the county is known as the Northern Rolling High Plains, flat lands with sandy soils. Elevations range from 3,600-6,500 feet.

The county encompasses a total area of 1,536,014 acres (2,400 square miles). More than 1,200,000 acres are used as range; other uses include forest, pasture and crops. Over the years, Weston County has experienced economic fluctuations driven by industries like oil and coal. The 1960s witnessed a significant economic upturn, fueled further by the 1970s oil embargo. However, the 1980s brought another downturn as oil prices fell. As of early 2012, prices were once again on the rise, though much of the oil drilling activity now occurs outside the county.

The Burlington Railroad discontinued passenger train services in Weston County on August 24, 1969. However, the railroad remains a major employer due to coal transport from two mines, Arch Coal Company’s Black Thunder Mine and Rio Tinto Energy America’s Jacobs Ranch Mine, located outside the county near Wright, Wyoming.

Weston County's formation dates back to March 12, 1890, following the decision of the Wyoming Territorial Legislative Assembly. It was named in honor of John Weston, credited with discovering coal deposits in the area. This split Crook County in half, designating the southern portion as Weston County (Wyoming Historical Society, 2014)

National protected areas include part of the Thunder Basin National Grassland and part of the Black Hills National Forest. Major highways through the county include U.S. Highways 16, 20, and 85, and State Highways 116, 450, and 585.

Weston County averages 32 days per year with temperatures above 90˚F; during summer months, the average maximum temperature is 83.9˚F, with a record high of 108˚F set on July 5, 1936. The county averages 171 days a year with temperatures below 32˚F; during winter months, the average minimum temperature is 13.6˚F, with a record low of -37˚F set on January 17, 1930. The county averages 16.44 inches of precipitation per year, and 40.3 inches of snow. Growing season typically lasts 120-140 days a year.

3 Population Trends

The following tables provide population and demographic information for Weston County and its jurisdictions. As of 2020, the county has an estimated population of 6,743, which is a decrease of 6.3% since the 2010 census. A closer look at the data shows the county's population trends show a drop in 2017 that was never regained. It should be noted that the relatively small population of the county means that small changes can have a disproportionate change on the percentage rates, so some variability is to be expected.

Table 3-1 Weston County Population Distribution

Jurisdiction	2020 Estimated Population	% of County Total
Total	**6,743**	**-----**
City of Newcastle	3,232	48%
Town of Upton	922	14%
Unincorporated	2,589	38%

Source: US Census Bureau

Table 3-2 Weston County Population Change, 2010-2020

Jurisdiction	2010 Census	2015	2016	2017	2018	2019	2020	% change
Total	**7,198**	**7,202**	**7,228**	**6,962**	**6,895**	**6,880**	**6,743**	**-6.32%**
City of Newcastle	3,529	3,502	3,526	3,398	3,374	3,378	3,232	-8.42%
Town of Upton	1,098	1,105	1,108	1,062	1,054	1,054	922	-16.03%
Unincorporated	2,571	2,595	2,594	2,502	2,467	2,448	2,589	0.70%

Source: US Census Bureau

Table 3-3 Weston County Demographic Profile

Population	
Population estimate, 2020	6,743
Population Growth, 1970-2020 (US average was 63.1%)	0.07%
Age and Sex	
Median Age (US median age is 38.8)	42.4
Percent of population under 18	19.3%
Percent of population 18-34	45.3%
Percent of population 35-44	11.8%

Population	
Percent of population 45-64	11.8%
Percent of population 65 and over	11.8%
Percent of population male	11.8%
Percent of population female	11.8%
Race and Hispanic Origin	
White alone, 2020	95.3%
White alone, not Hispanic or Latino	90.7%
Hispanic or Latino	1.9%
Two or More Races	2.9%
American Indian and Alaska Native alone	0.6%
Black or African American alone	0.6%
Asian alone	1.6%
Native Hawaiian and Other Pacific Islander alone	1.7%
Education	
High school graduate or higher, age 25 years+	93.3%
Bachelor's degree or higher, age 25 years+	17.2%
Vulnerable Populations	
Percent of population under 5 years old	5.0%
Percent of population 85 years and older	2.3%
Percent of population that speak English "not well"	0.2%
Percent of population with disabilities	14.2%
Percent of population without health insurance	11.6%
Percent of population below poverty level	15.3%
Percent of population in deep poverty (<1/2 federal poverty level)	7.2%

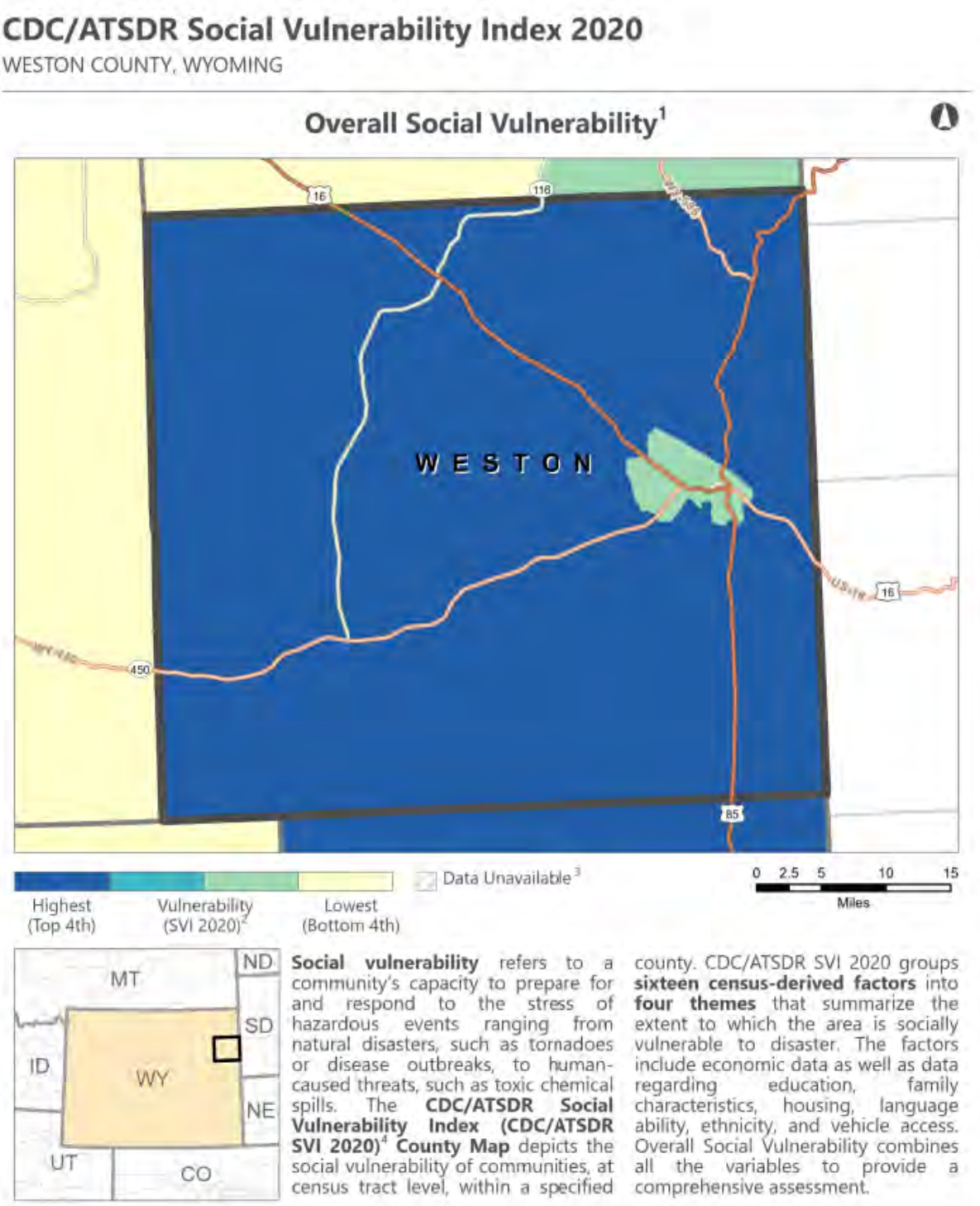
Source: US Census Bureau

3.1 Social Vulnerability

Social vulnerability is broadly defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards. Additional details on social vulnerability, the Centers for Disease Control and Prevention (CDC) social vulnerability index (SVI), and community resilience ratings can be found in Section 4.1.4 of the Base Plan.

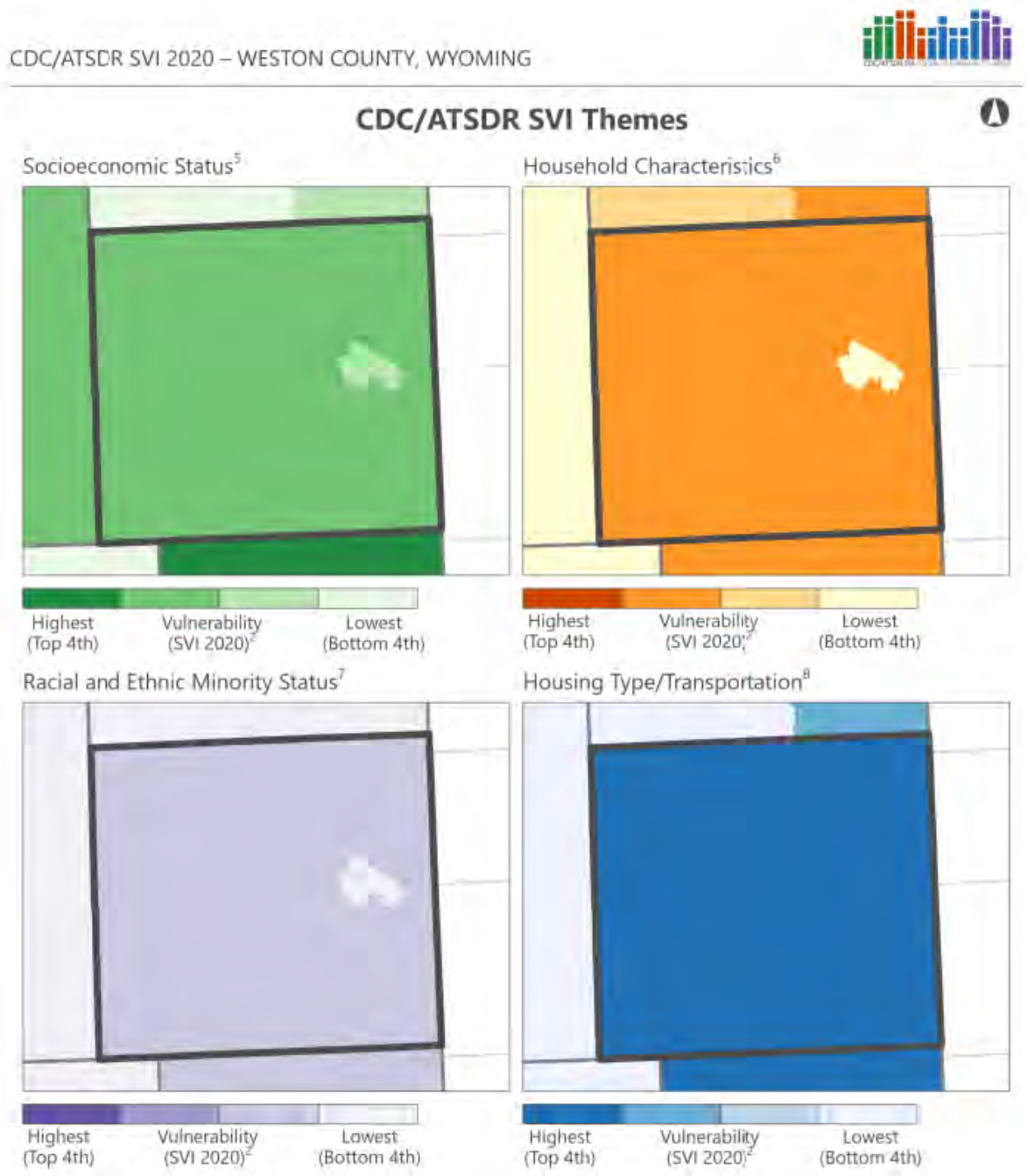
The SVI utilizes 16 demographic variables organized into four broader categories (Socioeconomic Status, Household Characteristics, Racial & Ethnic Minority Status, and Housing Type & Transportation) in order to determine the overall social vulnerability of a community at the census tract and county level. Figure 1 below displays the overall social vulnerability rating for Weston County at the census tract level, while Figure 2 details each of the four SVI themes. While most of the county is shown as high overall vulnerability, the county as a whole has a low social vulnerability rating due to the higher population areas being rated lower.

Figure 1 Weston County Overall Social Vulnerability



Source: CDC Social Vulnerability Index

Figure 2 Weston County SVI Themes



Source: CDC Social Vulnerability Index

4 Development Trends

Weston County is witnessing several pivotal development trends, although none are anticipated to magnify risk to hazards with the exception of more residences potentially vulnerable to wildfires in the unincorporated areas. Some development may enhance resilience such as a move towards sustainable natural resource management, a focus on renewable energy exploration (particularly wind and solar), and initiatives to enhance community resilience and leverage local attractions for tourism. Agriculture

remains a vital economic driver, with an emphasis on sustainable practices. Housing demand, transportation infrastructure, collaboration with neighboring counties, and public land management are also key areas of focus. Additionally, technology integration for improved services and communication is gaining importance (Weston County Planning Department).

Between 2010 and 2021 the County had a loss in population of 317 persons, a 4.4% decrease. In 2021, the median property value in Weston County, WY stood at $174,500, showing a 4.74% increase from the previous year. Although this figure is lower than the national average of $244,900, the homeownership rate is notably higher at 87%, aligning with the national average. Commuters in Weston County spend an average of 26.9 minutes driving alone to work, slightly above the national average. Moreover, car ownership is relatively higher, with households owning an average of 3 cars, surpassing the national average (U.S. Census).

According to the Weston County HMPC the Town of Upton annexed approximately 80 acres of public property into city limits in 2020. There has been some residential growth in rural areas around Upton and throughout Weston County.

5 Economy

Weston County has a diverse economy. The county's unemployment rate is 2.1%, slightly below the state average of 2.9%. The following information is provided by the U.S. Census Bureau American Community Survey (ACS) 5-year estimates from 2016-2020.

Table 5-1 Weston County Basic Economic Profile

Economic Characteristics	Weston County
Families Below Poverty Level	13.2%
Individuals Below Poverty Level	26.0%
Median Home Value	$166,600
Median Household Income	$53,333
Per Capita Income	$26,573
Population > 16 Years Old in Labor Force	53.2%
Population Employed	51.1%

Source: U.S. Census Bureau www.census.gov/

Table 5-2 below shows the breakdown of employment in Weston County by the industry sector. According to the ACS, the leading employment sectors in the County are agriculture, forestry, fishing, and hunting, and mining" which composes of nearly a quarter of the total employment in the County follows by "educational services, and health care and social assistance."

Table 5-2 Weston County Occupation by Industry Profile

Industry	Population Employed	Percent of Labor Force
Agriculture, forestry, fishing and hunting, and mining	611	21.0%
Construction	211	7.3%
Manufacturing	203	7.0%
Wholesale trade	30	1.0%
Retail trade	292	10.0%
Transportation and warehousing, and utilities	216	7.4%
Information	20	0.7%

Industry	Population Employed	Percent of Labor Force
Finance and insurance, and real estate and rental and leasing	227	7.8%
Professional, scientific, and management, and administrative and waste management services	131	4.5%
Educational services, and health care and social assistance	527	18.1%
Arts, entertainment, and recreation, and accommodation and food services	141	4.8%
Other services, except public administration	157	5.4%
Public administration	144	4.9%

Source: U.S. Census Bureau ACS 5-year estimates, 2016-2020

Weston County's economy is primarily driven by the energy and natural resources sector, specifically coal mining. The county is home to several coal mines, and coal production and related activities, including energy generation, have played a pivotal role in the local economy.

6 Hazard Identification and Risk Assessment

6.1 Identified Hazards

The HMPC reviewed the hazards from the State of Wyoming's hazard mitigation plan. The following table notes the summary of significance for each jurisdiction in the County based on a combination of geographic extent, potential magnitude/severity and probability as defined below. Hazard significance is rated as High, Medium, or Low based on the combination of factors described in the table below and the methodology in Chapter 4 of the Regional Plan. The HMPC changed the significance of Hail from medium to high due to the widespread damage to property and crops that frequently occurs. Hazardous materials changed from medium to high for the municipalities, due to risk from rail and fixed facilities. Coal Seam Fire was added as a hazard for the Region in 2023, but Weston County felt this was not applicable in their case due to most of the coal seams being west of the County.

Table 6-1 Overall Hazard Significance Summary Table

Hazard	Weston County	Newcastle	Upton
Dam Failure	L	NA	NA
Drought	H	H	H
Earthquake	L	L	L
Expansive Soils	H	M	M
Flood	M	M	M
Hail	H	H	H
Hazardous Materials	H	H	H
High Winds & Downbursts	M	M	M
Landslide/Rockfall/Debris Flow	L	L	L
Lightning	M	M	M
Mine & Land Subsidence	M	L	L
Severe Winter Weather	H	H	H
Tornado	M	M	M

Hazard	Weston County	Newcastle	Upton
Wildfire	H	H	M
Coal Seam Fire	NA	NA	NA

Geographic Extent
Negligible: Less than 10 percent of planning area or isolated single-point occurrences
Limited: 10 to 25 percent of the planning area or limited single-point occurrences
Significant: 25 to 75 percent of planning area or frequent single-point occurrences
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Potential Magnitude/Severity
Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.
Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

Probability of Future Occurrences
Unlikely: Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.
Occasional: Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Highly Likely: Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Overall Significance
Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.
Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

6.1.1 Hazards Considered but Not Profiled

Though noted in other relevant plans such as the Wyoming State Multi-Hazard Mitigation Plan from 2016, this plan does not further evaluate the following hazards:

- Avalanche
- Space weather
- Volcanism
- Windblown deposits

It is important to be aware of the probability of these events and the associated impacts for Weston County. However, the hazard identification described in Chapter 4 of the Base Plan omits these hazards due to the limited relevance in the regional context of this plan, or the hazards being sufficiently addressed in other planning mechanisms. Some of the above listed hazards are acknowledged to some degree under other hazard profiles, such

as windblown deposits carried by wind that could be associated with drought conditions.

6.2 Building Inventory and Assets

In addition to people, structures, critical facilities and infrastructure, and other important assets in Weston County are potentially exposed to hazards identified in this plan. **Error! Reference source not found.** summarizes the property inventory for the c ounty and each participating jurisdiction, based on improvement value (i.e., structures) and includes the building count and value grouped by parcel type and jurisdiction. This as an assessment of the overall property exposed within the county and by jurisdiction.

Assets inventoried to determine vulnerability include people, structures, critical facilities, and natural, historic, or cultural resources. For the regional planning process, locally available GIS databases were utilized. Parcel and assessor data were obtained through sources such as the Wyoming Property Tax Division's Assessor's Portal. This information provided the basis for building exposure and property types. The focus of the analysis was on improved or developed parcels; these parcels were identified based on an improvement value greater than zero. Abstract Codes were used to identify occupancy type as shown in the following table, which includes summations of total improved value for the various property types.

As presented in Table 6-2, total building exposure within Weston County is nearly $709 million, with $446 million in improved value properties and $262 million in estimated content value. The City of Newcastle has the greatest portion of susceptible structures, followed by unincorporated county.

Table 6-2 Weston County Building Inventory and Value by Jurisdiction and Property Type

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure
Newcastle	Commercial	172	$45,021,182	$45,021,182	$90,042,364
	Industrial	7	$3,800,581	$5,700,872	$9,501,453
	Residential	1,057	$131,389,828	$65,694,914	$197,084,742
	Total	**1,236**	**$180,211,591**	**$116,416,968**	**$296,628,559**
Upton	Commercial	58	$5,487,932	$5,487,932	$10,975,864
	Industrial	5	$1,527,707	$2,291,561	$3,819,268
	Residential	296	$39,364,149	$19,682,075	$59,046,224
	Total	**359**	**$46,379,788**	**$27,461,567**	**$73,841,355**
Unincorporated	Commercial	55	$13,097,194	$13,097,194	$26,194,388
	Industrial	7	$2,220,933	$3,331,400	$5,552,333
	Residential	996	$204,561,389	$102,280,695	$306,842,084
	Total	**1,058**	**$219,879,516**	**$118,709,288**	**$338,588,804**
	Grand Total	**2,653**	**$446,470,895**	**$262,587,823**	**$709,058,718**

Source: Wyoming CAMA 2022, WSP GIS Analysis

6.2.1 Critical Facilities, Infrastructure, and Other Important Community Assets

A critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Much of this data

is based on GIS databases associated with the 2022 Homeland Infrastructure Foundation-Level Data (HIFLD) and the 2023 National Bridge Inventory (NBI). Where applicable, this information was used in an overlay analysis for hazards such as dam failure, expansive soil, flood, landslide, and wildfire.

FEMA organizes critical facilities into seven lifeline categories as shown in Figure 3. These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

Figure 3 FEMA Lifeline Categories

Source: FEMA

Table 6-3 Weston County Critical Facilities Summary

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Newcastle	7	2	-	1	7	10	2	**29**
Upton	1	3	-	-	2	6	1	**13**
Unincorporated	29	21	2	1	2	2	41	**98**
Total	**37**	**26**	**2**	**2**	**11**	**18**	**44**	**140**

Source: HIFLD, National Bridge Inventory, WSP GIS Analysis

6.2.2 Natural, Historic, and Cultural Assets

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

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Historic and Cultural Resources

By definition, a historic property not only includes buildings of other types of structures, such as bridges and dams, but also includes prehistoric of Native American sites, roads, byways, historic landscapes, and many other features. Given the history of the County, these types of historic properties exist in the planning area.

Table 6-4 lists the properties and districts in Weston County that are on the National Register of Historic Places, which is the Nation's official list of cultural resources deemed worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior. Table 6-4**Error! Reference source not found.** also lists several other buildings considered historic that are not on the National Register.

Table 6-4 Weston County Historic Properties

Jurisdiction	National Register of Historic Places
Newcastle	Weston County Courthouse
	Newcastle Commercial District
	Jenney Stockade Site
	Cambria Casino
	US Post Office--Newcastle Main
	Wyoming Army National Guard Cavalry Stable
Jurisdiction	Other Historic Buildings
Newcastle	Old Pinnacle Bank Annex, Main St.
	Perkins Tavern, Main St.
	Isabella's, Main St.
	Donna's, Main St.
	Antlers Hotel, Main St.
	Weston County Library, Main St.
	Chevrolet, Main St.
	Bank of Newcastle
	Alligator Shack, Main St.
	Hardware/Paint, Main St.
	Broncos Bar
	Sedgwick Building
	Masonic Hall
	Penny's Quilt Shop, Main St.

Sources: National Register Information System, www.nps.gov/nr/; Weston County

Natural Resources

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

Wetlands

Wetlands are a valuable natural resource for communities, due to their benefits to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital. While the Wyoming Game & Fish Department does not identify any protected wetlands areas in Weston County, smaller wetland areas do exist in the County, such as riparian areas that are typically populated with willows. The presence of willows is often a good indicator of a floodplain within the County.

Endangered Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed. Species listed as in recovery are those whose population decline has stopped or reversed but are not yet deemed secure enough to be removed from the endangered species list.

There are four federally recognized threatened species in Weston County according to the U.S. Fish and Wildlife Service. These species are listed in Table 6-5.

Table 6-5 Endangered and Threatened Species in Weston County

Common Name	Scientific Name	Type of Species	Status
Bald eagle	Haliaeetus leucocephalus	Birds	Recovery
Ute ladies'-tresses	Spiranthes diluvialis	Flowering Plants	Threatened
Gray wolf	Canis lupus	Mammals	Recovery
Northern Long-Eared Bat	Myotis septentrionalis	Mammals	Threatened

Source: http://www.fws.gov/endangered/

6.3 Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, only where it differs from that of the Region. For a discussion of the methodology used to develop the loss estimates refer to Chapter 4 of the base plan. In many cases Chapter 4 contains information that differentiates the risk by county, thus the information is not duplicated here. For most of the weather-related hazards the risk does not vary significantly enough from the rest of the Region and thus the reader should refer to Chapter 4. Only issues or vulnerabilities that are unique to the county are discussed, where applicable.

6.3.1 Dam Failure

As listed in Table 6-6 below, Weston County has no high hazard dams and only two significant hazard dam – Spencer Dam on Stockade Beaver Creek and Turner Reservoir on Turner Creek. This can also be seen in Figure 4.

Table 6-6 High and Significant Level Dams in Weston County

Hazard Level	Dam Name	Normal Capacity (AF)	Nearby Jurisdiction/Populated Area
Significant	Spencer	2,162	Edgemont, SD
Significant	Turner Reservoir	45	Osage, WY

Source: National Inventory of Dams

There has been one recorded dam failure in the county:

- Torrential rains accompanied by hail caused flash flooding in southern Weston County. Several earthen dams breached, causing damage to bridges and roads. Crop and property damage was substantial. In Gillette, heavy rain amounting to 1.5 inches in one hour resulted in flooded streets and basements and damage to new construction.

There are several other dams in the county rated as low hazard, which are not shown.

6.3.1.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

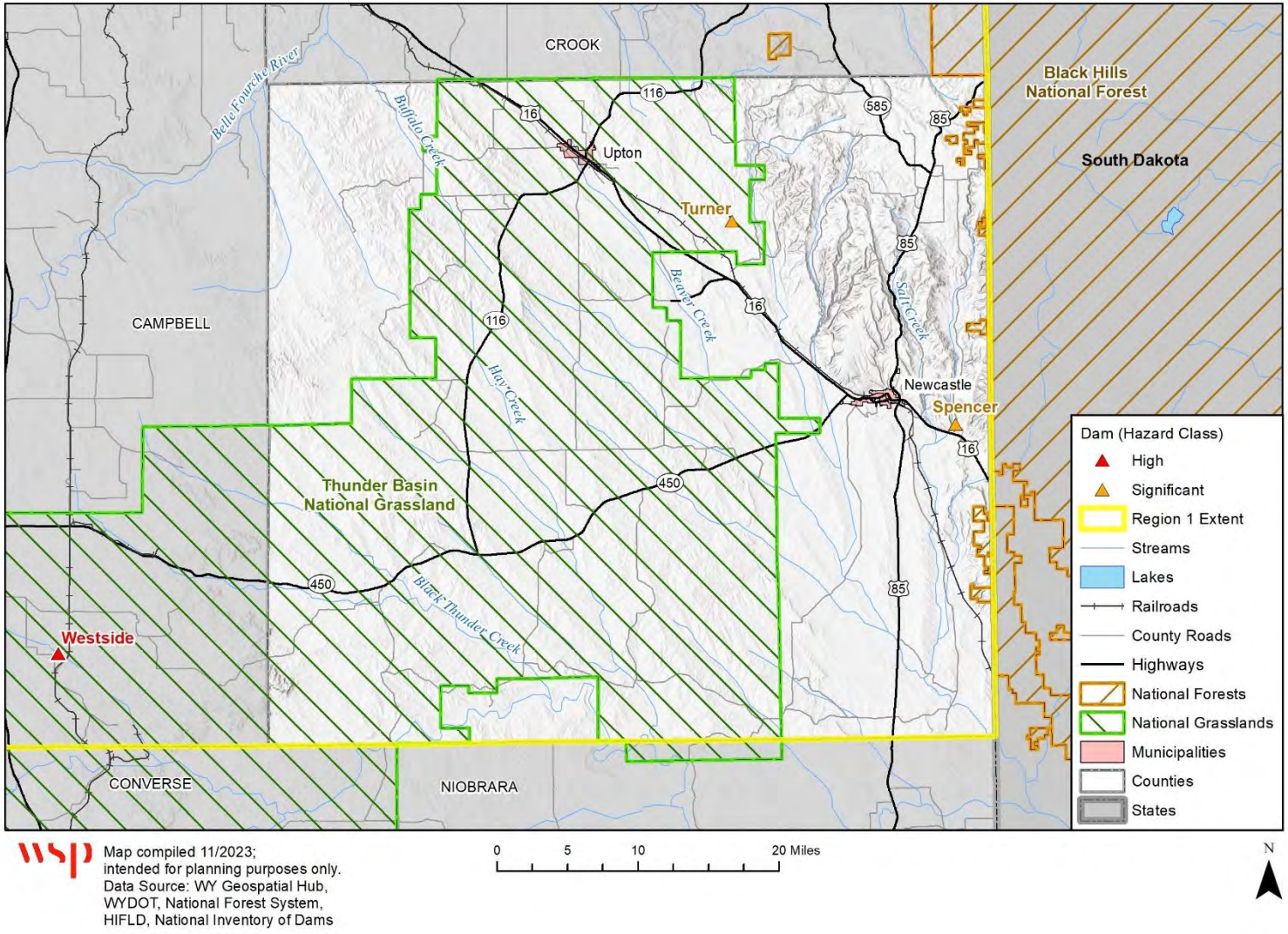
Based on GIS analysis no structures, critical facilities or other resources have been identified in dam inundation zones within the unincorporated area or municipalities.

While it is not considered likely, there is a possibility of structure failure-based flooding in the future. The overall risk of dam failure across Weston County and its jurisdictions is **low** and not applicable for Upton and Newcastle.

6.3.1.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

Figure 4 Significant Hazard Dams in Weston County



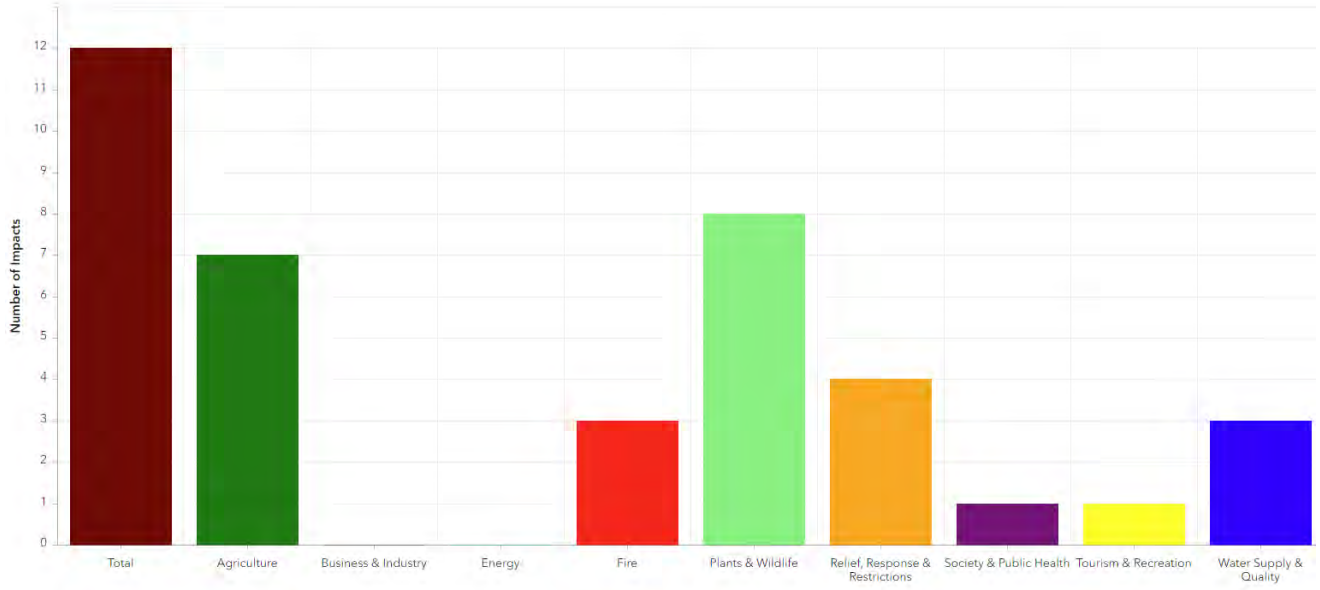
6.3.2 Drought

6.3.2.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Drought is a high significance hazard for the County and municipalities. Drought-related impacts to the local economy can be extensive, affecting the water supply and quality, plants and wildlife, relief response efforts, and even the tourism and recreation industries (e.g., due to increased wildfire danger, forest closures, and fire bans). One of the most affected sectors in Weston County, is plants and wildlife, as drought can have far-reaching and detrimental effects on ecosystems, including the loss of biodiversity, habitat degradation, and increased stress on wildlife and their environments. The other highly affected sector is agriculture, as crops and livestock cannot thrive during longer warmer seasons when there is a continued lack of precipitation, in turn causing farmers and growers to experience sales declines and increased management costs.

Since 2005, Weston County has received twelve reports of countywide impacts to the various sectors due to drought. Figure 5 below summarizes the number and type of reports that have been made at the county level, from 2005 to the end of 2022. These reports were submitted to indicate negative effects to the economic sectors and local industries due to drought events. Refer to Chapter 4 in the Base Plan for additional discussion of drought risk related to the region and the county.

Figure 5 County-Level Drought Reports in Weston County, 2005-2022



Source: https://www.drought.gov/data-maps-tools/drought-impact-reporter-dir

Table 6-7 takes the impacts of drought on crop production detailed in Table 4-17 of the base plan and breaks out the losses specific to Weston County; forage production has seen the greatest impacts.

Table 6-7 Indemnities Paid for Commodities that Suffered from Drought in Weston County, 2008-2017

Commodity	Acres Damaged	Indemnity Amount
All Other Crops	7,641.4	$542,805
Forage Production	20,229.4	$900,517
Oats	1,013.1	$19,593
Wheat	1,105.4	$49,505
Grand Total	29,989.3	$1,512,420

Source: USDA – Risk Management Agency

Drought can stress water supply systems, including reservoirs, water treatment plants, and pipes. Specific water system vulnerability has not been identified during the planning process.

Vulnerable populations that may be affected by drought may include ranchers and farmers. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a prolonged period of drought.

Natural resources include the Thunder Basin National Grassland and parts of the Black Hills National Forest, which could be more susceptible to wildfire impacts during droughts. No historic resources are expected to be vulnerable to drought.

6.3.2.2 Development Trends

Recent and future development in the County and municipalities is not anticipated to change vulnerability to drought in a significant way.

6.3.3 Earthquake

There has only been one recorded earthquake event with an epicenter in Weston County. Additionally, Weston County does not contain any mapped active faults or areas susceptible to liquefaction. This intensity IV event occurred in 1926 and is identified in the table below and described further in the following text.

Table 6-8 Weston County Seismic Events, 1926 – 2023

Location	Date	Magnitude/Intensity	Damage or Injuries
15 miles Northwest of Newcastle	5/1/1926	IV	No

Source: http://earthquake.usgs.gov and Wyoming Geological Survey

The following excerpts are from a report published for the Wyoming State Geological Survey in 2002 entitled “Basic Seismological Characterization for Weston County, Wyoming”.

The only reported earthquake in Weston County occurred near Osage on May 1, 1926, about 15 miles north-northwest of Newcastle. Several individuals felt this earthquake as an intensity IV event, and there were reports of dishes shifting and objects moving (Neumann, 1928).

6.3.3.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Based on the Level 1 HAZUS-MH analysis conducted for the State of Wyoming in 2020, Weston County had the second lowest projected losses and impacts in Region 1 under a 2,500-Year Probabilistic event scenario, with $6 million in projected damages and 3 minor casualties.

There are not vulnerable populations, lifelines and other natural resources within the County and jurisdictions of note. The overall significance of earthquakes for Weston County is considered **Low**.

6.3.3.2 Development Trends

Recent and future development in the County and municipalities is not anticipated to change vulnerability to earthquake in a significant way.

6.3.4 Expansive Soils

6.3.4.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Weston County classifies expansive soils as posing a high risk overall and a medium risk to the City of Newcastle and Upton and has historically caused problems with linear infrastructure and foundations in the county. In the Hazard Analysis and Risk Assessment chapter, specifically in section 4.2.5, there is a regional map illustrating soil types and the corresponding risk of expansive soil. Approximately $516 million in total property value is exposed to moderate expansive soils risk in Weston County, as shown in Table 6-9 below.

Table 6-9 Parcels and Population Risk to Moderate Expansive Soils in Weston County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Population
Newcastle	Commercial	172	$45,021,182	$45,021,182	$90,042,364	
	Industrial	7	$3,800,581	$5,700,872	$9,501,453	
	Residential	1,055	$130,827,959	$65,413,980	$196,241,939	2,416
	Total	**1,234**	**$179,649,722**	**$116,136,033**	**$295,785,755**	**2,416**
Upton	Commercial	58	$5,487,932	$5,487,932	$10,975,864	
	Industrial	5	$1,527,707	$2,291,561	$3,819,268	
	Residential	296	$39,364,149	$19,682,075	$59,046,224	678
	Total	**359**	**$46,379,788**	**$27,461,567**	**$73,841,355**	**678**
Unincorporated	Commercial	45	$11,117,568	$11,117,568	$22,235,136	
	Industrial	7	$2,220,933	$3,331,400	$5,552,333	
	Residential	446	$78,822,839	$39,411,420	$118,234,259	1,021
	Total	**498**	**$92,161,340**	**$53,860,387**	**$146,021,727**	**1,021**
	Grand Total	**2,091**	**$318,190,850**	**$197,457,987**	**$515,648,837**	**4,115**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-10 Parcels and Population Risk to Low Expansive Soils in Weston County

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Population
Newcastle	Residential	2	$561,869	$280,935	$842,804	5
Unincorporated	Residential	150	$35,395,598	$17,697,799	$53,093,397	344
	Total	**152**	**$35,957,467**	**$17,978,734**	**$53,936,201**	**348**

Source: Wyoming State Geological Survey, Wyoming CAMA 2022, WSP GIS Analysis

Table 6-11 Weston County Critical Facilities at Risk to Moderate Expansive Soil by Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Newcastle	6	2	-	1	7	10	2	**28**
Upton	1	3	-	-	2	6	1	**13**
Unincorporated	19	17	2	-	2	2	18	**60**
Total	**26**	**22**	**2**	**1**	**11**	**18**	**21**	**101**

Source: Wyoming State Geological Survey, HIFLD, National Bridge Inventory, WSP GIS Analysis

An estimated 348 people reside on areas of expansive soils, mostly in Pine Haven and Unincorporated areas. However, no direct impacts on people are anticipated. Should an impact occur, it is anticipated to be localized. Social vulnerability is not considered a factor. Natural and historic resource impacts are not considered to be a concern.

6.3.4.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Modern construction techniques typically account for and mitigate this hazard. Newcastle and Upton, in addition to the unincorporated County, should be wary of this hazard when new development takse place, based on generalized soil mapping indicating some risk

6.3.5 Flood

6.3.5.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

As of 2023, Weston County does not have any digital floodplains mapped by FEMA's National Flood Insurance Program. However, Newcastle and Upton do have mapped Flood Insurance Rate Maps with floodplains but they have not been converted over to digital/GIS products. Below are maps showing Hazus modeled floodplains to supplement the lack of digital FEMA floodplains showing Weston County first, then its jurisdictions. Hazus was only modeled for the 1% annual chance floodplain so losses for the 0.2% annual chance floodplain were not calculated for Weston County.

Table 6-12 below summarizes the building counts and improved value of parcels in the County, broken out by jurisdiction, that fall within the 1% chance floodplains. Additionally, the table also summarizes loss estimate values, which are calculated based upon the improved value and estimated contents value and assumes a two-foot deep flood which usually results in 25% of the total value, based on FEMA depth-damage curves.

Table 6-12 also indicates the estimated flood losses in each applicable jurisdiction in Weston County. The unincorporated areas of the County have the largest number of properties at risk to the 1% annual chance flood. The majority of the properties are residential with a total value of $5.5 million in improved values and almost $2.2 million in total estimated losses.

Table 6-12 Weston County Parcels at Risk to 1% Flood Hazard (Hazus) by County and Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Improved Value	Est. Content Value	Total Exposure	Estimated Loss	Population
Newcastle	Commercial	1	$8,876	$8,876	$17,752	$4,438	
	Residential	12	$992,541	$496,271	$1,488,812	$372,203	27
	Total	13	$1,001,417	$505,147	$1,506,564	$376,641	27
Unincorporated	Commercial	1	$66,516	$66,516	$133,032	$33,258	
	Industrial	1	$289,596	$434,394	$723,990	$180,998	
	Residential	27	$5,497,168	$2,748,584	$8,245,752	$2,061,438	62
	Total	**29**	**$5,853,280**	**$3,249,494**	**$9,102,774**	**$2,275,694**	**62**
	Grand Total	**42**	**$6,854,697**	**$3,754,641**	**$10,609,338**	**$2,652,334**	**89**

Source: Wyoming CAMA 2022, WSP GIS Analysis

Approximately 89 persons reside in flood hazard areas. General trends with populations vulnerable to flooding can be referenced in Section 4.2.6 in the base plan. More specifics are not known, but the slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts and recovery from a significant flood.

No natural or historic resources are known to be at-risk.

Weston County has a total of 29 critical facilities located in the 1% annual chance floodplain. All 29 are transportation lifelines and these consist of non-scour bridges in varying degrees of condition ranging from poor, fair, or good condition. This is shown in Table 6-13. No details are avaialbe about historic or cultural resources at risk to flooding.

Table 6-13 Weston County Critical Facilities at Risk to 1% (Hazus) Flood Hazards

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Unincorporated	-	-	-	-	-	-	29	29
Total	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**29**

Source: Hazus-MH MR2, HIFLD, National Bridge Inventory, WSP GIS Analysis

Figure 6 Weston County Hazus 100-year Flood Hazards

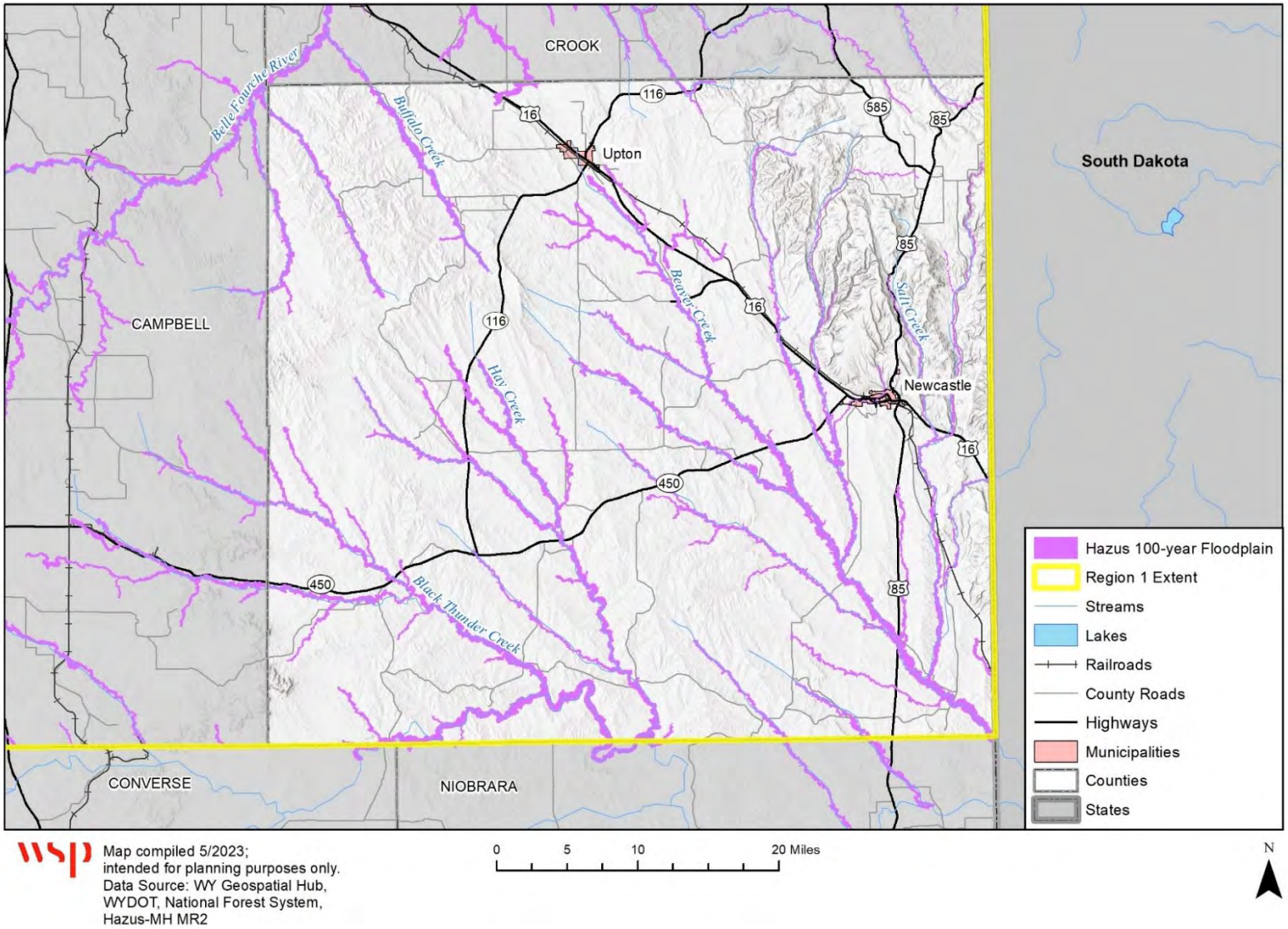


Figure 7 Newcastle Hazus 100-year Flood Hazards and Structures at Risk

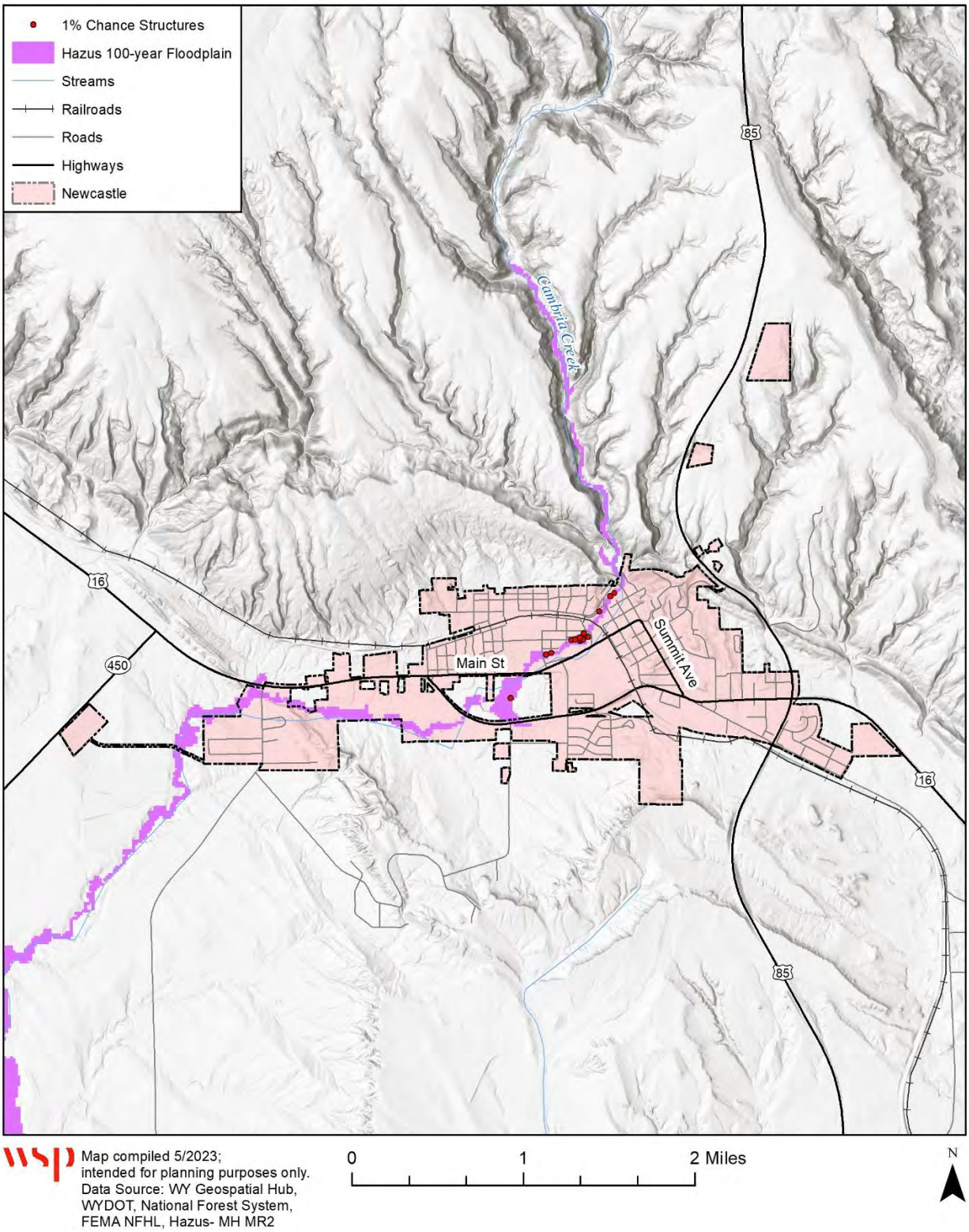
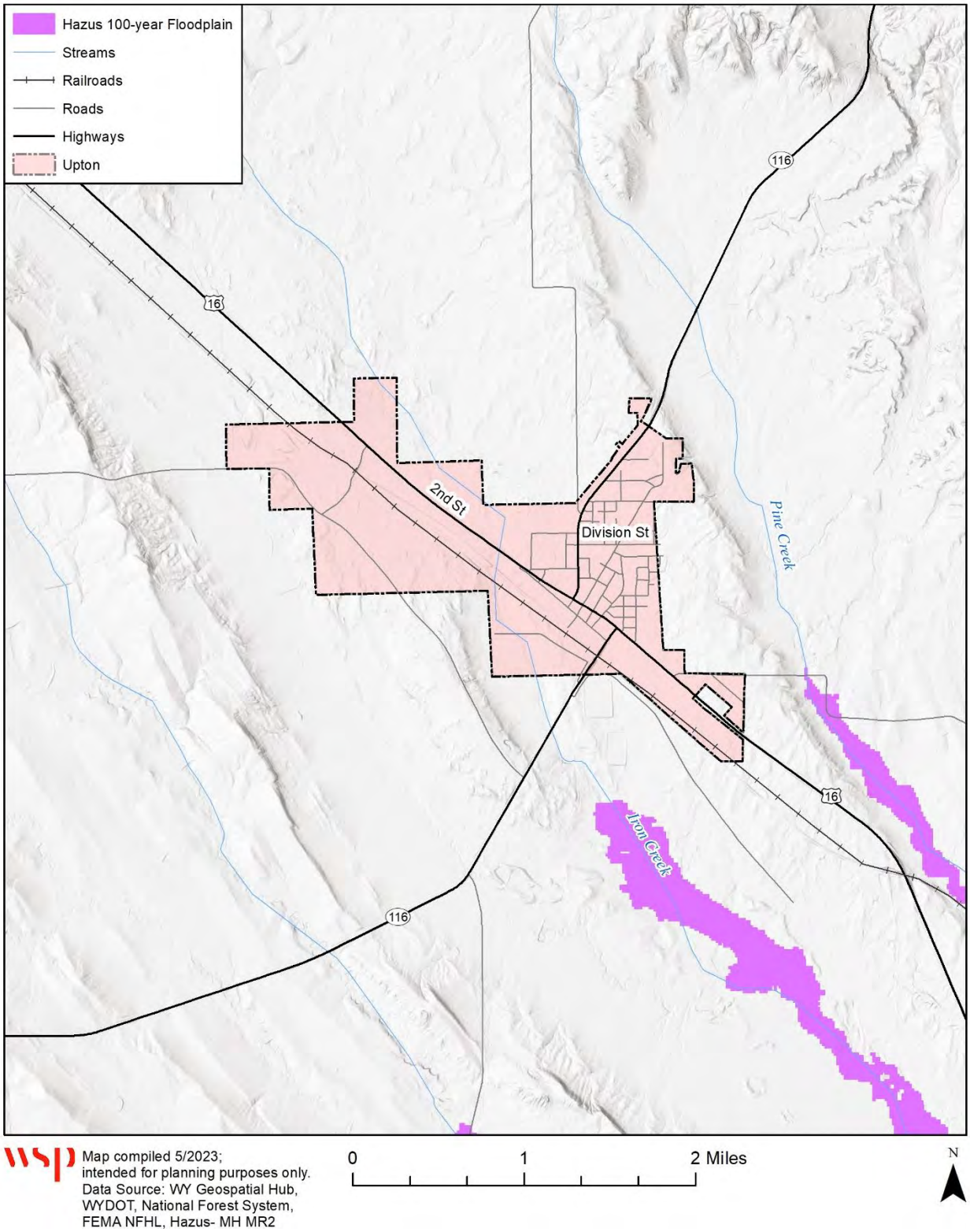


Figure 8 Upton Hazus 100-year Flood Hazards



NCEI recorded 20 riverine and flash flood events reported in Weston County since 1998, totaling $518,000 in reported damages. Areas most affected include Upton and Newcastle, and the unincorporated areas of Osage, Four Corners, and Rochelle. The unincorporated community of Osage has been hit with the costliest flood related damages, amounting to $178,000 just from 2011 to 2013. The most damaging event took place May 9 of 2011, when heavy rains fell over eastern Weston in under two hours, causing flash flooding that also affected Newcastle. Cars and culverts were damaged, sewers clogged, and basements flooded. The majority of flood events in the county are caused by flash accumulation of water from heavy rains and burn areas. In burn areas, soils become oversaturated easily due to excessive debris and inability from water to soak, causing rapid inundation and runoff that affect public infrastructure, properties, and natural areas. The main sources of flooding are Iron Creek, Oil Creek, Buffalo Creek, Beaver Creek, Lodgepole Creek, and Black Thunder Creek.

Table 6-14 summarizes significant flood events that occurred between 1998 and 2023 in Weston County, as reported to the NCEI National Centers for Environmental Information system.

Table 6-14 Flood Events in Weston County

Type	Location	Date	Property Damage	Crop Damage
Flash Flood	Four Corners	7/2/1998	$0	$0
Flash Flood	Upton	7/24/1998	$0	$0
Flood	Upton	6/4/2001	$0	$0
Flash Flood	Newcastle	8/12/2005	$100,000	$0
Flood	Newcastle	5/23/2008	$0	$0
Flash Flood	Osage	5/9/2011	$163,000	$0
Flash Flood	Upton	5/24/2011	$50,000	$0
Flash Flood	Osage	7/17/2012	$5,000	$0
Flash Flood	Four Corners	6/21/2013	$25,000	$0
Flash Flood	Rochelle	7/28/2013	$100,000	$0
Flash Flood	Osage	8/7/2013	$10,000	$0
Flash Flood	Osage	6/10/2015	$0	$0
Flash Flood	Osage	6/17/2015	$0	$0
Flash Flood	Rochelle	6/25/2015	$30,000	$0
Flood	Rochelle	6/25/2015	$0	$0
Flood	Osage	5/29/2018	$0	$0
Flash Flood	Four Corners	6/30/2019	$0	$0
Flood	Newcastle	7/3/2019	$10,000	$0
Flash Flood	Newcastle Airport	8/10/2019	$25,000	$0
Flood	Newcastle Airport	8/10/2019	$0	$0
Total			**$518,000**	**$0**

Source: NOAA NCEI

Weston County does not have any Repetitive Loss or Severe Repetitive Loss properties as defined by the National Flood Insurance Program (NFIP). There are only two policies in the City of Newcastle with one claim.

Table 6-15 NFIP Policy and Insurance Claim Data for Weston County

Weston County	Policies	Coverage "Insurance in Force"	# of Claims "Closed Paid Losses"	Paid Losses "$ of closed paid losses"	# of Policies in A Zones
Newcastle, City of	2	$202,000	1	$1,174	1
Total	**2**	**$202,000**	**1**	**$1,174**	**1**

Source: FEMA Policy and Claim Statistics http://www.fema.gov/policy-claim-statistics-flood-insurance and State of Wyoming Office of Homeland Security, NFIP Coordinator as of 11/13/2023

6.3.5.2 Development Trends

For NFIP participating communities such as Newcastle, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. The lack of comprehensive flood hazard mapping in unincorporated areas of Weston County makes floodplain management challenging. No major growth or development in the County or jurisdictions is expected to significantly alter the general area flood risk, but good planning, zoning, and general hazard mitigation practices are always necessary to prevent future development from being heavily impacted by flooding.

6.3.6 Hail

Since 1950, NCEI has recorded 278 significant hail events in Weston County, causing over $1.5 million in reported damage. Hail less than two inches is most common but hail up to 3.5" has been reported in the county.

6.3.6.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Hailstorms irregularly in Region 1 and typically linked to severe summer weather conditions. These storms predominantly affect structures and agriculture, with a notable focus on crop damage. However, there is the potential for substantial structural harm when exceptionally large hailstones are involved. The likelihood of these events recurring in Weston County is moderate, but their severity can range from minimal to substantial. Overall, hail presents a high significance hazard throughout the county due to frequency of events and potential for damage, and this assessment is consistent across all jurisdictions.

All above-ground critical infrastructure and lifelines are potentially exposed to hail events and it is not possible to refine risk further. Though it should be noted that property damages will be higher in the municipalities (due to exposed infrastructure, cars, etc.), potential crop and livestock damages would be concentrated in the more rural and unincorporated areas. See Section 4.2.7 of the Base Plan for more information on the previously recorded hail events and associated damages, and to revisit the hail map found on Figure 4-37.

No specific natural, cultural, or historical resources are at risk.

Vulnerable populations that may be affected by drought may include ranchers and farmers that work outdoors. Slightly higher socioeconomic vulnerability according to the SVI may indicate the potential susceptibility to local economic impacts from a major hail event.

6.3.6.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.7 Hazardous Materials Release

As further discussed at a regional level in the Base Plan, since 2007 Weston County has been exposed to at least 42 hazardous materials incidents that were significant enough to be recorded in the U.S. Coast Guard's National Response Center (NRC) database and Risk Management Plans (RMP) network; more information can be obtained at http://www.rtk.net/#rmp. Note that this number can vary considerably from year to year: there were no incidents in 2014, but nine in 2015.

Table 6-16 NRC-Reported Incidents in Weston County: 2007-2022

Year	Weston
2007	3
2008	3
2009	5
2010	3
2011	5
2012	6
2013	3
2014	0
2015	9
2016	1
2017	0
2018	0
2019	2
2020	2
2021	0
2022	0
Yearly Average	**2.0**
Total	**42**

Source: http://www.rtk.net/#rmp

Weston County has two Risk Management Plan (RMP) facilities, both in Newcastle: a refinery and a natural gas plant. Seven large quantity hazmat generator sites are located in the county, along with two hazmat transportation companies. The railroad lines passing through the county further increase the risk of hazardous materials incidents.

6.3.8 High Winds and Downbursts

Wind is a constant presence in Wyoming, and the HMPC noted that high winds are a consistent issue for the County.

6.3.8.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

It is difficult to assess vulnerability as it relates to location because damaging winds have occurred everywhere in the Region. According to NOAA data, from 1950 through 2022 Weston County experienced 191 high wind events, causing one reported injury and total damages of $618,600, though the totals damages is likely under reported. Average wind speed during these events was 52 mph, and the maximum wind speed recorded was 90 mph.

Overall, high winds pose a medium threat across the County and do not vary between the jurisdictions. There is not anticipated variation or specific vulnearbilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to wind damage leading to periodic power outages. The HMPC noted a wind event in 2016 that resulted in downed power lines and significant damage in Upton and Newcastle. See Chapter 4 of the base plan for more information on wind zones, events, and impacts.

6.3.8.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.9 Landslide/Debris Flow/Rockfall

The geologic history and unique conditions of Wyoming make landslides one of the most common hazards. Weston County's landslide hazard areas are all located on the northeast and east of the county, to the right of Highway 16 up to Newcastle, and to the right of the railway tracks southwest of the county. While complex slope movement types of landslides are the most prevalent, some slump and debris/earth flow areas can also be found on the east and northeast.

6.3.9.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

While the overall hazard significance is low in the county, GIS analysis of properties reveals the following potential exposure; a site specific analysis would be required to determine true risk. The results are summarized by jurisdiction in the table below. As shown in Table 6-17, Weston County has a total of 756 parcels potentially exposed to landslide hazard, valued at $146M. That is the lowest exposure in the Region. Four communications lifelines/critical facilities have been identified as at risk of landslides in the county based on GIS analysis. The HMPC reported landslide incidents affecting Highway 85, and the water line to stock tanks.

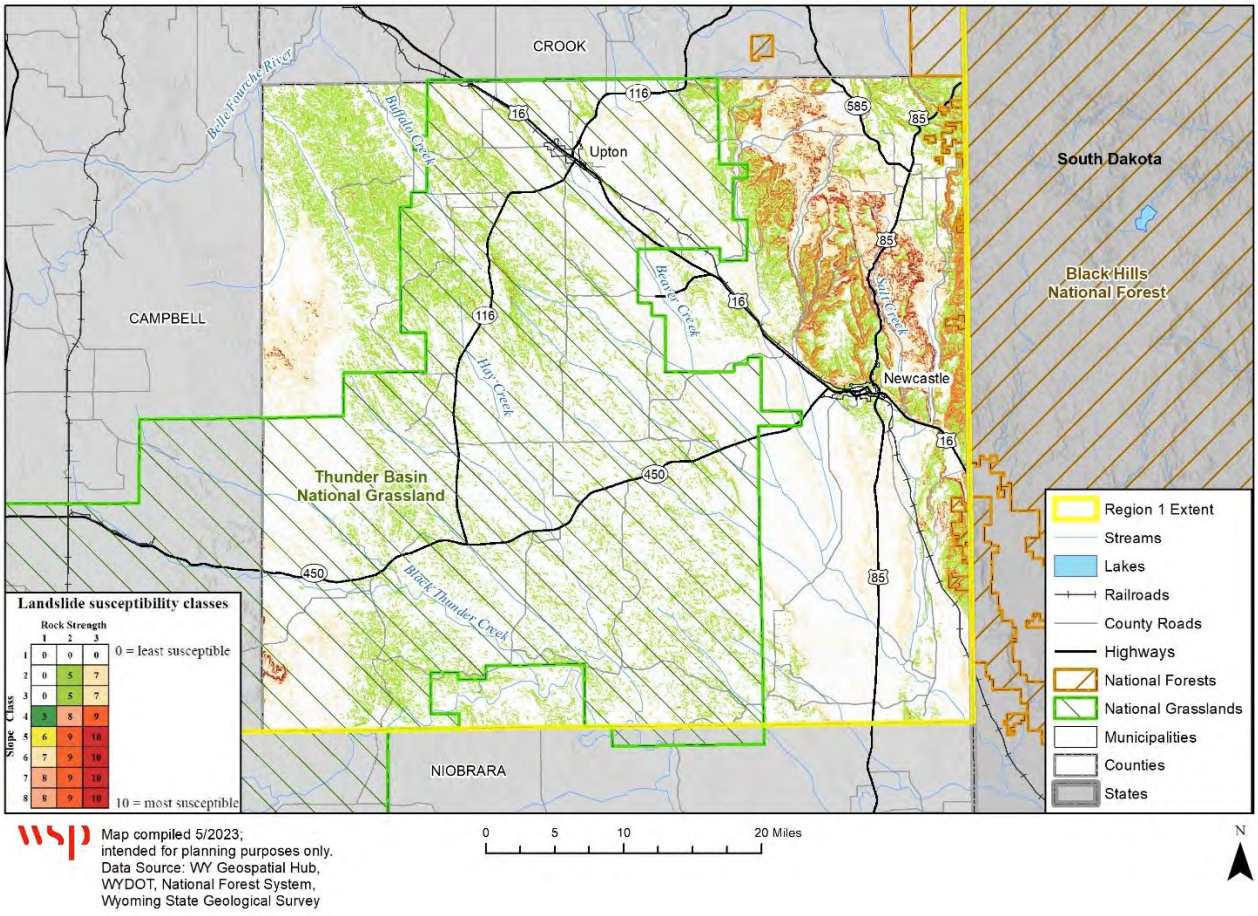
Table 6-17 Landslide Hazards by Jurisdiction and Property Type in Weston County

Jurisdiction	Parcel Count Highest	Parcel Count Moderately High	Parcel Count Moderate	Total Parcel Count	Improved Value
Newcastle	-	8	303	311	$45,664,074
Upton	-	-	3	3	$393,591
Weston Unincorporated	93	99	250	442	$100,166,385
Total	**93**	**107**	**556**	**756**	**$146,224,050**

Source: WYGS Landslide susceptibility data, Wyoming CAMA 2022, WSP GIS Analysis

Mapped landslides for Weston County are shown on the following figure; the towns of Newcastle and Upton do not have significant landslide hazards to map.

Figure 9 Weston County Landslide Hazards



Based on the GIS analysis approximately 9,688may reside on landslide susceptible areas, mostly in the unincorporated areas. Risk to populations is generally considered low as the landslides are commonly slow moving events in this part of the Region. No specific natural or cultural resources have been identified as at risk.

6.3.9.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Furture planning in areas of steep slopes should consider the potential for slope failure/landslide hazards particularly around Newcastle,

6.3.10 Lightning

6.3.10.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

Lightning strikes pose a risk to all regions in western Wyoming, with the potential for impacts on individuals and property expected to be isolated. Outdoor workers, outdoor enthusiasts, and livestock are all at risk of lightning strikes. The average flash density across the county varies, ranging from 3 to 13 flashes per square mile per year. According to NCEI, 1960-2015 Weston County experienced one reported damaging lightning strikes, causing no injuries or fatalities.

Table 6-18 Lightning Events in Weston County, 1950-2022

County	Number of Events	Injuries	Fatalities	Property Damage	Crop Damage	Total Damage
Weston	1	0	0	$0	$ 0	$0

Source: 2016 Wyoming State Multi-Hazard Mitigation Plan

These number greatly understate the frequency of lightning strikes in the county, as most strikes go unreported. Lightning-induced wildfires are the most significant impact from this hazard which could impact local natural resources. No specific cultural resources have been identified as at risk

Sometimes, communications and infrastructure are interrupted by lightning strikes. These events raise the vulnerability of the essential functions by delaying response times, hindering interagency communication efforts, or endangering or damaging communication networks..

6.3.10.2 Development Trends

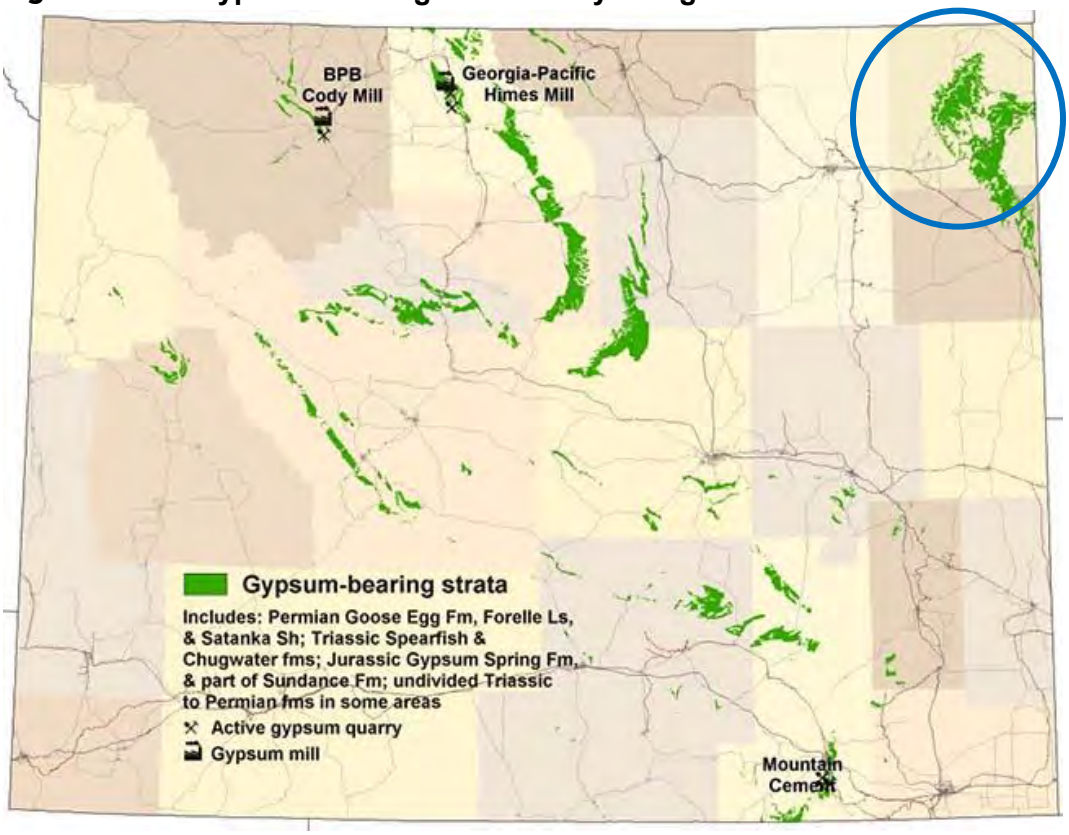
As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.11 Mine and Land Subsidence

Weston County has relatively few abandoned mine sites compared to other counties in the Region. However, land subsidence events have taken place in the county, particularly near Gillette, and are expected to continue to occur. Weston County should continue to make efforts to study geologic hazards as they relate to future industry and development to avoid future problems. A study was conducted to evaluate the presence of geologic hazards along the proposed Bakken Pipeline route in Crook and Weston counties. The report, published April 4, 2012, determined that the abundance of soluble gypsum beneath the proposed pipeline route could compromise the project. If the pipeline were damaged by a sinkhole, natural gas or liquid petroleum could seep out. Liquid petroleum leaking out of the pipeline could contaminate local ground water. Subsidence issues could seriously compromise the Bakken Pipeline project and other development initiatives that are undertaken without a thorough geologic hazard study.

A layer of prehistoric rock known as the Triassic Spearfish Formation lies underneath the northeast corner of Weston County. The formation is abundant with gypsum, a soluble mineral that dissolves as water infiltrates the ground. As the gypsum dissolves, caves form underground; sinkholes appear on the ground surface when the roof of an underground cave collapses. This type of landscape is referred to as “karst,” identified by the dissolution of layers of soluble minerals and bedrock. Karst landscapes may be marked by caves, sinkholes, cenotes, and other surface features. Figure 10 depicts known locations of gypsum-bearing strata in the State. Note the gypsum in Weston County (circled in blue). There are some sinkholes and occasionally livestock have fallen in, but the HMPC generally felt the significance of subsidence was low.

Figure 10 Gypsum-Bearing Strata in Wyoming



Source: Wyoming State Geological Survey, "Gypsum," accessed December 13, 2012.

The overall significance of this hazard is medium across the County. Refer to Section 4.2.12 from the Base Plan for a more detailed vulnerability assessment and location of abandoned mine sites, mine reclamation and abandonment programs, land subsidence information, and other details relevant to Sheridan County and Region 1.

6.3.11.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The overall risk of this hazard in the County is low and not anticipated to have substantial effects on structures, populations, natural or cultural resources or variability across jurisdictions. Linear infrastructure in the unincorporated areas could be potentially vulnerable.

6.3.11.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions. Linear pipeline development initiatives shouldn't be undertaken without a thorough geologic hazard study.

6.3.12 Severe Winter Weather

Winter storms are a yearly feature of the Wyoming climate and may occur anywhere in the state. Blizzard conditions bring the triple threat of heavy snowfall, strong winds and low temperatures. Poor visibility and huge snowdrifts are major hazards caused by blowing snow.

6.3.12.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

These storms disrupt work, make travel difficult or impossible, isolate communities, kill livestock by the hundreds or thousands and sometimes leave human fatalities in their wake. Heavy snow can temporarily affect transportation infrastructure, making access to rural homes difficult. Medically fragile persons and seniors can also be more vulnerable, especially during prolonged storms; residents are encouraged to keep a 3-day supply of food, medication, and oxygen.

While most winter storms are not isolated to one county, NCEI records 244 winter storm events, including events labelled as blizzards, heavy snow, winter storm or winter weather, ice storms, and extreme cold impacting Weston County from 1996 to 2023. Total reported damages from these events are $2,364,000 with no reported injuries or fatalities. The county averages 171 days a year with temperatures below 32˚F, and approximately 6 severe winter weather events per year. The average winter minimum temperature for the county is 13.6˚F, with a record low temperature of -37˚F recorded in 1930.

The overall significance of this hazard is **high** across the County and does not largely vary between the jurisdictions. Winter storms do not have substantial impacts to natural or cultural resources. Impacts on livestock are a concern that can have socioeconomic impacts. Refer to Section 4.2.13 of the Base Plan for more details since winter storms and related weather are easier to describe regionally than on a county-by-county basis.

6.3.12.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.13 Tornado

Most tornado events Region 1 tend to be small in terms of magnitude, with limited associated impacts. Of the 27 tornadoes recorded in Weston County since 1950, thirteen were rated F0/EF0, nine were rated F1/EF1, and only four were rated F2/EF2. Many of these may have been rated F0 or F1 simply because these tornadoes are often formed over open land and result in little or no damage. NOAA records 10 damaging tornado events in Weston County since 1950, collectively causing $307,810 in reported property damage and two injuries and no fatalities.

Table 6-19 Tornado History in Weston County, 1950-2023

County	Total Incidents	Magnitude	Damage-Causing Incidents	Fatalities	Injuries	Property Damage
Weston	27	F2	10	0	2	$307,810

Source: NOAA's NCEI

6.3.13.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

The overall significance of tornado events in Weston County is Medium. Region 1 tornado events are very small in terms of magnitude, with limited associated impacts, and the significance of this events does not largely vary across jurisdictions. There is not anticipated

variation or specific vulnerabilities to socially vulnerable populations, natural, historic or cultural resources. Power line infrastructure can be susceptible to tornado damage leading to periodic power outages. Refer to the map within the base plan for geospatially locations of NCEI-reported tornadoes across Wyoming Region 1.

6.3.13.2 Development Trends

As noted in Sections 3 and 4, population and development trends are not considered to result in significant increases or decreases in hazard exposure or vulnerability for any of the jurisdictions.

6.3.14 Wildfire

Wildfire is considered a **high** significance hazard for Weston County. Around 144,817 acres were burned just in fires of 1,000 acres and above (not considering the acreage burned in smaller fires). The most significant wildfire event (the Oil Creek fire) took place in 2012, affecting 61,460 acres of land in the northeastern part of the county. A list of fires burning over 1,000 acres of land in the county are summarized in Table 6-20 below.

Table 6-20 Wildfires over 1,000 acres in Weston County: 1980-2023

Name	Year	Acres Burned
Oil Creek	2012	61,460
Elk Mountain Complex	2001	27,469
Red Point	2003	17,703
Peterson-Elliott	1994	7,922
Whoopup	2011	6,090
35 Mile Marker	2010	4,893
Cummings	2006	4,238
Cellers	2021	3,333
Barrel	2011	3,212
Butterfield	2012	2,978
Wade Hill	2007	2,442
Skull Creek	2012	1,734
Buck Draw	2016	1,342
TOTAL		**144,817**

Source: National Incident Feature Service (NIFS)

The Weston County Community Wildfire Protection Plan (CWPP) reports 478 wildland fires in Weston County since 2009, burning a total of 97,410 acres. Since 2009 there have been 12 wildfires over 500 acres in size. The most significant wildfire event was the Oil Creek fire in 2012, which burned 62,318 acres of land in the northeastern part of the county. As noted in Section 4, the number of new residences in WUI areas increased 6.3% between 1990 and 2017; that trend is expected to continue.

6.3.14.1 Vulnerability of Populations, Structures, Lifelines, Natural, Historic, and Cultural Resources

There have been no catastrophic urban fires documented in Weston County although large wildland fires become increasingly damaging as the population expands into the more rural areas. The method utilized for estimating potential future impact is to determine the value of structures that are located within Wildfire Risk Areas, or wildland fire building exposure values.

Wildland fire building exposure value is the value of buildings that can be potentially damaged by wildland fire in an area. Building exposure values are based on county assessor data. The methodology utilized is like that used to model flood exposure described in the flood chapter.

Table 6-21 summarizes the building counts, property value, and estimated population exposed to medium, high, or highest wildfire risk areas throughout Weston County. There are an estimated 901 improved parcels exposed to medium or higher wildfire risk areas, with a total exposure estimated at $257 million in property value. Approximately $161 million of this total is located in the unincorporated areas of the county. An estimated 1,827 people in Weston County reside in these areas of medium wildfire risk or higher as well. Weston County has the lowest number of vulnerable residents and total exposed property value in Region 1. Vulnerable populations may include school-aged children and elderly populations, or those that may not have resources to evacuate.

Refer to Section 4.2.15 of the HIRA for details on vulnerable critical facilities in Weston County. The lifelines in areas of medium to high risk include communications (16), energy (11) and transportation (5) facilities,

Natural and cultural resources impacts could be significant to national protected areas such as the Thunder Basin National Grassland and part of the Black Hills National Forest.

Figure 11 through Figure 14 below display the areas of greatest wildfire risk, according to WYWRAP data, for the county, the City of Newcastle, and the Town of Upton, respectively. Generally, the areas of highest risk are concentrated in and around the municipalities of Weston County, with a few small pockets of high to highest wildfire risk dotted throughout the county. The majority of the county is rated as low risk. Figure 14 also displays the risk to WUI areas in Sheridan County, and Figure 15 illustrates the extent of areas burned by wildfire in the county from 1980 to 2023.

Table 6-21 Wildfire Hazard Exposure – General Property Summary by Weston County

Jurisdiction	Parcel Count Highest	Parcel Count High	Parcel Count Medium	Total Parcel Count	Improved Value	Estimated Content Value	Total Value	Population
Newcastle	52	48	12	**112**	$23,594,659	$17,083,788	**$40,678,447**	204
Upton	233	24	2	**259**	$35,187,153	$20,429,941	**$55,617,094**	520
Unincorporated	134	265	131	**530**	$102,619,071	$58,309,279	**$160,928,350**	1,104
Total	**419**	**337**	**145**	**901**	**$161,400,883**	**$95,823,008**	**$257,223,891**	**1,827**

Source: WYWRAP, Wyoming CAMA2022, WSP GIS Analysis

Figure 11 Weston County Wildfire Risk

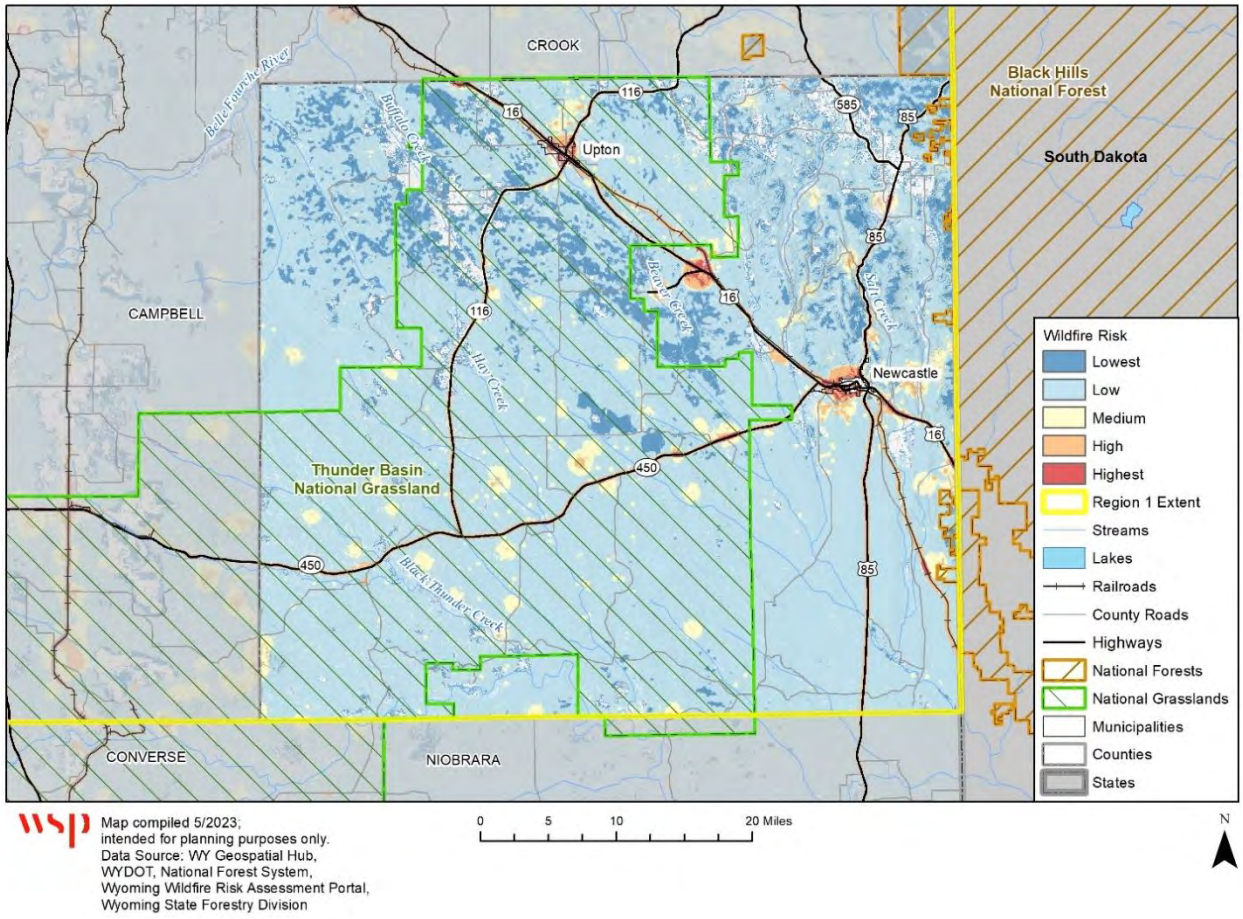


Figure 12 City of Newcastle Wildfire Risk

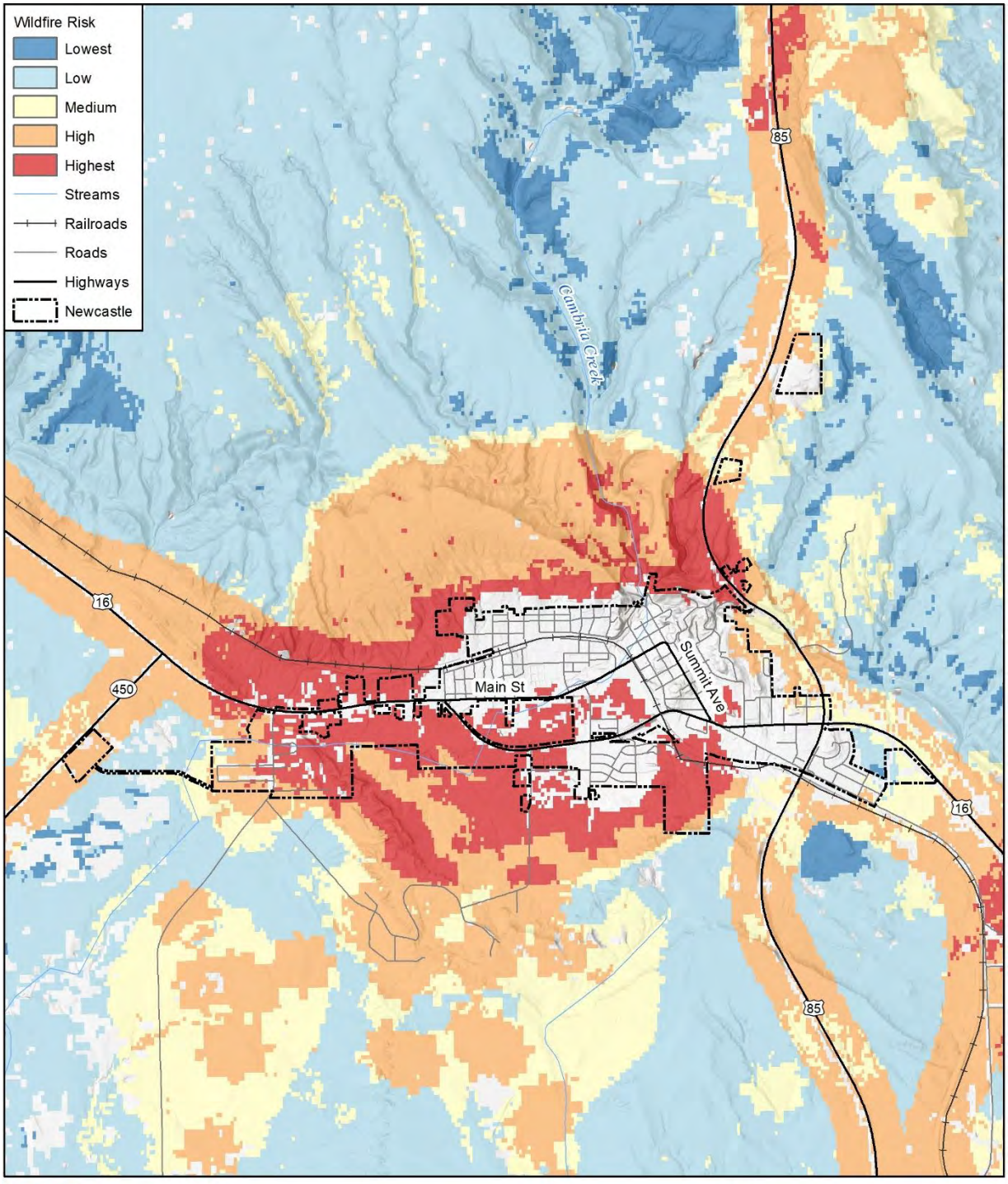


Figure 13 Town of Upton Wildfire Risk

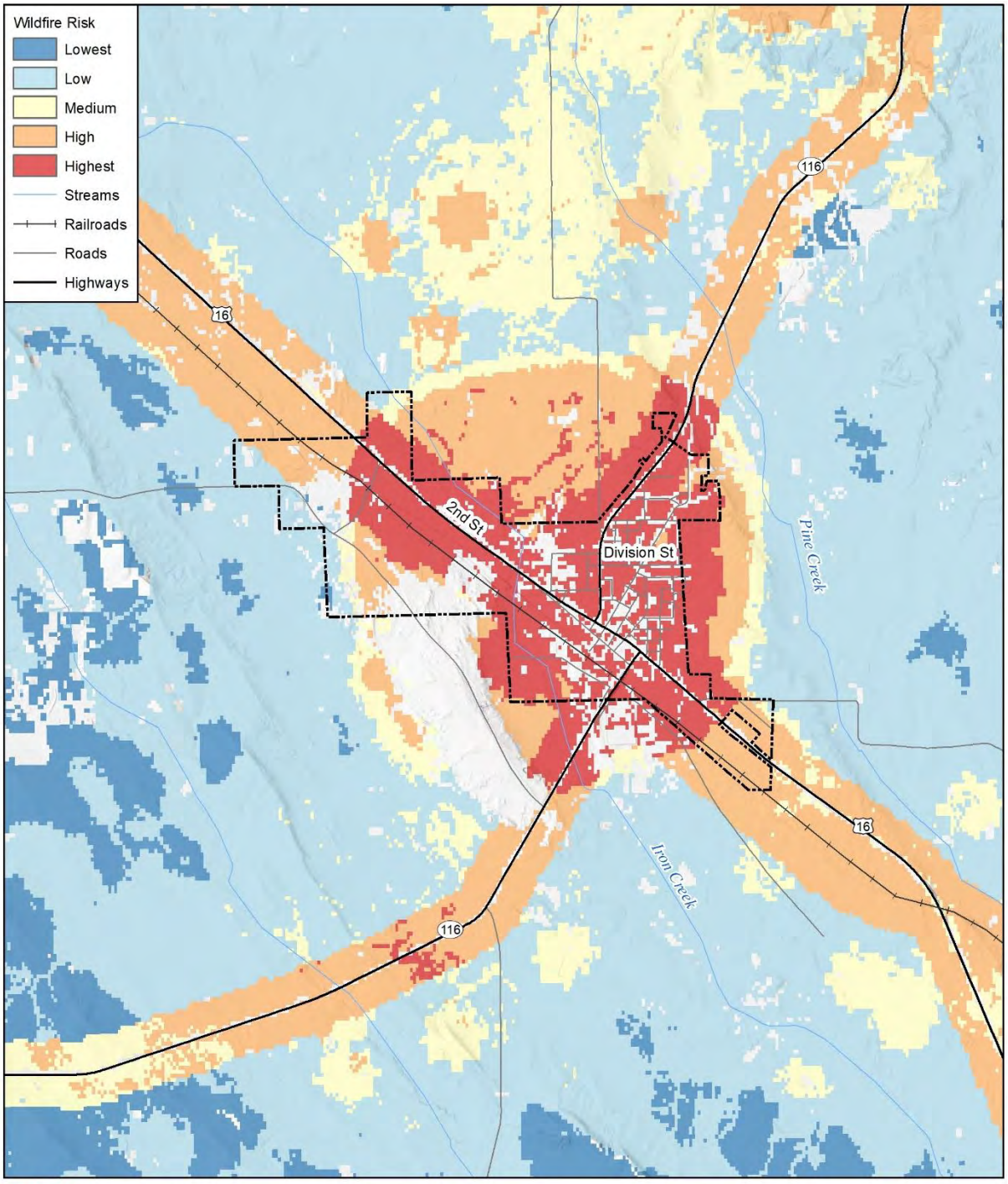


Figure 14 Weston County WUI Risk

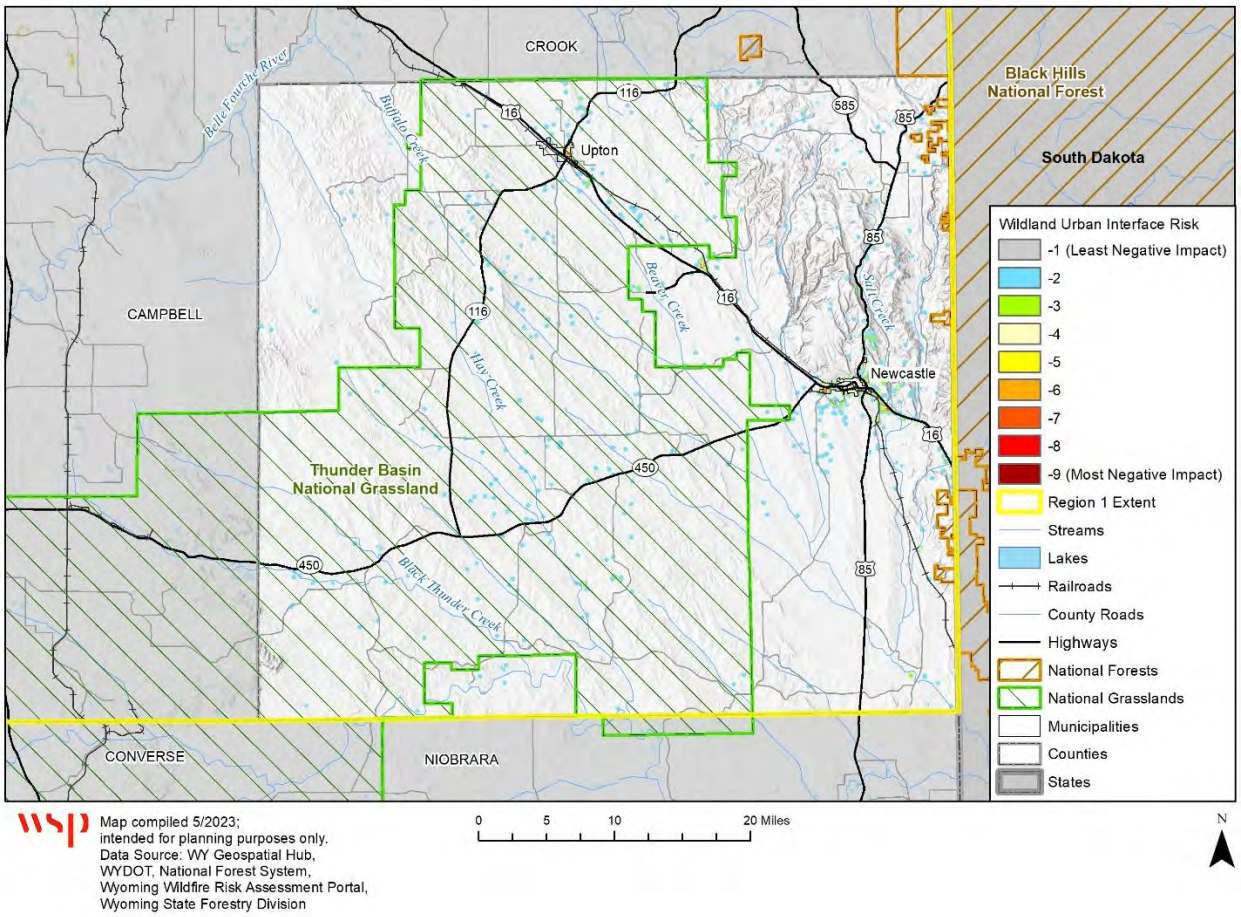
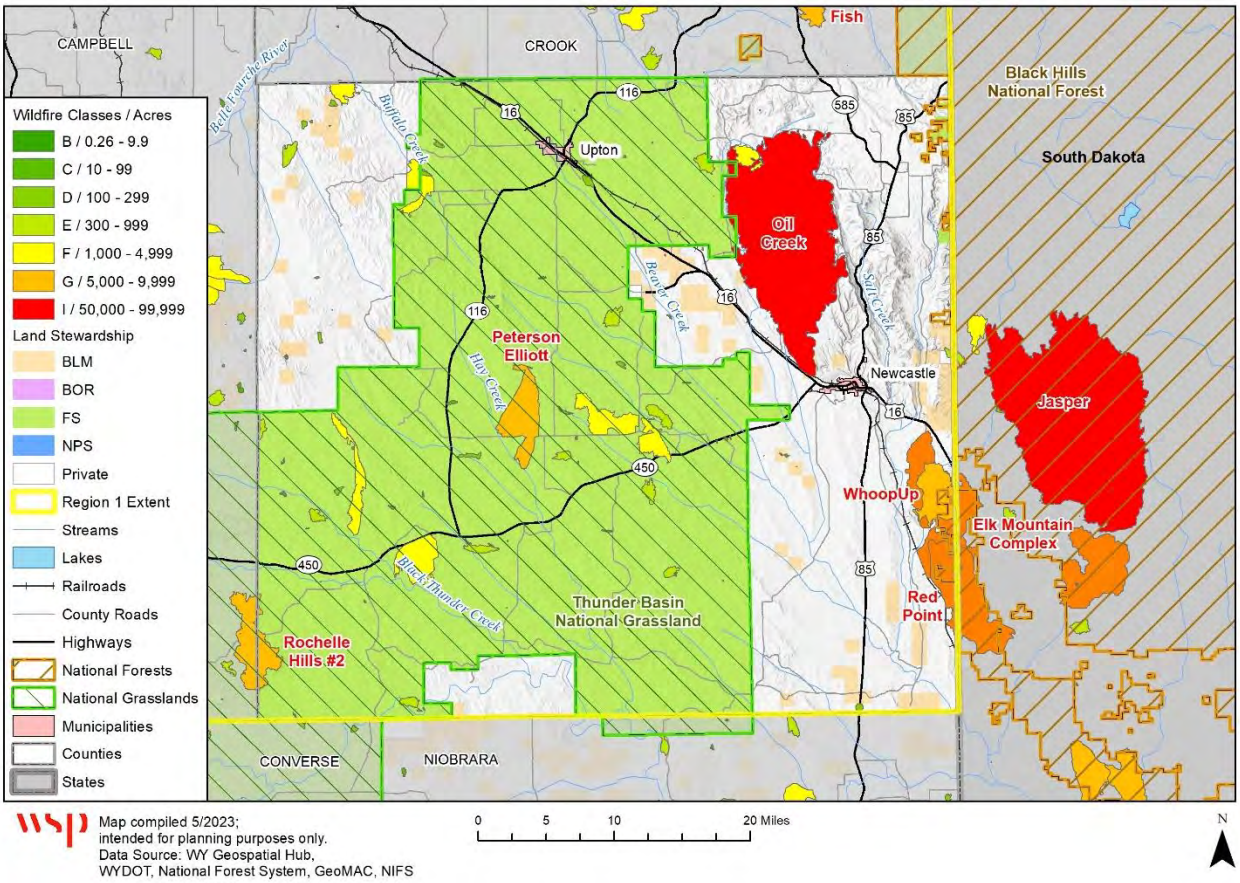


Figure 15 Weston County Wildfire History, 1980-2023



6.3.14.2 Development Trends

As noted in Sections 3 and 4, population growth in the unincorporated County may be indicative of a potential increase in hazard exposure. The wildland/urban interface (WUI) is a very popular building location, as shown by national and statewide trends, and anecdotal input from the HMPC indicates that this trend is occurring in Weston County.

6.3.15 Coal Seam Fire

The history of coal mining in Weston County suggests that the County may have experienced coal seam fires during various times. However, research from E. L. Heffern (2013)[1] shows limited history of coal seam fires in the area. The County and both municipalities ranked this hazard as Not Applicable.

7 Mitigation Capabilities Assessment

As part of the regional plan development, the Region and participating jurisdictions developed a mitigation capability assessment. Capabilities are those plans, policies and procedures that are currently in place and contribute to reducing hazard losses capabilities. Capabilities also include staffing and financial considerations, including the ability to leverage funding for mitigation projects. Combining the risk assessment with

1 *Known Historic Or Active Coal Fires In The Powder River Basin, Wyoming and Montana*, Compiled by E.L. Heffern, 2013; *Clinker Distribution and Age in the Powder River Structural Basin*, E. L. Heffern, P. W. Reiners, and C. A. Riihimaki, 2013

the mitigation capability assessment results in "net vulnerability" to disasters and more accurately focuses the goals, objectives, and proposed actions of this plan. The purpose of this effort was to identify policies and programs that were either in place or could be undertaken, if appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, projects, and programs to determine if they contribute to reducing hazard related losses.

Most communities, including Weston County, have developed, and implemented emergency preparedness plans for a variety of contingencies. Emergency preparedness plans are primarily reactive and focus on the community's readiness to respond to natural and man-made disasters if and when they occur.

7.1 Capability Summary

Table 7-1 provides an assessment of Weston County's mitigation capabilities, based on input collected from the HMPC via data collection guides and information on county and municipal websites.

Table 7-1 Weston County Capability Assessment

Element	County	Newcastle	Upton
Planning Capabilities			
Comprehensive Plan	No	No	No
Capital Improvement Plan	No	Yes	Yes
Emergency Operations Plan	Yes	Yes	Yes
Recovery Plan	No	No	No
Mitigation Plan	No	No	No
Debris Management Plan	Yes	Yes	Yes
Economic Development Plan	No	No	Yes
Transportation Plan	No	No	Yes
Land-use Plan	No	No	No
Flood Mitigation Assistance (FMA) Plan	No	No	No
Watershed Plan	No	No	No
Community Wildfire Protection Plan or other fire mitigation plan	Yes – 2018	Included in CWPP	Included in CWPP
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	Yes
Floodplain Management Plan	No	Yes	No
Stormwater Program/Plan/Ordinance	No	Yes	N/A
Erosion / Sediment Control Program	No	No	N/A
Policies/Ordinance			
Zoning Ordinance	No	Yes	Yes
Building Code (Provide Year)	No	No	Yes – v1997
Floodplain Ordinance	No	No	No
Subdivision Ordinance	Yes	No	Yes
Tree Trimming Ordinance	No	Yes	No
Nuisance Ordinance	No	Yes	Yes

Element	County	Newcastle	Upton
Storm Water Ordinance	No	Yes	No
Drainage Ordinance	No	Yes	NA
Site Plan Review Requirements	No	Yes	NA
Historic Preservation Ordinance	No	Local Committee	No
Landscape Ordinance	No	No	No
Growth Management Ordinance	No	No	Yes
Elevation Certificates for Floodplain Development	No	No	No
Other Hazard Ordinance (Steep slope, wildfire, snow loads, etc.)	No	No	No
Programs			
Zoning/Land-use Restrictions	No	Yes	Yes
Codes Building Site/Design	No	Yes	Yes
Hazard Awareness Program	THIRA	No	No
National Flood Insurance Program	No	Yes – 5/1/1986	No
Community Rating System (CRS)	No	No	No
National Weather Service (NWS) Storm Ready Certification	In Progress	In Progress	In progress
Firewise Community Certification	No	No	No
Building Code Effectiveness Grading (BCEGs)	No	No	No
ISO Fire Rating	No	Yes	No
Economic Development Program	No	Yes	No
Land-use Program	No	No	No
Public Education/Awareness	WCEM Chamber of Commerce, Univ. of WY/WCPH	Chamber of Commerce. WCEM	WCEM, WCPH
Property Acquisition	No	No	No
Planning/Zoning Boards	Yes	Yes	Yes
Stream Maintenance Program	No	No	No
Tree Trimming Program	No	Yes	No
Engineering Studies for Streams (Local/County/Regional)	No	No	No
Mutual Aid Agreements	EMS / Sheriff	No	Yes
Studies/Reports/Maps			
Hazard Analysis/Risk Assessment	THIRA, HMP	Yes - in HMP	Yes - in HMP
Evacuation Route Map	No	No	No
Critical Facilities Inventory	Yes - in HMP	Yes - in HMP	No
Vulnerable Population Inventory	At Risk Notification via. Code Red	No	No
Land-use Map	No	No	No

7.1.1 Land Use and Development Policies.

Weston County has always taken a simplified approach to land use management. Most communities in the nation and even some in Wyoming have addressed land use issues through zoning. Weston County is in the minority when it comes to using or not using zoning as a means for resolving and managing land use matters. With this in mind, the only local land use regulations that the County currently has are subdivision regulations. The County has not adopted building codes. Newcastle does have zoning but not building codes. Upton has building codes and zoning.

Administrative/Technical Resources

Table 7-2 Administrative/Technical Resources

Administrative/ Technical Resources	County	Newcastle	Upton
Staffing/Department			
Building Code Official	No	Yes	No
Building Inspector	Yes	No	No
Mapping Specialist (GIS)	Yes	Yes	Yes
Engineer	Yes	Yes	Contract
Development Planner		No	No
Public Works Official	Yes	Yes	Yes
Emergency Management Coordinator	Yes	Yes	Yes
NFIP Floodplain Administrator	No	Yes Public Works/City Building Inspector	No
Bomb and/or Arson Squad	RERT – Campbell County	RERT – Campbell County	RERT – Campbell County
Emergency Response Team	Yes	Yes	Yes
Hazardous Materials Expert	Yes	Yes	No
Local Emergency Planning Committee	Yes	Yes	Yes
Sanitation Department	No	Yes	Yes
Transportation Department	Yes – Road and Bridge Department	Yes/City Public Works	Yes/City Works
Economic Development Department	No	No	Yes
Housing Department	No	No	Yes
Historic Preservation	No	Yes	Yes
Planning Board / Commission	Yes	Yes	Yes
Warning Systems / Services (Flood)	Yes	Yes	Yes
Warning Systems / Services (Other/multi hazard)	Yes	Yes	Yes

Administrative/ Technical Resources	County	Newcastle	Upton
Grant Writing/ Management	Yes	No	Yes
Other?			

Table 7-3 Weston County Non-Governmental Organizations (NGOs) and Mitigation Partnerships

Non-Governmental Organizations (NGOs)			
Group	County	Newcastle	Upton
American Red Cross	Yes	Yes	Yes
Salvation Army	No	No	No
Veterans Groups	Yes	Yes	Yes
Local Environmental Organization	No	No	No
Homeowner Associations	Yes	No	No
Neighborhood Associations	No	No	No
Chamber of Commerce	Yes	Yes	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes	Yes	Yes

7.2 Financial Capabilities

Table 7-4 identifies the County and Town financial tools or resources that the jurisdictions have access to or are eligible to use and could potentially be used to help fund mitigation activities. Grants play a crucial role in enhancing and maintaining county roads, minimizing the reliance on county funds. They have also been pivotal in constructing and refurbishing vital county facilities, including the courthouse, Sheriff's Department, and Mallo Camp.

Table 7-4 Weston County Jurisdiction Financial Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)			Has this been used for mitigation in the past?
	County	Newcastle	Upton	
Apply for Community Development Block Grants	Yes	No	Yes	No
Fund projects through Capital Improvements funding	Yes	No	Yes	No
Authority to levy taxes for specific purposes	Yes, but currently maxed out	No	Yes	No
Fees for water, sewer, gas, or electric services	No	Yes	Yes	No

Financial Resources	Accessible/Eligible to Use (Yes/No)			Has this been used for mitigation in the past?
Impact fees for new development	Yes, was done when building coal mines	No	Yes	No
Incur debt through general obligation bonds	Yes, but have not done so	No	Yes, but we have no bonded debt at this time	No
Incur debt through special tax bonds	Yes	No	Yes, but we have no special tax bonds out at this time	No
Incur debt through private activities	No	No	Yes, but we have no private debt at this time	No
Withhold spending in hazard prone areas	No	No	NA	No
FEMA Hazard Mitigation Assistance grants	Yes	Yes	Yes	Yes
Other				

Source: Data provided by jurisdiction

The CPT noted that Weston County is exploring the potential use of Hazard Mitigation Grants in the near future to enhance its capabilities in addressing issues related to flooding and wildland urban fire protection. It was also noted that the Town of Upton has adopted a Continuity Plan through policy that is designed to reduce disaster losses.

The CPT also noted a mitigation accomplishment in 2022, the successful conclusion of the Willow Street Water & Sewer project resulted in the resolution of certain drainage and flooding concerns. Additionally, since the inception of the 2018 plan, several projects, including Upper Pine Street, Pearl Street, Kellog Street. 3rd Street, and Willow Street, have been completed. These projects collectively bolster the Town of Upton's capacity and dependability when it comes to the fire flows. Furthermore, the City of Newcastle has also undertaken updates to its water and sewer projects.

The County has received FEMA Hazard Mitigation Grant Program funding under DR-4306 for utility protective measures for a total project cost of $111,933, with the federal share being $83,994.

7.3 Education and Outreach Capabilities

Table 7-5 shows the mitigation education and outreach capabilities the County and jurisdictions have in place now. It was noted by the HMPC that there is a need for the improvement of outreach and education.

Table 7-5 Weston County Education and Outreach Capabilities

Education & Outreach	Yes/No (And Briefly Describe)		
	Weston County	Newcastle	Upton
Public Education /Outreach Program	WCPH, WCEM trainings, EWC, WCSD #7, WCSD #1	No	No
Citizen Groups That Communicate Hazard Risks	LEPC	LEPC	LEPC
Firewise	No	No	No
StormReady	Yes	No	No
Other?	Social Media through Weston County Emergency Management and other Partner Agencies	No	No

Source: Data provided by jurisdiction

7.4 Opportunities for Enhancement

Based on the capabilities assessment, Weston County and the municipalities have several existing mechanisms in place that already help to mitigate hazards. There are also opportunities for the jurisdictions to expand or improve on their policies, programs and fiscal capabilities and further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and WOHS. Additional training opportunities will help to inform County and municipal staff members on how best to integrate hazard information and mitigation projects into their departments. Continuing to train staff on mitigation and the hazards that pose a risk to the County will lead to more informed staff members who can better communicate this information to the public.

Other opportunities include improved cross-jurisdictional communication on evacuation and awareness to mitigate life safety impacts during dam incidents, floods, or wildfires including the development of brochures and using existing communication capabilities through social media or other media. Other specific opportunities for improvement include:

- Mitigation efforts planned aim to safeguard critical infrastructure or replace deteriorating infrastructure to protect both property and human lives.
- Develop a County Comprehensive Plan.
- Consider benefits of joining the National Flood Insurance Program

Newcastle:

- Build grant writing capabilities to leverage mitigation fundings.

Upton:

- Consider benefits of joining the National Flood Insurance Program

7.4.1 NFIP Participation and Continued Compliance

Unincorporated Weston County is not mapped and is not required to participate in the NFIP; they are exploring the possibility of participation in the future. The City of Newcastle has been a participant in the NFIP since 1986. The Town of Upton is mapped but does not participate in the NFIP, and residents can't get federal flood insurance as a result; according to the community, the Town is minimally flood prone. As a result of the planning process, the Town will re-evaluate the pros and cons of participation and contact the state's NFIP coordinator at WOHS to discuss further.

Table 7-6 NFIP Status in Weston County

Jurisdiction	Effective Map Status	Date Joined	Comments
Weston County	Not mapped		Participation optional due to no mapping
City of Newcastle	04/2/02	05/01/86	
Town of Upton	06/25/76		Sanctioned since 06/25/77

Source: NFIP Community Status Book

The City of Newcastle has been a participant in the NFIP since 2002 and will continue to comply with the NFIP to reduce flood losses and increase flood resiliency. Continued compliance with the NFIP includes continuing to adopt floodplain maps when updated and implementing, maintaining and updating floodplain ordinances. Actions related to continued compliance include:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- **Implementation of substantial improvement/substantial damage provisions**. After a flood event, or any event that may cause loss of a structure such as a fire or tornado, it is the role of the floodplain administrator to review and assess damaged structures located within the Special Flood Hazard Area. Substantial improvement/substantial damage occurs when the cost of restoring a structure exceeds 50 percent of its market value before damage occurred. Property owners are advised that structures experiencing substantial damage or undergoing substantial improvements must go through the floodplain application and permit process. Additionally, these structures must be upgraded during the repair or reconstruction process to meet the minimum building standards stipulated in the regulations. If it is determined substantial improvement/substantial damage has occurred, those structures must be brought up to current floodplain management standards. This ensures compliance with floodplain management measures and contributes to the overall safety and resilience of the affected structures. Additional items specific to Newcastle include:
  - The City Building Inspector as the floodplain administrator is responsible for reviewing permits to determine applicability of the substantial improvement/ substantial damage provisions.
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;

- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

Also, to be considered are the flood mitigation actions contained in this Regional Plan that support the ongoing efforts by participating counties to minimize the risk and vulnerability of the community to the flood hazard, and to enhance their overall floodplain management program.

8 Mitigation Strategy

This section describes the mitigation strategy and mitigation action plan for Weston County. See Chapter 5 of the base plan for more details on the collaborative process used to develop and update the mitigation strategy.

8.1 Mitigation Goals

As part of the 2018 planning process, Weston County identified six goals and a number of objectives to guide the development of the Hazard Mitigation Strategy. Goals from other hazard mitigation plans in the Region were reviewed during the planning process.

During the 2023 plan update, the HMPC revisited the goals and objectives which were developed in prior iterations of the regional plan. The goals and objectives provide a guide to help protect people and property in Weston County from natural and human-caused disasters. The HMPC felt that these goals and objectives still aligned with the intent of Weston County's mitigation strategy and chose to keep them. The goals and objectives are as follows:

Goal 1: Reduce the impact of severe weather on people, property or natural resources.

- Objective 1.1: Improve severe weather detection and tracking capabilities.
- Objective 1.2: Improve warning and communication capabilities.
- Objective 1.3: Provide public education on personal preparation and appropriate response to severe weather events.
- Objective 1.4: Promote appropriate shelter during severe weather.
- Objective 1.5: Increase the local capacity to deal with psychological effects of emergency and disaster events.
- Objective 1.6: Reduce Flood Damage.

Goal 2: Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

- Objective 2.1: Determine the need for volunteers and training.
- Objective 2.2: Provide training and public educational opportunities.
- Objective 2.3: Reduce the potential for fire in future developments

Goal 3: Maintain the reliability and resilience of critical infrastructure.

- Objective 3.1: Work to harden critical public infrastructure.
- Objective 3.2: Provide for continuity of both governmental and private sector functions.
- Objective 3.3: Provide for continuity of public sector GIS data/information functions.

Goal 4: Reduce the impact of human-caused incidents, emergencies or disasters.

- Objective 4.1: Prepare the public to minimize the impact of hazardous material incidents.
- Objective 4.2: Reduce the impact of terrorism within the jurisdictions.
- Objective 4.3: Reduce the impact of incidents, emergencies and disasters on our Special Needs populations.

Goal 5: Increase resilience through coordination of governmental policies, procedures, codes and regulations.

- Objective 5.1: Review current planning documents and their ability to protect the public from natural and human-caused incidents, emergencies and disasters.
- Objective 5.2: Educate the public and contractors about the relationship between construction techniques and potential for disasters.

8.2 Mitigation Actions

This section provides updates on the actions identified for Weston County in the 2018 Wyoming Region 1 Multi-Hazard Mitigation Plan, along with new actions identified during the 2023 Regional Plan update.

8.2.1 Progress on 2018 Actions

During the 2023 planning process the Weston County Planning Team reviewed all the mitigation actions from the 2018 plan. Of their 13 mitigation actions from 2018, six of the county actions are continuing or are implemented annually, demonstrating ongoing progress towards building the community's resiliency to disasters. These continuing actions are detailed in the following section.

Five (5) actions have been completed since 2018 and another three have been deleted, which are detailed in Table 8-1 below.

Table 8-1 Completed and Deleted Mitigation Actions

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
MJ-3	Acquire additional generators at critical facilities. Availability and need. gas company possible source of funds, community stake holders, Wyoming Earth Moving for equipment	Multi-hazard: wind, winter storm, lightning, flood	County, Newcastle, Upton	Low	Deleted. This has been replaced by new action specific to shelters.

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
MJ-4	Evacuation Routes. Determine evacuation routes for any given emergency, fires, spills, landslides	Wildfire, Hazmat, Landslide	County, Newcastle, Upton	High	Completed. County Evacuation Annex to the EOP
MJ-5	Conduct a Commodity flow study - railroad. County, Tiger Rail car park Hazardous materials	Hazmat	County, Newcastle	High	Completed in 2023.
C-1		Multi-hazard: wind, winter storm	County	High	Deleted.
C-2	Safe rooms. Provide safe shelter locations for public and mobile home communities. Identify current shelters that qualify for Tornado Shelters, purchase or construct predesigned safe rooms: Newcastle 3 safe rooms, Upton 2 safe rooms, Osage 1 safe room	Tornado	County	High	Completed. All shelters have been identified in all communities; we are not doing "safe rooms" but have tornado shelters identified.
N-1	Flood Mitigation - Cambria Creek thinning. Enhance/improve drainage stream flow along Cambria Creek through Newcastle. Possible Channel work. Reduce potential of flooding through town. Remove trees and other vegetation to improve/ enhance stream flow.	Flood	Newcastle	Low	Completed.
N-2	Flood Mitigation - Carter St. flow over, change to culvert. Carter Street was designed to have Cambria Creek flow over the street during times of flood/heavy runoff. At times this renders the street impassible or at best dangerous to cross. Re-engineer and put culverts in stream bed and raise road level to avoid overflow	Flood	Newcastle	Low	Deleted. Not cost effective.

2017 ID	Mitigation Action	Hazards Mitigated	Jurisdiction	Priority	Status/ Implementation Notes
N-3	Wildfire - fuels reduction adjacent to City limits. Identify high risk areas and options to include controlled burns or mechanical treatments	Wildfire	Newcastle	High	Completed. Fuels reduction/thinning has taken place

8.2.2 Identification and Implementation of Mitigation Measures

During the 2023 Regional Plan development, existing mitigation projects for Weston County were assessed to determine whether the action was completed, deleted, or ongoing/continued. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources. The action plans were also shared amongst the regional plan participants to showcase progress and stimulate ideas amongst the respective planning committees in each county. The HMPC's evaluation of action items and goals also lead to the development of new strategies.

Table 8-2 details all continuing and new mitigation actions for the 2023 regional plan. Weston County has developed 13 new mitigation actions in 2023 to accompany the 6 continuing mitigation actions from 2018, for a total of 19 mitigation actions.

Background information as well as information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and timeline also are described. Per the DMA requirement, actions have been identified that address reducing losses to existing development as well as future development.

The Cost Estimate column describes the estimated project costs using the following categories:

- Little to no cost
- Low: Less than $10,000
- Moderate: $10,000-$100,000
- High: $100,000-$1,000,000
- Very High: More than $1,000,000

The Timeline column describes the estimated time of completion for each project using the following categories:

- Short Term: 1-2 years
- Medium Term: 3-5 years
- Long Term: 5+ years
- Ongoing: action is implemented every year

The Status/Implementation Notes column describes the progress made on the actions so far using the following categories:

- Not Started: project is carried over from the previous Weston County Annex; little to no work has been completed.
- In Progress: project is carried over from the previous Weston County Annex; work has begun on the project and is proceeding.
- Annual: project is carried over from the previous Weston County Annex and is implemented every year on an ongoing basis.

- New in 2023: The action is new to this plan update; little to no work has been completed.

Table 8-2 Weston County Mitigation Action Plan

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
MJ*-1	Culverts/ infrastructure upgrades to reduce flood and stormwater damage. Upton, Osage, Newcastle storm water management plan, not flood mapping	Flood	Weston County, Newcastle, Upton, Osage	Upton, Osage, and Newcastle administration, WY DOT, **County Public Works**	Ongoing	Moderate; Staff Time, PDM Grants, NFIP CAP, USACE Small Flood Control Projects	Medium	In Progress. Continuous Upgrades of Culverts and other critical infrastructure is still taking place. Replacing old bridges etc.
MJ-2	Install additional lightning protection at public buildings and critical facilities. Protect Property, infrastructure and community during severe storms from damage by lightning by providing diversion, surge protection for facilities, education to the public, signage about dangers of lightning in public arenas. Avoided damages to electrical equipment, buildings, fire protection, prevent loss of life	Lightning	Weston County, Newcastle, Upton	**County EM**, NOAA partner/	Short Term	Moderate; HMGP, PDM, NOAA, funding NWS - awareness, signs local stakeholders	Low	In Progress. Signage was placed and education has been done.
MJ-3	Wildfire Protection. Educate the public about the dangers or wildfires and how to construct buildings to prevent them from burning. Educate the public about creating a defensible space around their homes. Work with Electric, Telephone, companies to replace old weathered or damaged poles. Create incentives to control undergrowth, and overgrowth.	Wildfire	Weston County, Newcastle, Upton	**Fire Warden**- Weston County Fire Protection District, Fire District Board, State Forestry, Fuel Mitigation Coordinator	Ongoing	Moderate; Program is currently funded through Weston County Fire Protection District	High	Annual Implementation. Always continuous as Wildfire is our #1 Hazard
MJ-4	Additional Sirens for Upton to enhance awareness and operational resiliency during severe weather events.	Dam Failure, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Severe Winter Weather, Tornado, Wildfire,	County, Upton	Upton administration, **County EM**	Short Term	Moderate; County General Fund; Municipal General Funds; HMGP, FMA, NWS	High	In Progress. We have been replacing old sirens but have not yet added sirens yet.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
MJ-5	CWPP update with a focus on identifying and prioritizing communities at risk	Wildfire	Weston County, Newcastle, Upton	**County EM**, Conservation District	Short Term	Medium; Community Wildfire Defense Grants	High	New in 2023
MJ-6	Work with state and FEMA on the need for floodplain mapping to be able to understand flood hazard risk and enable ability for floodplain management	Flood	County, Upton	**County EM**, WOHS, Conservation District	Medium Term	Staff Time, WOHS/FEMA, NFIP Community Assistance Program (CAP), Risk MAP Program	Low	New in 2023
MJ-7	Work with other counties in the region to show support for addressing weather radar shadow/ gap with mobile radar units; project is being advocated by State Engineers Office (SEO); this would enhance visibility of storms tracking from the west	Dam Failure, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	County, Upton, Newcastle	**County EM and other EM coordinators in Region 1**; Upton and Newcastle administration WY SEO; NOAA	Short Term	Moderate; SEO, NOAA	High	New in 2023
MJ-8	Develop a "Good Neighbor Handbook" related to rural living in Weston County its municipalities and include a section on hazards, construction considerations for drought, landslides, subsidence, earthquakes, expansive soils and wind, and encourage self-sufficiency before and during hazard events.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Weston County, Weston County, City of Newcastle, Town of Upton	**County EM and Planning**, Upton and Newcastle administration Conservation District	Short Term	Low; Staff Time, FEMA HMA, EMPG	High	New in 2023 Refer to other examples such as Chelan County WA or the Hot Springs County "Code of the West" document). The document would be placed in the administration offices and libraries of the participating jurisdictions.
C-1	Vulnerability analysis on utility poles. Work with utility providers to survey where pole falls occur and why to assess mitigation options and upgrade status/schedules	Flood, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	County	Utility companies: Powderhorn, Sundance, Black Hills Power, in coordination with **County**	Short term	Moderate; FEMA HMA, Utility companies	Medium	Not started.

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
C-2	Work with partners regarding the need and installation of additional snow fences on major transportation corridors. Prevent blowing snow during snowstorms to allow for efficient clearing of major highways. Avoid impacts to transportation routes (16 & 85)	Winter Storms	County	**County Road & Bridge**, WY DOT, Conservation District	Short Term	Staff Time: HMGP, WYDOT, Road and Bridge Budget, Conservation District Funds, State Living Snowfence Program	Low	In Progress. The Wyoming Living Snowfence program could be a resource, as well as the Conservation District, for implementation.
C-3	Backup power for shelters & emergency communications. Obtain backup generators for emergency shelters and emergency communications to maintain operational resiliency during hazard events.	Earthquake, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	Weston County	**County EM**, Fire, EMS, Sheriff's Office, Search & Rescue	Short Term	Moderate; EMPG ARPA Grant	Medium	New in 2023
C-4	Backup power for schools to build resilience for extreme weather events.	Earthquake, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado, Wildfire	Weston County, Newcastle, Upton	**County EM**, School District	Short Term	Moderate; EMPG ARPA Grant	Medium	New in 2023
C-5	Install 4 weather stations to enhance drought monitoring and other severe weather hazards	Drought, Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	Weston County, City of Newcastle, Town of Upton	**County EM**, Upton, Osage, and Newcastle administration Conservation District	Short Term	Moderate; NWS, County General Funds, Municipal General Funds,	Medium	New in 2023
C-6	Culvert and bridge enhancement to reduce repetitive washouts and damage on county roads and preserve access during hazard events	Flood	County	**County Road & Bridge**, WY DOT, Conservation District	Medium Term	High; PDM Grants, NFIP CAP, USACE Small Flood Control Projects	Medium	New in 2023
C-7	Evaluate options for severe weather shelter at the Fairgrounds	Flood, Hail, High Wind, Lightning, Severe Winter Weather, Tornado	County	**County EM**, County Public Works	Short Term	Low; Staff Time, EMPG/HMEP	Low	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
C-8	Update Emergency Operations Plan to include evacuation planning annex related to wildfires, hazardous materials incidents.	Wildfire, Hazmat	County	**County EM**, LEPC	Short Term	Little to no cost; Staff Time, EMPG	Medium	New in 2023
C-10	Develop new dispatch center with enhanced communication infrastructure and backup power to enhance operational resiliency and mitigate potential life safety impacts during hazard events.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Weston County, City of Newcastle, Town of Upton	**County EM** Upton and Newcastle administration	Medium Term	High; FEMA Homeland Security Grant Program, BRIC	Medium	New in 2023
C-11	Initiate a rural addressing program in the County to enable improved operational resilience, including the ability for mitigation and response for residents that may have access and functional needs.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	Weston County	**County Planning,** GIS	Long Term	Medium; County General Funds, Staff Time	Medium	New in 2023

ID	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/Implementation Notes
C-12	Leverage online survey tools for continued public involvement related to hazard education, awareness, and mitigation ideas.	Dam Failure, Drought, Earthquake, Expansive Soils, Flood, Hail, Hazmat, High Wind, Landslide, Lightning, Subsidence, Severe Winter Weather, Tornado, Wildfire, Coal Seam Fire	County	**County EM**	Short Term	Little to no cost; Staff Time	Low	New in 2023

*Multi-Jurisdictional

9 Implementation

Moving forward, the County HMPC will use the mitigation action table in the previous section to track progress on implementation of each project. Implementation of the plan overall is discussed in Chapter 6 in the Regional Plan.

The Weston County HMPC formed during the 2023 Regional Plan update will be responsible for implementing and reviewing the plan action items. The HMPC will meet no less than semi-annually, or as time permits.

The Weston County Commissioners and the Mayor of all cities and towns (except where noted in Section 1) in Weston County will adopt the Region 1 Hazard Mitigation Plan and each jurisdiction will take responsibility for plan implementation of mitigation issues arising in their jurisdictions. Plan implementation and evaluation will be a shared responsibility among the HMPC. The Weston County EM Coordinator will serve as a convener to facilitate the HMPC meetings and will assign tasks such as updating and presenting the Plan to the members of the group.

9.1 Incorporation into Existing Planning Mechanisms

Also, discussed in Chapter 6 of the base plan is the importance of implementation and incorporation of the principles of this plan into other planning mechanisms.

To determine if this plan is consistent with goals identified in other community plans, the members of the Weston County Emergency Management Agency, along with the HMPC and LEPC, will meet with other agencies who have plans that address such issues as debris management, subdivision resolutions/ordinances, or Community Wildfire Protection Plan. The process will provide an opportunity to integrate and/or correlate plans for the purpose of:

- Determining if the mitigation plan is compatible with goals stated in other plans.
- Identifying mitigation initiatives or proposed projects which serve multiple objectives for the communities and could be included in multiple plans.
- Identifying needs for revision or updating to the mitigation plan, or other plans, to provide a more comprehensive approach to hazard mitigation (including addition of new mitigation measures).

During the 2023 planning process the HMPC discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. As described in the capability assessment, the County and municipalities already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. The group discussed opportunities to cross reference the hazard mitigation plan in other upcoming planning efforts. Where applicable, these existing mechanisms could include:

- County or community comprehensive or land use plans
- County or community development codes
- County or community Emergency Operations Plans
- Threat and Hazard Identification and Risk Assessments (THIRA)
- Community Wildfire Protection Plan (CWPP) updates

- Recovery planning efforts
- WYDOT landslide and winter storm mitigation efforts
- Office of State Lands and Investments Drinking Water or Clean Water Intended Use Plan
- Other plans, regulations, and practices with a mitigation aspect

9.1.1 General Process

To determine if this plan is consistent with goals identified in other community plans, the members of the Weston County Emergency Management Agency, along with the HMPC and LEPC, will meet with other agencies who have plans that address such issues as debris management, subdivision resolutions/ordinances, or Community Wildfire Protection Plan. The process will provide an opportunity to integrate and/or correlate plans for the purpose of:

- Determining if the mitigation plan is compatible with goals stated in other plans.
- Identifying mitigation initiatives or proposed projects which serve multiple objectives for the communities and could be included in multiple plans.
- Identifying needs for revision or updating to the mitigation plan, or other plans, to provide a more comprehensive approach to hazard mitigation (including addition of new mitigation measures).

During the 2023 planning process the HMPC discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. To date the previous mitigation plan has not been integrated with other planning efforts, but opportunities to do so more effectively moving forward are noted in the next sub-section.

9.1.2 Individual Process

The group discussed opportunities to cross reference the hazard mitigation plan in other upcoming planning efforts. As described in the capability assessment and **Error! Reference source not found.**, the County and municipalities already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. The list below shows plans that are both common and/or unique to the participating jurisdictions that may have applicable goals, projects or actions related to mitigation and resilience. When these plans are updated identifying relevant cross-references to the hazard mitigation plan will foster resilience by factoring in hazard considerations into multiple planning mechanisms:

- County
    - Emergency Operations Plan
    - Debris Management Plan
    - Community Wildfire Protection Plan (CWPP)
- Municipalities (Newcastle and Upton)
    - Capital Improvement Plan
    - Emergency Operations Plan

- Debris Management Plan
- Floodplain Management Plan (Newcastle)
- Economic development plan
- Transportation Plan

9.2 Funding Sources

Funding for mitigation projects may come from a variety of sources. Below is a partial list of possible sources of funding that could help fund the actions identified in Section 8.

Local Government

- General revenues in the form of matches.
- One Percent Sales Tax
- County and Municipal Utility Authorities

State of Wyoming

- Community Development Block Grant Program
- Federal Mineral Royalty Capital Construction Account
- Wyoming Water Development Program
- State and Community Highway Safety, Department of Transportation
- State Lands and Investments Board (SLIB) Grants and Loans
- Transportation Enhancement Activities Local (TEAL)
- Wildfire Mitigation Grant (State Forestry Division)

Federal Government Programs

- Federal Emergency Management Agency Hazard Mitigation Assistance Grants including:
  - Building Resilient Infrastructure and Communities (BRIC)
  - Pre-Disaster Mitigation (PDM)
  - Flood Mitigation Assistance Program (FMA)
  - Hazard Mitigation Grant Program (HMGP)
  - Notice of funding availability typically released in June with applications due in October/November of each year.
  - HMGP is dependent on federally declared disasters within the state and funding amount is based on a percentage of disaster relief costs.
  - FEMA Fire Management Assistance Grants - As of June 8, 2018 FEMA is making HMGP funds available for states, territories, and federally-recognized tribes that have a Fire Management Assistance Grant (FMAG) declaration
- USDA Environmental Quality Incentive Program
- USDA Conservation Reserve and Conservation Reserve Enhancement Program
- USDA Small Watersheds (NRCS)

There are many more potential funding opportunities available to the municipalities and county.

Funding research will be done during the scoping process for each project to determine what funding mechanisms are available and appropriate for that project. Funding cycles will be monitored to ensure there is adequate time to prepare grant applications.

9.3 Monitoring, Evaluating and Updating the Plan

Weston County will follow the procedures to review and update this plan in accordance with Region 1 as outlined in Chapter 6 of the Regional Plan. Weston County realizes it is important to review and update this plan regularly. This is especially important as the County receives additional information, which might change the risk analysis and resulting mitigation projects list.

Continued public involvement is imperative to the overall success of the plan's implementation. The County has used online surveys to collect public feedback and will continue to use this as way for continued public involvement. Weston County will continue to solicit participation from the public in the following ways:

- Hard copies of the updated HMP will be available at the County Emergency Management office, with an electronic version available on the County website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions MJ-2, MJ-3, C-9, and C-12.
- The public will be invited to LEPC meetings where the HMP is discussed. The meetings will provide the public a forum for which they can express concerns, opinions, or ideas about the plan.
- The DES Coordinator will publicize meetings through public information channels including social media and web posting.

The City of Newcastle will:

- Post a link to the plan from the City's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions MJ-2 and MJ-3, as well as partnering with county-led initiatives such as action C-9 and C-12.

The Town of Upton will:

- Post a link to the plan from the Town's website.
- Implementation of mitigation actions in Section 8.2 related to hazard education and awareness, notably actions MJ-2 and MJ-3, as well as partnering with county-led initiatives such as action C-9 and C-12.

Wyoming Region 1
Regional Hazard Mitigation Plan

APPENDIX A: PLANNING PROCESS DOCUMENTATION

From:	Michael A. Phipps
To:	AFraser@bepc.com; Barbara Craig; Bernadette.Hinshaw@PacifiCorp.com; Brandon Price (brandon@gillettewy.gov); Breann Bockstahler (); Brislawn, Jeff P; Cheyenne Love (clove.cccd@gmail.com); christopher.beltz@cchwyo.org; Clark M. Melinkovich; Corey Nestor; David A. King; Dennis Holmes; Denton Knapp; DHugo@bepc.com; Doug Evans (doug.evans@wyo.gov); Dwayne L. Dillinger; Elizabeth Coleman; Eric Oubre (eric.oubre2@volunteer.redcross.org); Howard Jones; hyunk@gillettewy.gov; Jane C. Glaser, RN; Janie@gillettewy.gov; Jed L. Holder; Jeff Bender (jbender@ccfire.us); Jennifer Toscana; John Holloman; Joseph W. Kuchler; Kelly; Ken Rogers (binsp@gillettewy.gov); Kevin F. Geis; Leslie J. Perkins; Levi Strohschine (wrightwsd@vcn.com); Mark (marka@precorp.coop); Mark andersen; Matthew D. Olsen; Melissa Smith (melissa.smith@noaa.gov); Michael A. Phipps; Michael Howe; Michael "Mike" Cole; Paul J. Pownall; Randy Okray - Wyoming Dept of Transportation (randall.okray@wyo.gov); Richard Hauber (hauber.cccd@gmail.com); Robby Gallob; Ryan Fox; Sam G. Proffer; Sawley Wilde (sawley@gillettewy.gov); Shamika McDonald; Stephanie Monz (stephanie.munoz@redcross.org); Stephanie Styvar (stephanie.styvar@wyo.gov); Susan Sanders - NOAA Federal; Tim Kellogg (Tim.kellogg@usda.gov); Tracy Mathews (tracym@gillettechamber.com); Treasure L. Boller
Subject:	Region 1 Hazard Mitigation Plan Update 2023 – Planning Team invitation and kickoff meeting
Date:	Thursday, December 15, 2022 10:37:54 AM
Attachments:	image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

You are invited to the first of three planning meetings to update the Region 1 Hazard Mitigation Plan. The plan was developed in 2018 in accordance with the Disaster Mitigation Act of 2000, which requires all local governments to develop a plan to assess their risks to hazards and identify actions that can be taken in advance to reduce future losses. Hazard mitigation plans are to be updated every five years in order to maintain eligibility for FEMA Hazard Mitigation Assistance grants. The Region 1 Hazard Mitigation Plan includes Campbell, Crook, Johnson, Sheridan and Weston counties. Each county has an annex as part of the plan with specifics to each jurisdiction.

Regional Multi-jurisdictional Hazard Mitigation Plan Update
Kickoff Meeting/Webinar
Date: January 11, 2023
Time: 10:00am-noon
Remote Webinar link will be sent by Outlook.

The hazard mitigation planning process is heavily dependent on the participation of representatives from local government agencies and departments, the public, and other stakeholder groups. County Planning Teams (CPT) are being re-vitalized to support this project and will include representatives from the County and incorporated cities and towns. Other interested stakeholders, including local and regional agencies involved in hazard mitigation activities or agencies that regulate development, are also invited. This includes special districts, private-non-profit entities, business partners, academic institutions, and other local, state, and federal agencies in the Region.

At the kickoff meeting, we will discuss the benefits of updating the hazard mitigation plan, the project schedule, and revisit the list of hazards that affect the Region, such as wildfires, floods, winter storms, landslides, and more.

Appropriate persons to be a part of the planning committee include but are not limited to: county and municipal planners, public works directors, floodplain managers, economic development directors, GIS staff, first responders, local government administration, elected officials, business partners, private-non-profit representatives, and school district representatives. Entities that address underserved populations, as

well as special districts, are encouraged to participate. Each municipality or district must have at least one representative at the meetings to meet participation requirements. We request your assistance in forwarding this invitation to others in your jurisdiction, as needed. There will be 3 total primary planning meetings held during the update process over the next 6 months, with submittal of the updated plan for State and FEMA review later in 2023.

As the County Emergency Manager, I will be taking the lead in coordinating the update of this plan. The Wyoming Office of Homeland Security has hired a consultant, WSP, to manage the planning project. WSP will facilitate the planning process, collect the necessary data, and perform other technical services, including updating the risk assessment and plan document. However, to successfully complete this project and ensure that participating local government organizations are eligible for FEMA hazard mitigation assistance funding, we need your participation and input.

A Microsoft Outlook meeting invitation/calendar item will be sent out soon; please confirm your attendance or provide contact information for your designated alternate. Looking forward to your input and participation during the process.

Michael Phipps
Deputy Emergency Management Coordinator | Emergency Management

Campbell County wyoming

Campbell County Emergency Management
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"Providing quality, efficient and cost-effective services for all Campbell County residents through sound decision making and fiscal responsibility"

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WYOMING REGION 1 HAZARD MITIGATION PLAN UPDATE

CROOK, CAMPBELL, SHERIDAN, JOHNSON AND WESTON COUNTIES

KICKOFF MEETING

Wednesday, January 11, 2023, 10:00 am – 12:00 pm

Microsoft Teams Meeting

Join on your computer or mobile app

Click here to join the meeting

Meeting ID: 268 896 537 659

Passcode: MF7SUE

Download Teams | Join on the web

Or call in (audio only)

(866) 670-1764 898579776#

1. Opening Remarks and Introductions
2. Mitigation, Mitigation Planning, and Disaster Mitigation Act Requirements
3. Objectives and Schedule for Regional Plan Update
4. Regional Multi-County Steering Committee and County Planning Committees Organization and Roles
5. Review of Identified Hazards
6. Coordinating with Other Agencies\Related Planning Efforts\Recent Studies
7. Planning for Stakeholder and Public Involvement
8. Information Needs/Next Steps
9. Questions and Answers/Adjourn

Wyoming Region 1 Hazard Mitigation Plan Update
Kick-Off Meeting Summary
January 11, 2023, 10:00 am-12:00 pm MST
Virtual Webinar via Teams

Introductions and Opening Remarks

Wyoming Region 1, which includes Campbell, Crook, Johnson, Sheridan, and Weston Counties, will be updating its Regional Hazard Mitigation Plan in 2023. A kickoff meeting for this planning process was held on January 11, 2023, facilitated by WSP (formerly Wood Environment & Infrastructure Solutions, Inc.) the consulting firm hired by the Wyoming Office of Homeland Security to facilitate the planning process and develop the updated Region 1 plan. A total of 75 people attended (see Attendance Attachment), primarily representing county and municipal governments, as well as various stakeholders including representatives from Wyoming Office of Homeland Security (WOHS). Jeff Brislawn, Project Manager, (WSP) began the meeting by going over the meeting agenda. Each County Emergency Management Coordinator, as well as the State Hazard Mitigation Officer for Wyoming, introduced themselves to the group and thanked everyone for their participation.

The key discussion is summarized below; additional details can be found in the PowerPoint presentation. An interactive polling tool called Slido was used to gather feedback from the group throughout the meeting. After an icebreaker test question, the group was polled 'Did you participate in the 2017 plan?' 29% responded Yes and 71% No.

A recording of the meeting can be referenced at:

https://drive.google.com/drive/folders/1aopUYTy05Qwc4EYgw9r02v4aIuKUssJ9?usp=share_link

Mitigation, Mitigation Planning, and Disaster Mitigation Act Requirements Overview

Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from natural or human-caused hazards. Mitigation Planning guides mitigation activities in a coordinated and economic manner to make Wyoming more disaster resilient. The U.S. Disaster Mitigation Act of 2000 requires state and local governments to adopt a hazard mitigation plan, updated every five years, to maintain eligibility for FEMA mitigation assistance grants.

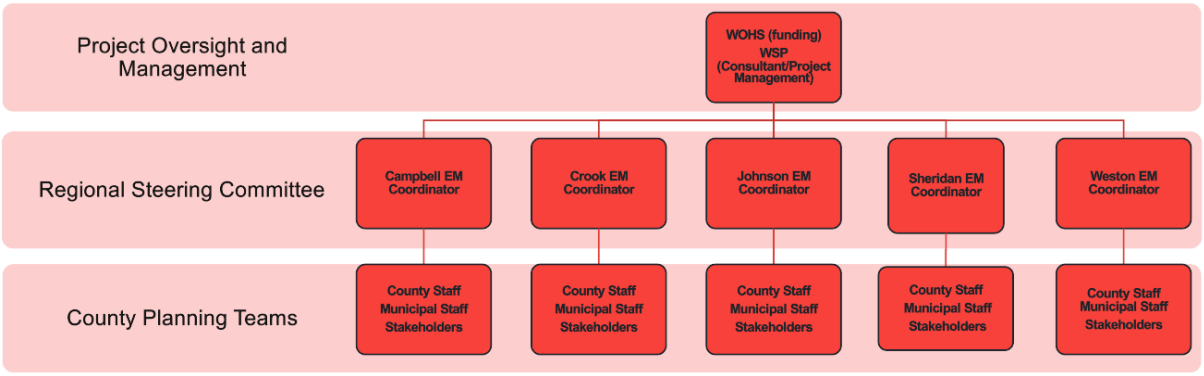
Jeff (WSP) explained the Disaster Mitigation Act of 2000 which requires having an updated plan in place to ensure each local jurisdiction in Region 1 is eligible for pre- and post-disaster hazard mitigation grant funds. There are trends resulting in increased costs for disaster response and recovery related to population growth and the increase in the types of events we experience as a community. The COVID-19 Pandemic is a good example of a circumstance that can cause a regional disruption in the community and to the economy. Jeff explained we need these plans for several reasons because they reduce future recovery costs, we can plan around predictive events, and they guide mitigation activities in a coordinated manner.

Jeff explained Federal Emergency Management Agency (FEMA) guidance breaks down the planning process into 4 key phases with 9 total steps (at the time of the meeting, Wyoming Region 1 is in the first phase of the planning process and will soon be entering the second phase of the process):

- Phase 1: Organize Resources
  - Step 1 Determine the Planning Area and Resources
  - Step 2 Building the Planning Team
  - Step 3 Create an Outreach Strategy
  - Step 4 Review Community Capabilities
- Phase 2: Assess Risk
  - Step 5 Conduct a Risk Assessment
- Phase 3: Develop a Mitigation Strategy
  - Step 6 Develop a Mitigation Strategy
- Phase 4: Plan Adoption, Monitoring, and Evaluation
  - Step 7 Keep the Plan Current
  - Step 8 Review and Adopt the Plan
  - Step 9 Create a Safe and Resilient Community

Step 2: Hazard Mitigation Planning Committee

The Region 1 Hazard Mitigation Planning Committee consists of the Regional Steering Committee represented by each of the five county Emergency Managers. The County Planning Teams are composed of county and municipal staff as well as stakeholders within each county. Jeff noted that every update cycle is an opportunity to include additional local government participating jurisdictions, which are defined by FEMA as any entity with a governing board. This includes special service districts. Some special districts have gotten on board with the plan update, including the Campbell County Conservation District. Jeff recommended any other special service district interested in participating should let their county coordinator know soon so they can be folded formally into the plan update effort.



Currently the Hazard Mitigation Planning Committee is working through Steps 3-5 of the 9-step planning process with the next steps of developing an outreach strategy, reviewing Region 1 capabilities, and conducting the Risk Assessment. Step 6 involves developing a mitigation strategy. Steps 7 and 8 involve final plan adoption and implementation and ensuring the adopted plan builds a safer and more resilient community.

Step 3: Public Outreach Strategy

FEMA requires we provide two opportunities for public involvement during the planning process: during the draft stage and prior to plan approval. Public involvement will include an online survey during the planning effort and will look to the participating jurisdictions to assist with advertising these opportunities. In addition, the County Planning Teams are asked to post the draft plan online and solicit comments prior to the submission to the State and FEAM. The WSP team will be responsible for documenting this process; this may involve documenting specific meetings with stakeholders or other organizations.

Step 4: Capabilities Assessment

Jeff explained that the team will examine existing policies and programs and evaluate the effectiveness of the mitigation gaps and shortfalls to see where there are areas for improvement. He stated the WSP team will also look at each jurisdiction's fiscal abilities to understand where there could be funding options for mitigation not limited to grants. The capability assessment is being aligned with current FEMA planning guidance and will be an area of focus during the update.

Step 5: Risk Assessment

Jeff discussed the three components of the risk assessment. He covered the aspects of natural hazards included in the assessment and how those hazards overlap with community assets. He discussed where there is overlap between the hazards and assets is where we have risk (e.g., potential for losses).

The vulnerability assessment looks at a range of assets in the Region: residential/commercial structures and critical facilities and infrastructure. The WSP team will align this update with the more recent FEMA Community Lifeline framework. Understanding risks to lifeline facilities and identifying ways to minimize those risks with mitigation actions, will better position the plan for grant funding. He also stated we will look at development trends and natural resource areas in terms of assets that may warrant protection from hazard impacts.

Step 6: Mitigation Strategy

The Mitigation Strategy begins with reviewing the plan's existing goals, which are broad overarching statements of what we want to achieve. Goals are supported by mitigation actions, which are specific and measurable. The group reviewed each of the counties' goals from the 2018 plan and Jeff noted these will be looked at more closely in future meetings.

Jeff reviewed the goals from the 2018 plan and shared different reference guides for mitigation action alternatives, such as FEMA's Mitigation Ideas document and the National Flood Insurance Program Community Rating System (NFIP CRS) guidance. The HMPC will need to review and select the alternatives for new actions as part of the plan update process. Each jurisdiction will need at least one new action, and actions will need to be prioritized. This will be done by applying selection and prioritization criteria, such as whether it will work, is it cost-beneficial, affordable, legal, and fair etc. This process will occur at a future planning meeting/workshop.

Steps 7 & 8: Plan Maintenance and Adoption

Jeff explained there will be three drafts of the plan: (1) Internal HMPC Review; (2) Public Review (3) State and FEMA Review. As part of the first review, the Regional Steering Committee will review and agree upon plan maintenance procedures. Each county and municipality within Region 1 will need to readopt the plan to secure the buy-in for the process.

David King noted that if FEMA does not approve the plan for any reason and it gets kicked back for changes, they are allowed another 45 days to review the document. This eats up a good chunk of the year period that Region has to develop the plan and get it approved before the old plan expires. Jeff noted that the State usually addresses any potential issues before FEMA, so there is typically no issue, but it is important to consider.

Objectives and Schedule for Regional Plan Update 2023

Jeff reviewed the key elements of the plan update process which include updating the risk assessment to reflect current hazards, past events and risk and vulnerability. The 2018 mitigation actions will be assessed, including developing new actions and documenting progress that has been made in terms of mitigation in the Region, as well as noting changes in priorities.

The plan expires on January 8, 2024, and the update will be developed over the next 9-12 months. The next meeting will focus on the Risk Assessment and Goals update, which will require the WSP team to conduct the assessment itself and complete the analysis. Other forthcoming deliverables include the public survey. The next 2 planning meetings will be in the spring and summer with exact dates to be determined.

Roles of the Multi-County Steering Committee and County Planning Committees

The county Emergency Management Coordinators will comprise the Steering Committee, which is a committee that will work with WSP throughout the process. Each Coordinator will convene a County Planning Team (CPT) within each participating entity. The CPTs will include members of appropriate departments, e.g., road and bridge, planning, public works, police/fire/public safety, and emergency management and include municipalities and could include special districts (e.g., fire and school). The coordinators will be responsible for identifying members of their HMPC and assisting with meeting logistics. The CPTs are responsible for participating in the planning process, assisting in the updating of the plans content and reviewing the draft plans to ensure it meets specific needs and local issues. Finally, each county will need to formally adopt the plan. By doing so the plan will maintain eligibility for FEMA mitigation funds. WSP will be facilitating the planning process and developing the risk assessment and plan update over the course of the next year.

Requirements for Participating Jurisdictions (adopting local governments and special districts):

- Attend and participate in planning meetings/workshops
- Provide available data requested of the County coordinators and WSP including a Plan Update Guide
- Provide input on progress on local mitigation strategy (actions/projects) and identify new actions/projects (where applicable)

- Advertise and assist with public input process
- Review and comment on draft plan
- Coordinate formal adoption

Stakeholders, which include representatives from the state or federal government, private, non-profit entities or other interested organizations have various options for their level of participation:

- Attending planning meetings or staying in the loop via email list
- Providing data and information
- Partner on mitigation efforts
- Review the draft plan

Shamika McDonald, the Wyoming State Hazard Mitigation Officer, noted that the CPTs should identify other stakeholders and interesting special districts or jurisdictions and invite them to attend the planning process. It is difficult to know what disasters will happen in the next five years and having this plan in place assures that any jurisdiction who wants to apply for a mitigation project down the road will have a much easier time getting the project approved than those who did not participate in this plan update. Shamika also noted that, while the county can apply on behalf of special districts and jurisdictions in their county, it is not recommended because the county would then be responsible for meeting all the procurement requirements, including quarterly reports and reimbursements.

Bob Latham with Crook County asked if the hospital district is someone they should encourage to get involved with the process. Jeff said yes, especially if they have a project in mind such as installing a generator, they could be eligible if they participate in this process. Anthony Vopat with the Hospital did note they planned on participating.

Shamika noted that FEMA considers participation as more than just simply showing up to meetings and signing in, but also providing feedback on the Hazard Identification and Risk Assessment and draft plan to ensure that all the information is accurate and catered to local areas of concern.

Review of Identified Hazards

Jeff led a brief discussion on the past hazard rankings, noting that there are some differences across jurisdictions for the significance rankings since that question was asked by a participant. The 2018 Region 1 plan addressed the following natural hazards:

- Dam Failure
- Drought
- Earthquake
- Expansive Soils
- Flood
- Hail
- High Winds
- Landslide
- Lightning
- Mine and Land Subsidence
- Severe Winter Storm
- Tornado
- Wildfire
- Hazardous Materials

The group also reviewed the hazard rankings of the 2020 Wyoming Statewide Hazard Mitigation Plan. Marilyn Connolly asked how vulnerable housing and populations are noted in the plan. Jeff explained that each hazard will include a discussion on how vulnerable populations will be adversely impacted by that hazard.

David King notes that a problem they have run into is that FEMA has more federal funding sources for natural hazards rather than human caused, such as cyber-attack, which is why the Weather Service is a key partner on the development of this plan.

Shamika noted that FEMA will consider projects that address multiple hazards, so while a project to address solely cyber-attack may not get approved, a project that couples cyber-security with another hazard could and she could talk about specifics with any interested jurisdiction.

Slido Poll: Do you generally agree with the current list and ratings of hazards? 97% replied Yes, 3% No.

Slido Poll: What other hazards should be considered? Answers include:

- Intentional damage to electrical substations
- Nuclear plant in other part of state
- Failures of food sustainability to rural areas
- Overloading electrical grids with increase in push for electric everything.
- dam features Such as debris clogs, ice dams, etc.
- Cyber
- human caused is very broad.
- Humans can cause a lot of problems
- Physical and cybersecurity of remote facilities, malevolent acts/sabotage, attacks on public utilities through drinking water
- failure of irrigation conveyances-on a limited scale probably
- Burning coal seams, maybe included in wildfires
- Sabotage on grid infrastructure
- Solar flaring activity on grid
- Specific (beyond hazmat), train derailment.
- From chat: Dan Coughlin "Stream erosion risk to infrastructure and ranking level of impacts specific to infrastructure affected such as water treatment facilities capabilities as a measure of the risk."

Jeff then reviewed a slide of previous disaster declarations in Region 1. Since 2018, there have been two disaster designations in the Region, both for COVID-19. David King noted that the number of disaster declarations seemed high for Campbell County. This is in part due to the two COVID-19 designations, the Hurricane Katrina survivor relocation disaster declaration, and the multi-county drought disaster declaration.

Slido Poll: Do you have specifics on any hazard impacts in the past 4 years that may increase or decrease vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)

- increased recreating in the outdoors, campfires, etc.
- Increased numbers of individuals moving in from the south who do not understand the safety risks associated with our winter weather patterns. They put themselves at risk in situations that natives may not.
- regional water connections
- Population growth along flood plain
- Increase in population

- Growth impact on already strained emergency services
- Crook County is seeing increase in rural development, as well as increased urban development in Pine Haven. This has increased the fire vulnerability.

Slido Poll: Do you have specifics on any hazard impacts in the past 4 years (damage assessments, people and property impacts, repair costs etc.?)

- Severe cold
- Large fire
- Windstorm event

Jeff reviewed a list of hazard information sources including the 2018 Region 1 HMP, 2020 State HMPC Community Wildfire Protection Plans, etc.

Slido Poll: What other existing or recent plans, reports, or studies should be reviewed for this planning process?

- Hazardous materials pipeline mitigation efforts.
- County/City Comp Plans
- ASDS so inspection and assessment of dams certified personnel
- Reservoir breach response plans
- 2017 Campbell County Forestry Strategy
- Water Risk & Resilience Assessments
- Updated wildland fire mitigation efforts, THIRA update, private utility improvements.
- All departmental response plans.
- CWPP
- Campbell County Natural Resource Land Use Plan
- Sheridan Wildfire Hazard Assessment, local watershed plans
- Water System Emergency Response Plan
- Sheridan area watershed assessment
- Watershed Planning
- AARs would be good references, especially for wildfires and winter hazards

Coordination with Other Agencies, Related Planning Efforts, and Recent Studies

A discussion was held on how to coordinate this planning process with other agencies, related planning efforts and recent studies in order to meet one of the DMA planning requirements. This is also an opportunity to develop a holistic plan and integrate related mitigation efforts where possible.

Slido Poll: Has the 2018 HMP been cross referenced or integrated with other planning mechanisms? If not, what opportunity exists to do so?

- Possible CWPP for Campbell County tied to a CWDG grant application. Stay Tuned.
- Crook County has crossed with its recent EOP update as well as THIRA
- I will have to talk to our planning depts to see what's out there
- It is cross referenced with our County Emergency Operation Plan Annexes
- Not with the NRLUP or Comp
- Not to my knowledge at least directly
- THIRA

Slido Poll: Are there any upcoming opportunities for outreach at scheduled public meetings or events?

- Third Thursday public events in downtown Sheridan during the summer.
- Home shows
- Invite I&S Districts, etc.
- Doing a presentation/briefing at council/commissioner meetings
- Will advise R1 HCC/HPP
- community speaks on the radio
- Johnson County will talk about this at the regular radio station public education program
- conservation district annual watershed meetings in March

Initial Information Needs/Next Steps

A Plan Update Guide will be developed by WSP to gather data and updated information from the Planning Teams. Each county and municipality will be asked to complete the data based on various department inputs. The Guide will capture recent hazard impacts in the last five years as well as input on capability assessment updates.

GIS data collection is already in process.

Stakeholders are asked to provide additional information on hazards, related planning, and project efforts as applicable. As well as stay in the loop of the planning process via emails from the county coordinators.

Slido poll: What key stakeholders should be involved in this process?

- Military if facilities in jurisdiction
- Agriculture groups
- National Guard (if you have them)
- Native people
- IT
- Support businesses such as mechanics, water district operators, support service businesses such as tire companies for support of equipment, etc.
- large private landowners
- K12
- Fire departments
- Those down line of agency or organization executives (i.e. crew foremen)
- any large industrial company mines or power plants etc.
- hospitals
- Mines/Industry
- County Commissioners
- EMS and Hospitals
- Hospitals, VA Complex in Sheridan
- Railroad
- County Commissioners
- Hospital
- Emergency Planners for private corporations
- From chat: Dan Coughlin “Private Property owners in the vicinity of hazards”

The group was polled 'What is your preference on how future meetings should be held?' 73% responded Virtual, 15% In Person and 12% No preference.

Attachments: Attendance and Chat Log

Attendees based on Chat Log input:

1. Allen Thompson-Sheridan County Commission
2. Allison McKenzie, NRCS, Buffalo
3. Amanda Hulet, District Clerk, Clear Creek Conservation District, Buffalo
4. Amy Ormseth, USFS
5. Anthony Vopat, EMS Coordinator Crook County, Medical Services
6. Bob Latham Crook County Commissioner
7. Brandon Elkins, MRCS, Gillette WY
8. Brandon Price, City of Gillette Wastewater Manager
9. Carrie Rogaczewski, District Manager, Sheridan County Conservation District
10. Carson Steinhorst, Supv. Field Operations, Montana Dakota Utilities
11. Chad Brutlag, City of Sheridan Fire-Rescue
12. Chase Christensen, Superintendent, Sheridan County School District #3
13. Cheyenne Love, Campbell County Conservation District Manager
14. Chris Schock, Mayor, Clearmont
15. Chris Thomas, Sheridan County Fire Warden
16. Christopher Johnson, WSP, Hazard Mitigation Planner
17. Cooper Ellis regulatory/technical specialist City of Gillette water
18. Corey Nestor GIS Analyst, Campbell County
19. Dan Coughlin, Sheridan Area Water Supply JPB Administrator
20. Dan Roberts, City of Sheridan Utilities Director
21. Danielle Roth State Engineers Office Regional Hydrographer / Commissioner
22. David DeBolt - Amerigas Propane
23. David King, Campbell County EMA Coordinator
24. Dennis Holmes, Campbell County School District, Associate Superintendent for Instructional Support
25. Ed Robinson, Crook County EMA Coordinator
26. Edward Hinzman, PHRC, SCPH
27. Eli Leturgey, Distribution Supervisor for the City of Gillette
28. Gene Hale, Emergency Manager, Sheridan VA
29. Gilbert Nelson - Weston County EM Coordinator
30. Howard Jones, Water Manager, City of Gillette
31. J.R. Fox, Deputy Chief -Campbell County Fire Department (RERT1).
32. Jackie Turner, Program Specialist, Sheridan County Conservation District
33. Jacob McCarthy - Wyoming State Forestry Division - District 5 (Johnson, Sheridan, Campbell Co)
34. Jason Campbell Crook County LEPC Chairman
35. Jeff Brislawn, WSP consultant, project manager
36. Jesse Ludikhuize - Sheridan County EM
37. Jim Waller Johnson County Planner
38. Joff Pilon, City of Gillette, Electrical Engineering
39. Joseph Kuchler Campbell County Public Health

40. Ken Muller, County Engineer, Sheridan County
41. Kent Andersen- Sheridan College
42. Kevin Hillard, District Fire Management Officer, Bighorn National Forest
43. Kris LeDoux, Clerk, Town of Kaycee
44. Les Hook, City of Buffalo Public Works Director
45. Leslie Perkins, Campbell County Community and Government Relations
46. Levi Dominguez, Sheridan County Sheriff
47. Marilyn Connolly, Johnson County EMA
48. Mark Andersen with Gillette College
49. Mark Reid, County Planner, Sheridan County
50. Mayor of Clearmont
51. Megan Fraley, Johnson County Lake DeSmet Operations
52. Michael Phipps, Deputy EM Coordinator, Campbell County is in the same room as David King, Campbell Co EMA
53. Mick Wolf City of Gillette Electrical Services
54. Natalie Schoen, Hazard Mitigation Planner, WSP
55. Paul Wright, Fuels Mitigation Coordinator, Sheridan
56. Peter Clark Town of Ranchester
57. Regulatory Technical Specialist, City of Gillette
58. Richard Immell, GIS Coordinator Sheridan County
59. Rick Gill PRECorp.
60. Rob Forister, Sheridan Hospital
61. Robby Gallob Town of Wright Coordinator
62. Robin King, PHRC Johnson County
63. Sam Proffer, Planner and Zoning Administrator, Campbell, County
64. Scott Ostlund, City of Gillette, Streets Manager
65. Shamika McDonald, WY SHMO
66. Skylar Riehemann City of Gillette Solid Waste Manager
67. Shannon Sickler Compass Center for Families/Family Crisis Center Buffalo
68. Shannon Stefanick – City of Gillette
69. Spencer Kukucha
70. Stephanie Munoz, Red Cross, Disaster Preparedness Manager
71. Steve Small Sheridan County LEPC Chairman
72. Susan Sanders, National Weather Service
73. Travis Koltiska, Chief of Police, Sheridan Police Department
74. Susan Bridges, Chief of Police – Upton
75. Terry Asay, City of Buffalo City Planner

Chat log

[10:57 AM] McKenzie, Allison - NRCS, Buffalo, WY

Allison McKenzie, NRCS, Buffalo

[10:57 AM] Sam G. Proffer

Sam Proffer, Planner and Zoning Administrator, Campbell, County

[10:57 AM] Hulet, Amanda - NRCS-CD, Buffalo, WY

Amanda Hulet, District Clerk, Clear Creek Conservation District, Buffalo

[10:57 AM] Eli Leturgey (Guest)

Eli Leturgey, Distribution Supervisor for the City of Gillette

[10:57 AM] Cooper (Guest)

Cooper Ellis

[10:57 AM] Shannon Sickler

Shannon Sickler Compass Center for Families/Family Crisis Center Buffalo

[10:58 AM] Andersen, Mark

Mark Andersen with Gillette College

[10:58 AM] Johnson, Christopher A

Christopher Johnson, WSP, Hazard Mitigation Planner

[10:58 AM] Anthony Vopat

Anthony Vopat FP-C NREMT-P

EMS Coordinator

Crook County Medical Services

713 W. Oak St.

[10:58 AM] Jesse Ludikhuize - Sheridan EM (Guest)

Jesse Ludikhuize - Sheridan County EM

[10:58 AM] Travis Koltiska (Guest)

Travis Koltiska, Chief of Police, Sheridan Police Department

[10:58 AM] Jackie Turner

Jackie Turner, Program Specialist, Sheridan County Conservation District

[10:59 AM] Jesse Ludikhuize - Sheridan EM (Guest)
Edward Hinzman, PHRC, SCPH

[10:59 AM] Steve Small (Guest)
Steve Small Sheridan County LEPC Chairman

[10:59 AM] Jesse Ludikhuize - Sheridan EM (Guest)
Mark Reid,, County Planner, Sheridan County

[10:59 AM] JR Fox
J.R. Fox, Deputy Chief -Campbell County Fire Department (RERT1).

[11:00 AM] Susan from NWS (Guest)
Susan Sanders, National Weather Service

[11:00 AM] Jesse Ludikhuize - Sheridan EM (Guest)
Ken Muller, County Engineer, Sheridan County

[11:00 AM] Cooper (Guest)
Cooper Ellis regulatory/technical specialist City of Gillette water

[11:00 AM] Jim Waller
Jim Waller Johnson County Planner

[11:00 AM] Allen Thompson
Allen Thompson

[11:00 AM] Chase Christensen (Guest)
Chase Christensen, Superintendent, Sheridan County School District #3

[11:00 AM] Jesse Ludikhuize - Sheridan EM (Guest)
Gene Hale, Emergency Manager, Sheridan VA

[11:01 AM] Steinhorst, Carson

Carson Steinhorst, Supv. Field Operations, Montana Dakota Utilities

[11:01 AM] Shannon Stefanick (Guest)

Shannon Stefanick

[11:01 AM] Jesse Ludikhuize - Sheridan EM (Guest)

Chris Thomas, Sheridan County Fire Warden

[11:01 AM] Allen Thompson

Allen Thompson-Sheridan County Commission

[11:01 AM] Andersen, Kent

Kent Andersen- Sheridan College

[11:01 AM] Shannon Stefanick (Guest)

Regulatory Technical Specialist, City of Gillette

[11:01 AM] Jacob McCarthy (Guest)

Jacob McCarthy - Wyoming State Forestry Division - District 5 (Johnson, Sheridan, Campbell Co)

[11:01 AM] Jesse Ludikhuize - Sheridan EM (Guest)

David DeBolt - Amerigas Propane

[11:01 AM] Danielle Roth (Guest)

Danielle Roth State Engineers Office Regional Hydrographer / Commissioner

[11:01 AM] Corey Nestor

Corey Nestor GIS Analyst, Campbell County

[11:01 AM] Chad - SFR (Guest)

Chad Brutlag, City of Sheridan Fire-Rescue

[11:01 AM] Mick Wolf (Guest)

Mick Wolf

[11:02 AM] Mick Wolf (Guest)

Mick Wolf City of Gillette Electrical Services

[11:02 AM] Richard Immell

Richard Immell, GIS Coordinator Sheridan County

[11:02 AM] David A. King

Michael Phipps, Deputy EM Coordinator, Campbell County is in the same room as David King, Campbell Co EMA

[11:02 AM] Rick Gill

Rick Gill PRECorp.

[11:02 AM] Peter Clark (Guest)

Peter Clark Town of Ranchester

[11:02 AM] Joff Pilon (Guest)

Joff Pilon

[11:03 AM] Jesse Ludikhuize - Sheridan EM (Guest)

Kevin Hillard, District Fire Management Officer, Bighorn National Forest

[11:03 AM] Joff Pilon (Guest)

Joff Pilon, City of Gillette, Electrical Engineering

[11:03 AM] Paul Wright (Guest)

Paul Wright, Fuels Mitigation Coordinator, Sheridan

[11:04 AM] Jesse Ludikhuize - Sheridan EM (Guest)

Amy Ormseth, USFS

[11:04 AM] Brandon Price (Guest)

Brandon Price

[11:05 AM] Brandon Price (Guest)

Brandon Price, City of Gillette Wastewater Manager

[11:06 AM] Joseph W. Kuchler

Joseph Kuchler Campbell County Public Health

[11:30 AM] Dan Coughlin

Private Property owners in the vicinity of hazards.

[11:33 AM] Dan Coughlin

Who and how are possible stakeholders identified and contacted to raise awareness and participation?

[11:35 AM] Steve Small (Guest)

I'm assuming Federal experts includes our partners with NOAA. They have the best database on past natural events other than fires.

[11:39 AM] Johnson, Christopher A

Hi Dan, we typically use the previous hazard mitigation plan as our initial starting point for identifying stakeholders. But these meetings and coordination are where we try to identify anyone who might be missing and should be at the table for this process. There is also a process for engagement of the general public through surveys, town halls, and a public review draft (at the latter end of the plan update). So if you have any specific groups that you think need to be involved please share them!

[11:41 AM] Shamika McDonald, Wy SHMO (Guest)

If anyone wants additional information on mitigation grant programs feel free to contact me: Shamika McDonald shamika.mcdonald1@wyo.gov 307.777.4914

[11:41 AM] David A. King

Dan...historically we have looked at what local organizations are working with the public already or providing services (housing, low-income services, etc.) and ask reps from their groups to attend and provide input.

[11:41 AM] David A. King

At the very least, review the draft plan and make suggestions/comments

[11:57 AM] Dennis (Guest)

Just curious how many other school districts are on this web presentation?

[11:58 AM] Dennis (Guest)

besides Campbell County...

[11:58 AM] Travis Koltiska (Guest)

Will this power point be made available to the participants?

[11:59 AM] Dan Coughlin

What actions constitute participation and adoption by SAWSJPB of the "plan".

[11:59 AM] Chase Christensen (Guest)

Sheridan County #3 is on.

[12:00 PM] Dennis (Guest)

Thanks Chase...

[12:04 PM] Shamika McDonald, Wy SHMO (Guest)

Dan, did that help answer your question?

[12:06 PM] Howard Jones (Guest)

Does this plan address or include coordinated Risk & Resilience Assessment data or Emergency Response Plans from any of the groups/agencies/entities that complete them pursuant to EPA or other Federal risk management compliance mandates?

[12:08 PM] Dan Coughlin

Not completely

[12:09 PM] Howard Jones (Guest)

Or items such as malevolent attacks, cybersecurity, physical security of remote facilities, etc?

[12:10 PM] Steve Small (Guest)

Dan: Is there consideration to add Health Related occurrences such as the COVID outbreak?

[12:10 PM] Steve Small (Guest)

Sorry meant to send to Jeff.

[12:13 PM] Howard Jones (Guest)

One often overlooked component of mitigation is not having all assets (vehicle staging for example) all in one location getting hit by a tornado for example

[12:13 PM] Dan Coughlin

Stream erosion risk to infrastructure and ranking level of impacts specific to infrastructure affected such as water treatment facilities capabilities as a measure of the risk.

[12:19 PM] Johnson, Christopher A

https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

Disaster Declarations for States and Counties

Explore historic federal disaster declarations by state, county, hazard, and year.

[12:20 PM] Johnson, Christopher A

This is the website used for the declarations

[12:21 PM] Dan Coughlin

Debris flow affecting water turbidity hampering treatment capabilities.

[12:24 PM] Dan Coughlin

I don't see any of my responses under the question on slido. Do I need to do somelhing different than entering my comments in "chat"?

[12:31 PM] Jacob McCarthy (Guest)

Dan, There was a link posted in the chat at the beginning of the meeting with a link to it

[12:31 PM] Jacob McCarthy (Guest)

https://app.sli.do/event/6Kr6Z2makbyeRAPpjsTcNd

Join Slido: Enter #code to vote and ask questions

Participate in a live poll, quiz or Q&A. No login required.

[12:33 PM] Dan Coughlin

I think I figured it out. Logged into slido.com. Will my comments be included from my chat responses?

[12:34 PM] David A. King

Dan...they should be as they're pulling the chat log as part of the record

[12:39 PM] Chase Christensen (Guest)

Chris Schock, Mayor of Clearmont has been on the meeting with me. Thank you.

[12:42 PM] Anthony Vopat

none here, thank you

[12:42 PM] Carrie Rogaczewski

Carrie Rogaczewski, District Manager, Sheridan County Conservation District

[12:42 PM] Jacob McCarthy (Guest)

Thank you Jeff!

[12:42 PM] Jim Waller

thank you

[12:42 PM] Leslie J. Perkins

thank you!

[12:42 PM] Shamika McDonald, Wy SHMO (Guest)

Thank you everyone for being here!

[12:42 PM] Paul Wright (Guest)

Thank you

[12:42 PM] Sam G. Proffer

Thanks!

[12:42 PM] Steve Small (Guest)

Thanks, Jeff!

[12:42 PM] Les Hook (Guest)

Thank you

[12:42 PM] Rick Gill

Thank you!

[12:42 PM] Ed Robinson (Guest)

thanks

[12:42 PM] Robin King (Guest)

Thank you! Robin King, PHRC Johnson County

WY R1 Kickoff

11 - 17 Jan 2023

Poll results

Table of contents

- If you didn’t have to be in the meeting today, what would you rather be doing?
- Did you participate in the 2018 plan?
- Do you generally agree with the current list and ratings of hazards?
- What other hazards should be considered?
- Have there been any growth and development trends in past 4 years that may increase or decrease vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)?
- Do you have specifics on any hazard impacts in past 4 years (damage assessments, people and property impacts, repair costs etc?)
- What other existing or recent plans, reports, or studies should be reviewed for this planning process?
- Has the 2018 HMP been cross referenced or integrated with other planning mechanisms? If not, what opportunities exist to do so?
- Are there any upcoming opportunities for outreach at scheduled public meetings or events?
- What key stakeholders should be involved in this process?

Table of contents

- What is your preference on how future meetings should be held?

wood.

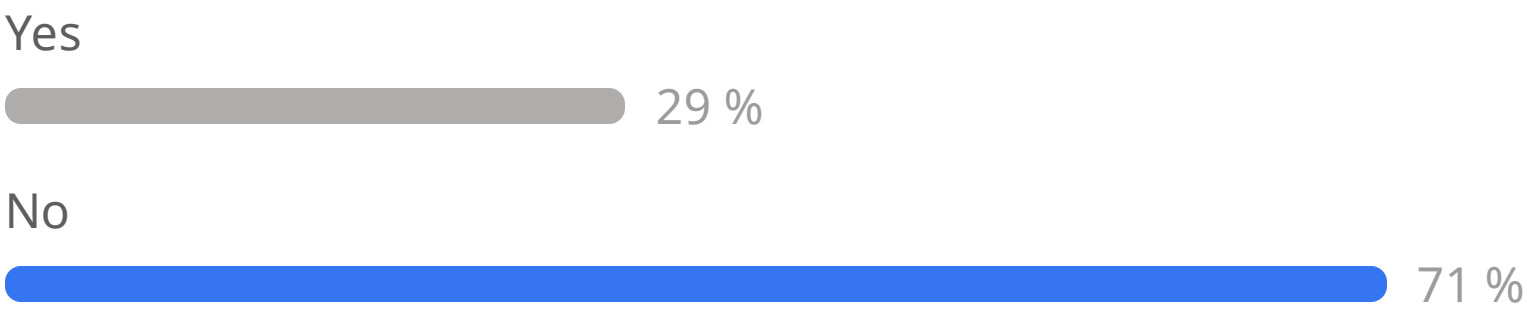
If you didn’t have to be in the meeting today, what would you rather be doing?

0 3 7

wood.

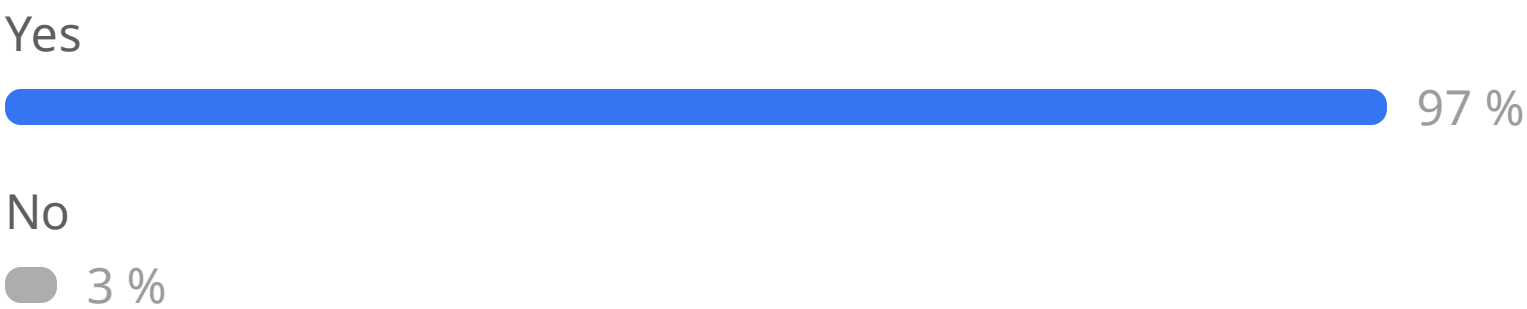
Did you participate in the 2018 plan?

0 3 8



Do you generally agree with the current list and ratings of hazards?

0 3 2



What other hazards should be considered?

013

- Intentional damage to electrical substations
- Nuclear plant in other part of state
- Failures of food sustainability to rural areas
- Overloading electrical grids with increase in push for electric everything.
- dam features Such as debris clogs, ice dams, etc.
- Cyber
- human caused is very broad. Humans can cause a lot of problems
- Physical and cybersecurity of remote facilities, malevolent acts/sabotage, attacks on public utilities through drinking water
- failure of irrigation conveyances-on a limited scale probably
- Cyber
- Burning coal seams, maybe included in wildfires
- Sabotage on grid infrastructure Solar flaring activity on grid
- Specific (beyond hazmat), train derailment.

wood.

Have there been any growth and development trends in past 4 years that may increase or decrease vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)?

007

- increased recreatin in the outdoors, campfires, etc
- Increased numbers of individuals moving in from the south who do not understand the safety risks associated with our winter weather patterns. They put themselves at risk in situations that natives may not.
- regional water connections
- Population growth along flood plain
- Increase in population
- Growth impact on already strained emergency services
- Crook County is seeing increase in rural development, as well as increased urban development in Pine Haven. This has increased the fire vulnerability

wood.

Do you have specifics on any hazard impacts in past 4 years (damage assessments, people and property impacts, repair costs etc?)

003

- Severe cold
- Large fire
- Wind storm event

wood.

What other existing or recent plans, reports, or studies should be reviewed for this planning process?

0 1 3

(1/2)

- Hazardous materials pipeline mitigation efforts.
- County/City Comp Plans
- ASDS so inspection and assessment of dams certified personnel
- Reservoir breach response plans
- 2017 Campbell County Forestry Strategy
- Water Risk & Resilience Assessments
- Updated wildland fire mitigation efforts, THIRA update, private utility improvements.
- All departmental response plans.
- CWPP
- Campbell County Natural Resourse Land Use Plan
- Sheridan Wildfire Hazard Assessment, local watershed plans
- Water System Emergency Response Plan
- Sheridan area watershed assessment
- Watershed Planning
- AARs would be good references, especially

What other existing or recent plans, reports, or studies should be reviewed for this planning process?

0 1 3

(2/2)

for wildfires and winter hazards

Has the 2018 HMP been cross referenced or integrated with other planning mechanisms? If not, what opportunities exist to do so?

007

- Possible CWPP for Campbell County tied to a CWDG grant application. Stay Tuned.
- Crook County has crossed with its recent EOP update as well as THIRA
- I will have to talk to our planning depts to see whats out therr
- Johnson
- It is cross referenced with our County Emergency Operation Plan Annexes
- Not with the NRLUP or Comp
- Not to my knowledge
- at least directly
- THIRA

wood.

Are there any upcoming opportunities for outreach at scheduled public meetings or events?

008

- Third Thursday public events in downtown Sheridan during the summer.
- Home shows
- Inivite I&S Districts, etc.
- Doing a presentation/breifung at counci/commissioner meetings
- Will advise R1 HCC/HPP
- community speaks on the radio
- Johnson County will talk about this at the regular radio station public education program
- conservation district annual watershed meetings in March

What key stakeholders should be involved in this process?

0 1 7

(1/2)

- Military if facilities in jurisdiction
- Agriculture groups
- National Guard (if you have them)
- Native people
- IT
- Support businesses such as mechanics, water district operators, support service businesses such as tire companies for support of equipment, etc.
- large private landowners
- K12
- Fire departments
- Those down line of agency or organization executives (i.e. crew foremen)
- any large industrial company mines or power plants ect
- hospitals
- Mines/Industry
- County Commissioners
- EMS and Hospitals
- Hospitals, VA Complex in Sheridan
- Railroad
- County Commissioners
- Hospital

What key stakeholders should be involved in this process?

0 1 7

(2/2)

- Emergency Planners for private corporations

wood.

What is your preference on how future meetings should be held?

0 3 3

Summary of the Wyoming Region 1 Multi-Hazard Mitigation Plan Update

Johnson, Weston, Crook, Sheridan, Campbell Counties

Risk Assessment and Goals Meetings

May 2023

Overview

A series of virtual/hybrid meetings was held to discuss the update of the risk assessment and mitigation goals aspects of the Wyoming Region 1 Hazard Mitigation Plan. Emergency Management Coordinators from counties in the Wyoming Region 1, as well as members of each County Planning Team (CPT), including participating jurisdictions and stakeholders, attended individual meetings based on counties. The primary focus of the meetings was to review the various hazards that can impact the various counties and get input from participating jurisdictions on the hazard ranking significance and note highlights in analysis with the plan update.

Each county had meetings on the dates below:

Johnson County:	Monday, May 15th at 1:00 pm MST.
Weston County:	Tuesday, May 16th at 10:30 am MST.
Crook County:	Tuesday, May 23rd at 1:00 pm MST.
Sheridan County:	Wednesday, May 24th at 1:00 pm MST.
Campbell County:	Thursday, May 25th at 1:00 pm MST.

Introductions and Opening Remarks

Jeff Brislawn, Project Manager with the consulting firm hired to facilitate the plan update process, WSP (formally Wood Environment & Infrastructure Solutions Inc.), and Chris Johnson, Hazard Mitigation Planner with WSP, began the meetings with welcoming remarks.

Consultants/State Hazard Mitigation Officer (attended all meetings)			
Name	**Jurisdiction**	**County**	**Title**
Jeff Brislawn	WSP	N/A - Consultant	Project Manager
Christopher Johnson	WSP	N/A – Consultant	Hazard Mitigation Planner
Carlie Hager	WSP	N/A – Consultant	Hazard Mitigation Planner
Shamika McDonald	WYOHS	State	State Hazard Mitigation Officer
Campbell County Meeting (5/25/2023)			
Name	**Jurisdiction**	**County**	**Title**
David King	Campbell County	Campbell	Emergency Manager
Joe Kuchler	Public Health	Campbell	Public Health Response Coordinator
Danielle Roth	Wyoming State Engineer's Office Water Division II District 1, 7, and 10	State	Hydrographer Commissioner
Robby Gallob	Town of Wright	Campbell	Coordinator
Michael Phipps	Campbell County Emergency Management Agency	Campbell	Deputy Emergency Management Coordinator
Wade Skinner	Rocky Mountain Power	N/A – Private Stakeholder	Emergency Management Program Manager
John Cranmer	WY Amateur Radio Emergency Service (ARES)	N/A – Private Stakeholder	WY Amateur Radio Officer- President
Ryan Fox	Campbell County Fire Department	Campbell	Division Chief
Sam Proffer	Campbell County	Campbell	Campbell County Planner and Zoning Administrator
Dalyn Hugo	Basin Electric Power Cooperative	N/A – Private Stakeholder	Dry Fork Station Environmental Coordinator
Brandon Price	City of Gillette	Campbell	Wastewater Manager
Brent Wasson	City of Gillette	Campbell	Deputy Police Chief
Denton Knapp	City of Gillette	Campbell	County Commissioner
Brett Myers			
Susan Sanders	National Weather Service	N/A - NWS	Warning Coordination Meteorologist
Chris Beltz	Campbell County Health	Campbell	Director of Urgent & Emergent Services
Jennifer Toscana	City of Gillette	Campbell	Public Affairs Director
Crook County Meeting (5/23/2023)			
Name	**Jurisdiction**	**County**	**Title**

Danielle Roth	State Engineers Office	State	Hydrographer
Ed Robinson	Crook County	Crook	Emergency Manager
Don Lancaster	Pine Haven Fire Department	Crook	Fire Chief
TJ Gideon	Pine Haven Fire Department	Crook	Fire Chief
Karla Bradenburg	Pine Haven	Crook	Mayor
Charlie Gulley	Pine Haven	Crook	
Johnson County Meeting (5/15/2023)			
Name	**Jurisdiction**	**County**	**Title**
Amanda Hulet	Clear Creek Conservation District	N/A – Private Stakeholder	District Clerk
Anita Bartlett	Powder River Conservations District	N/A – Private Stakeholder	District Manager
Lance VandenBoogart	National Weather Service-Riverton	N/A- NWS	Warning Coordination Meteorologist
Terry Asay	City of Buffalo	Johnson	City Planner
Tom Knapp	Kaycee	Johnson	Vice Chairman
Jim Waller	Johnson County	Johnson	County Planner
Megan Fraley	Johnson County	Johnson	Operations Manager
Marilyn Connolly	Johnson County	Johnson	Emergency Manager
Sheridan County (5/24/2023)			
Name	**Jurisdiction**	**County**	**Title**
Jesse Ludikhuize	WYOHS	State	Emergency Manager
Rob Forister	Sheridan Memorial Hospital	Sheridan	Director of Facilities Services
Gary Harnish	Sheridan-Fire Rescue	Sheridan	Fire Chief
Chris Thomas	Sheridan County	Sheridan	Fire Warden
Steve Small	Sheridan County	Sheridan	LEPC Chair
Carrie Rogaczewski	Sheridan County	Sheridan	Conservation District
Rich Hallaron	Powder River Energy Corporation	N/A – Private Stakeholder	VP of System Operations
Mark Reid	Sheridan County	Sheridan	County Planner
Peter Clark	Town of Ranchester	Sheridan	Mayor
Levi Dominguez	Sheridan County Sheriff's Office	Sheridan	Sheriff
Paul Wright	Sheridan County	Sheridan	Fuels Mitigation Coordinator
Weston County (5/16/2023)			
Name	**Jurisdiction**	**County**	**Title**
Gilbert Nelson	Weston County	Weston	Emergency Manager
Danielle Roth	State Engineers Office	State	Hydrographer Commissioner

Review of the Hazard Mitigation Planning Process

A PowerPoint presentation was presented by Jeff Brislawn and Chris Johnson. Jeff started the meeting by outlining the FEMA nine-step planning process and discussed the project status, now in step 5.

Jeff noted that the 5-year update is required to maintain eligibility for FEMA Hazard Mitigation Assistance Grants; funding is increasing nationally for mitigation with the new Building Resilient Infrastructure and Communities (BRIC) grant, and that jurisdiction participation and input will be increasingly important as we move forward in the planning process.

The online public survey results were discussed. This was successful in engaging the community and has received a total of 462 responses across the Region, with details broken out by the county as well.

Review of Vulnerability Assessment Update

Jeff reviewed the statewide hazard identification from the 2018 Region 1 Hazard Mitigation Plan and also the 2020 Wyoming Statewide HMP.

Jeff outlined the general risk assessment requirements before beginning a detailed discussion of each hazard. Jeff and Chris presented details on each hazard that will be included in the draft updated risk assessment chapter. Refer to the PowerPoint presentation and draft update of the Hazard Identification and Risk Assessment (HIRA - forthcoming) chapter for specific details on each hazard.

Several valuable details were learned during the risk assessment conversation among participants. Highlights of the discussions are noted by hazard in the tables below.

Review of Identified Hazards

Hazard or Topic	Meeting Discussion
Dam Failure	• Sheridan County: Jesse noted that they're doing some reassessments of the dams in the county and potentially changing their risk classifications. • Sheridan County: there's also been a lot of work at enhancing/restoring channels and floodplains in the county, which could help reduce flooding.
Drought	• Weston County: Gilbert noted that in general the northern part of the county gets more moisture than the south.

Earthquake	• Johnson County: Jeff noted the potential for rockfall and landslides that could be triggered by earthquakes in the mountainous parts of the Region, potentially affecting road infrastructure. Marilyn noted potential rockfall, specifically along Highway 16 west of Buffalo. • Sheridan County: Significance should be changed to Medium
Expansive Soils	• Campbell County: mentioned that have had issues in the past, there are engineering standards and requirements for development in the zoned areas of the county to mitigate this. • Crook County: No vulnerability areas, but there are impacts to highways from time to time. To be expected • Weston County: Gilbert noted that there's not many specific notable instances he can think of, but there is a lot of issues (one neighborhood in particular) with foundation problems throughout the county, as well as impacts to roads.
Flood	• Campbell county commented from CPT that they think they've been included in the 1978 FEMA declaration by error, they have not had bad significant flooding. • Sam Proffer, Campbell County, noted that they feel very confident in their floodplain management plan. • Johnson County: Discussion about the flood ordinance and floodplain regs for the county, Jim Waller gave an overview. Discussed that the county has not had modern maps, but are supposed to be next in line to have them done. • Sheridan County: Comment from CPT that they think we are missing disaster declarations, there was apparently a flood in 2019 that they are sure resulted in a declaration. FEMA was present during that time.
Hail	• Campbell County: David noted that he feels that hail should be high, might be their highest significance hazard. • Campbell County: Susan, Brandon Price and Sam Proffer concurred with David's Assessment • Johnson County: Marilyn noted a previous event that caused damage to cabins in the Big Horn region. • Johnson County: Lance V. noted that info from insurance companies would be helpful for these events, the NCEI database is only reflective of what's reported to the NWS. • Sheridan County: There was a hailstorm the same day as the Billings Tornado, about 40% of the roofs in Sheridan, occurred in 2011 or 2012. • Weston County: Gilbert said he might want to increase the rating higher when he can convene with the whole group. • Chris Johnson noted that hail damages are underrepresented in the NCEI data.
High Wind and Downbursts	• Johnson County: Marilyn noted that it seems like these events are occurring more often lately, Lance noted that it could be partially related to improvements in reporting and forecasting. • Sheridan County: Change frequency to Highly Likely; Comment to update the highest wind speed record, they think it is higher. • Sheridan County: Semis blown off the roadways.

Landslide/Rockfall/Debris Flow	• Campbell County: David thinks medium is appropriate, Sam Proffer noted that in some instances with issuance of building permits they do try to vet the locations of new structures. • Crook County: Ed noted 2 landslides. One on Highway 14 that collapsed onto the highway and closed it, another that is ongoing for the past 5 years or so in the Black Hills NF that has caused a campground to be closed (Cook Lake) • Johnson County: Marilyn noted again that the area along Hwy 16 just west of Buffalo is where they commonly see rockfall; the area near the Fetterman Massacre site (I-90 and Hwy 87) was also noted as landslide area. • Sheridan County: Landslide damage to I-90 is common and widespread in the county, but the plains areas are worse than the mountains. • Sheridan County: Most damage to property and infrastructure, is in the plain's areas. I-90 south of Sheridan lost a lane off the highway from landslides, same with Hwy 14. • Sheridan County: More slow, creeping slides rather than large abrupt landslides • Sheridan County: Suggested that we discuss this with WYGS for a map of landslides on the plains. • Sheridan County: Increase the frequency to highly likely. • Weston County: Wind Creek Road has tendency for rockfall.
Lightning	• Campbell County: David said he agrees with Medium, Susan noted that they don't really get reports of occurrences or injuries. Occasionally they get reports of deaths because that's news. • Weston Group: increase the rating when he can convene with the whole group. But additionally, they are fairly accustomed to this hazard because it is so prevalent.
Mine Subsidence	• Campbell County: David noted that most/all the coal mining in Campbell County is surface mining, rather than subsurface mining. Modern coal mining is not significantly contributing to the issue, it's more historic mining operations. Coal seams fire are a bigger issue. • Johnson County: Marilyn noted a past event with a subsidence incident beneath a house. Probably most likely east of Buffalo • Johnson County: Jim Waller noted the undermined areas are likely to continue being an issue, he also noted there was mapping done for coal fires when I-90 was being built. • Weston County: Gilbert noted there is an old mine called Cambria mines in the northeast of the County. No maps of undermines areas.
Tornado	• Campbell County: David noted that the largest magnitude was an EF3 in 2018 and Susan added that vulnerabilities include structure damage. • Crook County: Ed Noted that there is probably twice as many unreported • Johnson County: Discussion on past event in 2019 • Sheridan County: Suggested maybe moving to Low significance. • Weston County: Discussion on past event in 2019, an F1.

Severe Winter Weather	• Campbell County: David asked what the $980,000 looks very low, infrastructure damages alone are likely much higher. • Campbell County: Susan noted that they don't really get information on property damage estimates. Campbell county has 2 forecast zones in the county, so likely they are getting double counted for events. Still would consider this a high significance event because the impacts can be severe. • Sheridan: Severity level should be changed to high.
Coal Seam Fire	• Campbell County: David noted dangers to people, animals, vehicles driving over fires and falling into voids. • Campbell County: Suppression is very difficult, unique issue. • Crook County: Ed said specifically that he doesn't think they have any concerns about this hazard at all. Lower significance • Sheridan County: Ed said specifically that he doesn't think they do not have any concerns about this hazard. Lower significance. • Weston County: lower significance • Johnson County: not too many in the county.
Wildfire	• Campbell County: David noted that there's a rural subdivision in the northwest corner of the county that is at risk: Borderline Estates • Campbell County: Ryan Fox asked where our fire history data came from. Jeff noted WY State Forestry and will have Mack Chambers WSP GIS specialist confirm. • Crook County: High Significance is appropriate. Ed said this is the primary concern. • Crook County: Ed noted that Pine Haven as well as unincorporated county are experiencing development, so vulnerability will be increasing. • Sheridan County: High Significance is appropriate. Jeff asked what's going on out in the Eastern County where large fires have occurred but no comment. • Sheridan County: Ed noted that Pine Haven as well as the unincorporated counties are experiencing development, so vulnerability will be increasing. • Sheridan County: Significance level for Dayton should be changed to High. • Weston County: Gilbert noted that throughout the county is mostly high.
HazMat	• Campbell County Fire might have better data and not sure if this significance is high or low. • Crook County: Ed noted that there have been some new pipelines constructed in the county, asked how recent that map was from the National Pipeline Mapping Systems. • Sheridan County: CPT in debate about the significance of the hazard, there's an exercise planned for a spill in the middle of downtown Sheridan. The likelihood of incidents may be low, but impacts could be catastrophic. • Sheridan County: There should be a map with the rail lines and Interstate. There was a train derailment last week in the county. • Sheridan County: Increase the county Clearmont & Ranchester as medium and Sheridan as High due to the rail lines; rail lines have seen more freight train traffic in recent years.

	• Weston County: Gilbert noted that they might change a couple of these ratings when he can meet with the group.
Overall Hazards Significance Table	• Campbell: David asked if we could organize the hazard by significance level rather than alphabetically. Jeff said they would look at that and at a minimum can color code the levels to make them stand out more.

Review and Update of Hazard Mitigation Goals

The HMPC reviewed a list of typical goal statements for hazard mitigation plans, drawn from their existing plans other county plans in the region, and the Wyoming State Hazard Mitigation Plan. The counties in the region were asked to review their specific goals and consider changes.

Campbell County Goals

1. Reduce the impact of severe weather on people, property, or natural resources.
2. Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.
3. Maintain the reliability and resilience of critical infrastructure.
4. Reduce the impact of human-caused incidents, emergencies, or disasters.
5. Increase resilience through coordination of governmental policies, procedures, codes, and regulations.

Suggested changes: The group felt that they were still valid and did not suggest any changes.

Crook County Goals

1. Reduce the impact of severe weather on people, property, or natural resources.
2. Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.
3. Maintain the reliability and resilience of critical infrastructure.
4. Reduce the impact of human-caused incidents, emergencies, or disasters.
5. Increase resilience through coordination of governmental policies, procedures, codes, and regulations.

Suggested changes: The group felt that they were still valid and did not suggest any changes.

- No comments

Johnson County Goals

1. To protect life and property from hazards.
2. To increase public awareness and education about hazards.
3. The strength and improve disaster resistance of publicly and privately owned facilities and infrastructure.

Suggested changes: The group felt that they were still valid and did not suggest any changes.

- No comments

Sheridan County Goals

1. Mitigate the effect of hazards through educations, ordinances, resolutions, and clear definitions, and implementation of mitigation projects to reduce the loss of property and enhance life-safety.
2. Coordinate mitigation activities with all entities and stakeholders of Sheridan County to assess the hazards and take various actions to reduce or eliminate the risk factors of those hazards.
3. Reduce the economic impact on the local economy caused by the effects of hazards in the communities.
4. Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

Suggested changes: The group felt that they were still valid and did not suggest any changes.

- No comments

Weston County Goals

1. Reduce the impact of severe weather on people, property, or natural resources.
2. Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.
3. Maintain the reliability and resilience of critical infrastructure.
4. Reduce the impact of human-caused incidents, emergencies, or disasters.
5. Increase resilience through coordination of governmental policies, procedures, codes, and regulations.

Suggested changes: The group felt that they were still valid and did not suggest any changes.

- No comments

Plan Timeline/Next steps

- Jeff noted that each jurisdiction will need to create a minimum of one new mitigation action for the plan update, and ensure that all hazards are covered with mitigation actions.

- Jeff summarized the next steps in the process.

    - CPT homework:

        - Review the HIRA (when available) and provide feedback.

        - Review the mitigation actions in the plan and provide status (completed, completed-continuing, continue-not completed, deleted) on a worksheet/form that will be provided to the County EM Coordinators for distribution to the municipalities.

        - Start formulating ideas for new mitigation projects, based on HIRA results and community needs.

Campbell County

The meetings for Mitigation Strategy need to be July 24, 25, or 26th due to other scheduling issues. Jeff emphasized that this is an important meeting and will form the basis for the updated mitigation action plan.

The meeting materials will also be shared electronically, including the presentation.

Crook County

The meeting wrapped up by showing the group the regions draft goals and went over information needs and next steps.

Johnson County

Jeff closed the meeting by showing the group the regions draft goals and went over additional information needs and next steps. Marilyn noted that they may want to look at their objectives and fine tune them.

Sheridan County

Jeff closed the meeting by showing the regions draft goals, went over needs and next steps. There were no further comments.

Weston County

The meeting wrapped up with Jeff showing the group the regions draft goals, went over information needs and next steps. Gilbert stated he plans to hold meetings to discuss this information with his group. Jeff asked for documentation of those meetings to be sent when that occurs.

<INSERT COUNTY NAME> County Planning Team:
Please plan on attending the next and final *in-person* meeting for the Region 1 Hazard Mitigation Plan update. Our County's meeting will be held: <Note only the location for your county and delete the others>

- Tuesday July 25th – Johnson County, 9:00-11:00am (Location ?)
- Tuesday July 25th – Sheridan County, 2:00-4:00pm (Location ?)
- Wednesday July 26th – Campbell County, 9:00-11:00am (Location ?)
- Thursday July 27th – Crook County, 9:00-11:00am (Location ?)
- Thursday July 27th – Weston County, 2:00-4:00pm (Location ?)

An agenda is attached, and you will also receive a calendar invite. This meeting will be an interactive planning workshop and jurisdictional representation is required. It is imperative that jurisdictions that wish to fully participate in the plan, and ultimately re-adopt it, be represented at the meeting, and return requested information. As a reminder participation is defined as:

- Attend and participate in planning meetings/workshops
- Provide available data requested of the County coordinator and WSP
- Provide input on local mitigation strategy (actions/projects)
- Advertise and assist with public input process
- Review and comment on draft plan
- Coordinate formal adoption

Please bring your ideas and be prepared to shape the mitigation action strategy to best meet the needs of your jurisdictions.

Prior to the workshop we are requesting input on the status of mitigation actions identified in the 2018 plan for the County and jurisdictions. If you have not already done so, please edit the attached mitigation action tracker and return to myself and Christopher Johnson Christopher.johnson@wsp.com by July 21st. By completing this prior to the meeting we can report on progress, understand actions that will be carried forward into the plan update, and allow us to focus on identifying new mitigation actions.

Wyoming Region 1 Hazard Mitigation Plan
Campbell, Crook, Johnson, Sheridan & Weston Counties – 2023 Update
Mitigation Strategy Meeting Agenda

Date: Tuesday, July 25 – Thursday July 27, 2023 (Individual dates and times?)

Meeting at: (Location ?)

Project: Wyoming Region 1 Regional Hazard Mitigation Plan Update

Subject/Purpose

The purpose of this meeting is to review the planning process so far, then modify, add, and/or delete mitigation actions and projects applicable to Campbell, Crook, Johnson, Sheridan, and Weston Counties based on the Hazard Mitigation Planning Committee input and pertinent plan goals.

Attendees: Wyoming Region 1 Hazard Mitigation Planning Committee and Stakeholders

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1. Introductions
2. Review of the Planning Process
3. Review of possible mitigation activities and alternatives
4. Discuss criteria for mitigation action selection and prioritization
5. Review of progress on existing actions in the plan
6. Brainstorming Session: Development of new mitigation actions (group process)
7. Prioritize mitigation actions (group process)
8. Discuss plan implementation and maintenance
9. Discuss next steps
10. Questions and Answers/Adjourn

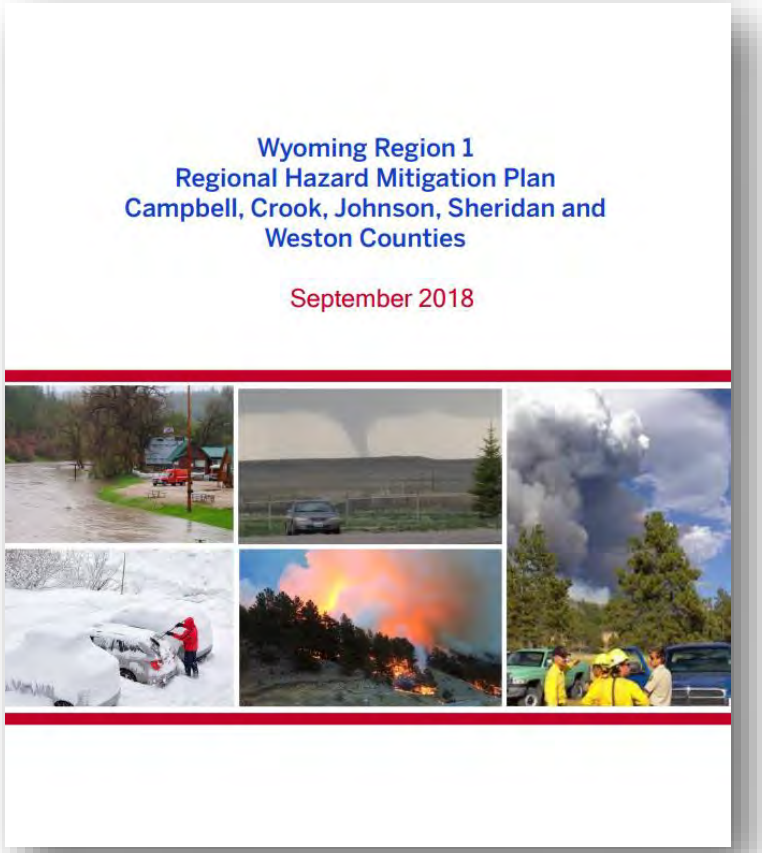
Wyoming Region 1 Hazard Mitigation Plan

Campbell, Crook, Johnson, Sheridan, and Weston Counties

Hazard Mitigation Planning Team –

Meeting #3 – Mitigation Strategy

July 25th- 27th 2023



Agenda

1. Introductions
2. Planning process update
3. Review of possible mitigation activities and alternatives
4. Discuss criteria for mitigation action selection and prioritization
5. Review of progress on existing mitigation actions (group process)
6. Brainstorming Session: Development of new mitigation actions
7. Prioritize mitigation actions (group process)
8. Discuss plan implementation and maintenance
9. Discuss next steps
10. Questions and answers/adjourn

Introductions

Introductions

- **County Emergency Management Coordinators**
  - Campbell – David King
  - Crook – Ed Robinson
  - Johnson – Marilyn Connolly
  - Sheridan – Jesse Ludikhuize
  - Weston – Gilbert Nelson
- **Federal & State Partners**
- **Other Stakeholders**
- **WSP Project Team**
  - Jeff Brislawn – Project Manger
  - Christopher Johnson – Hazard Mitigation Planner
  - Mack Chambers – Lead GIS Analyst
  - Carlie Hager– Hazard Mitigation Planner

Planning Process Update

FEMA's Nine-Step Planning Process

Step 1 **Determine the Planning Area and Resources**

Step 2 **Build the Planning Team**

Step 3 **Create an Outreach Strategy**

Step 4 **Review Community Capabilities**

Step 5 **Conduct a Risk Assessment**

Step 6 **Develop a Mitigation Strategy**

Step 7 Keep the Plan Current

Step 8 Review and Adopt the Plan

Step 9 Create a Safe and Resilient Community

Progress So Far

- Kickoff meeting held January 11, 2023
- Online public survey closed April 30, 2023
  - 462 total responses received regionwide
- Risk Assessment Meetings held for each county May 15th-25th, 2023
- GIS analysis & mapping completed
- Draft HIRA completed and undergoing internal review and QC, to be sent to HMPC for review in August
- Mitigation Workshops

Review of Hazard Significance Summaries

Johnson County Hazards – DRAFT Significance Rankings

Hazard	Johnson County	Buffalo	Kaycee	Powder River RCD	Clear Creek RCD
Dam Failure	High	High	Medium	Medium	Medium
Drought	Medium	High	Medium	Medium	Medium
Earthquake	Medium	Medium	Medium	Medium	Medium
Expansive Soils	Low	Low	Medium	Medium	Medium
Flood	High	High	High	High	High
Hail	Medium	Medium	Medium	Medium	Medium
Lightning	Medium	Medium	Medium	Medium	Medium
Landslide/Rockfall/Debris Flow	Medium	Medium	Medium	Low	Low
Mine & Land Subsidence	Low	Low	Low	Low	Low
Tornado	Medium	Medium	Medium	Medium	Medium
Wildfire	High	High	High	Medium	Medium
Coal Seam Fire	Low	Low	Low	Low	Low
High Winds & Downbursts	Medium	Medium	Medium	Medium	Medium
Severe Winter Weather	High	High	High	High	High
Hazardous Materials	Medium	Medium	High	Medium	Medium
Public Health	High	High	High		

Sheridan County Hazards- DRAFT Significance Rankings

Hazard	Sheridan County	Clearmont	Dayton	Ranchester	City of Sheridan	Sheridan County School District 3
Dam Failure	Medium	Medium	Medium	Medium	Medium	Medium
Drought	High	High	High	High	High	High
Earthquake	Low	Medium	Low	Low	Low	Medium
Expansive Soils	Low	Low	Low	Low	Low	Low
Flood	High	Medium	High	High	High	High
Hail	Medium	Medium	Low	Low	Medium	Medium
Lightning	Medium	Medium	Medium	Medium	Medium	Medium
Landslide/Rockfall/ Debris Flow	Medium	Low	Low	Low	Medium	Low
Mine & Land Subsidence	Low	Low	Low	Low	Low	Low
Tornado	Medium	Low	Low	Low	Medium	Low
Wildfire	High	High	Medium	Medium	High	High
Coal Seam Fire	Low	Low	Low	Low	Low	Low
High Winds & Downbursts	Medium	Medium	Medium	Medium	Medium	Medium
Severe Winter Weather	High	High	High	High	High	High
Hazardous Materials	Low	Low	Low	Low	Low	Low

Campbell County- DRAFT Significance Rankings

Hazard	Campbell County	Gillette	Wright	Campbell County Cons. District
Coal Seam Fire	Medium	Low	Low	Medium
Dam Failure	Low	Low	Low	Low
Drought	Medium	Medium	Medium	Medium
Earthquake	Medium	Medium	Medium	Medium
Expansive Soils	Medium	Low	Low	Medium
Flood	Medium	Medium	Medium	Medium
Hail	Medium	Medium	Medium	Medium
Hazardous Materials	High	High	High	High
High Winds & Downbursts	Medium	Medium	Medium	Medium
Landslide/ Rockfall/Debris Flow	Low	Low	Low	Medium
Lightning	Medium	Medium	Medium	Medium
Mine & Land Subsidence	Low	Low	Low	Low
Severe Winter Weather	High	High	High	High
Tornado	High	High	Medium	High
Wildfire	High	High	Medium	High

Crook County- DRAFT Significance Rankings

Hazard	Crook County	Hulett	Moorcroft	Pine Haven	Sundance
Dam Failure	Medium	Medium	Low	Low	Low
Drought	High	High	High	High	High
Earthquake	Low	Low	Low	Low	Low
Expansive Soils	Low	Low	Low	Low	Low
Flood	Medium	High	Medium	Low	High
Hail	Medium	Medium	Medium	Medium	Medium
Hazardous Materials	High	Medium	High	Medium	Medium
High Winds & Downbursts	Medium	Medium	Medium	Medium	Medium
Landslide/ Rockfall/Debris Flow	Low	Medium	Low	Low	Medium
Lightning	High	High	High	High	High
Mine & Land Subsidence	Low	Low	Low	Low	Low
Severe Winter Weather	High	High	High	High	High
Tornado	Medium	High	High	High	Medium
Wildfire	High	High	High	High	High

Weston County- DRAFT Significance Rankings

Hazard	Weston County	Newcastle	Upton
Dam Failure	Low	Low	Low
Drought	Medium	Medium	Medium
Earthquake	Low	Low	Low
Expansive Soils	Low	Low	Low
Flood	High	Medium	Medium
Hail	Medium	Medium	Medium
Lightning	Medium	Medium	Medium
Landslide/Rockfall/Debris Flow	Low	Low	Low
Mine & Land Subsidence	Medium	Low	Low
Tornado	Medium	Medium	Medium
Wildfire	High	High	Medium
Coal Seam Fire	Low	Low	Low
High Winds & Downbursts	Medium	Medium	Medium
Severe Winter Weather	High	High	High
Hazardous Materials	Medium	High	Medium

Review of Possible Mitigation Activities and Alternatives

Hazard Mitigation Examples

Reduce the future demand for, and rising costs of, disaster response and recovery.

Retrofit a critical facility, enforce building codes, land use planning, remove a structure from a hazard area.

MITIGATION: Elevated Home by the River

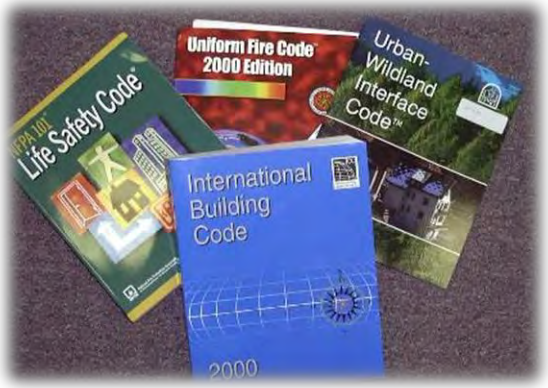
MITIGATION: Defensible Space, Fuels Reduction

MITIGATION: Home Removed from Landslide Area

RESPONSE: Purchase of Police Command Vehicle

Review Mitigation Alternatives

- Alter
- Avert
- Adapt
- Avoid



Review Mitigation Alternatives

- **Alter** the Hazard
  - Prescribed burns or fuels management to reduce wildfire intensity and severity
  - Draining lakes behind weakened dams

Review Mitigation Alternatives

- **Avert** the Hazard
  - Floodwalls and gates
  - Debris Nets and Basins
  - Drainage improvements
  - Channels and culverts
  - Firebreaks

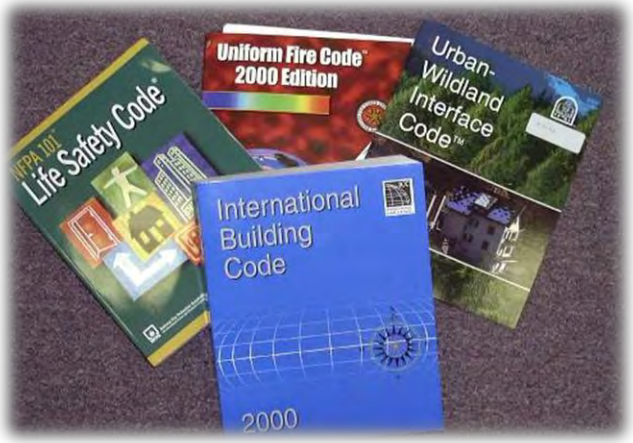
Review Mitigation Alternatives

- **Avoid** the Hazard
  - Acquisition
  - Relocation
  - Open space
  - Land use designation
  - Natural system protection

Review Mitigation Alternatives

Adapt to the Hazard

- Building codes
- Construction standards
- Land use and development regulations
- Design standards
- Monitoring and warning systems
- Safe rooms and shelters



FEMA Mitigation Action Categories

- Plans and Regulations
- Structure and Infrastructure Projects
- Education and Awareness
- Natural Systems Protection

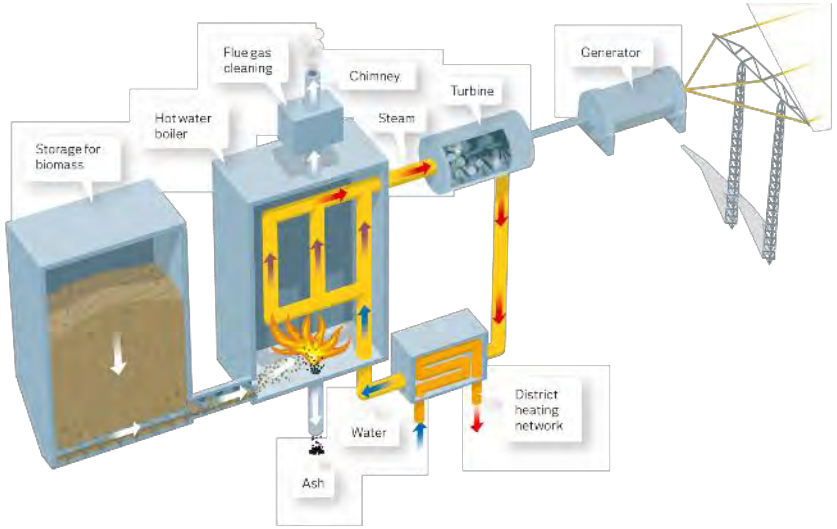
FEMA Community Lifelines

Lifeline Mitigation Examples

- Flood Mitigation, Evacuation Structure, Wildfire protection
- Relocation or protection water supply system, Pumping Station
- Mitigation of risks to Hospitals
- Microgrid, Electrical or Gas utilities relocation or protection
- Upgrades to Emergency communications infrastructure due to risks from natural hazards
- Bridge improvements, Road elevation and/or protection, Transit authorities
- Waste transfer station, Wastewater treatment plant

Projects Eligible for FEMA Funding - Wildfire

- Defensible space
- Structural protection through ignition-resistant construction activities
- Hazardous fuels reduction activities
  - Community level vegetation management
  - Vegetation removal
  - Vegetation clearing and/or thinning
  - Slash removal
  - Vertical clearance of tree branches
- Biomass Plant



Projects Eligible for FEMA Funding - Flood Mitigation

- Acquisition
- Dry and wet flood-proofing
- Elevation
- Minor localized flood reduction projects
  - Detention ponds
  - Channel stabilization
- Policy change: levee projects if no duplication of programs with Army Corps
- Infrastructure retrofit
  - Culverts, bridges, etc.

Projects Eligible for FEMA Funding – Winter Storm

- Ensure development and enforcement of building codes for snow loads
- Burying/hardening overhead power lines
- Informing the public about severe winter weather impacts
- Organizing outreach to vulnerable populations including establishing and promoting accessible heating centers
- Retrofitting public buildings to withstand snow loads and prevent roof collapse

Projects Eligible for FEMA Funding (Other Hazards)

- Landslides/geologic hazards
  - Channel or slope stabilization - protection of critical facilities
  - Property acquisition
- Utility protection/ infrastructure retrofit
- Safe rooms
- Generators
- Microgrids/smart grids
- Seismic building/infrastructure retrofit
- Climate resilient mitigation activities
  - Groundwater recharge
  - Green infrastructure

Discuss Criteria for Mitigation Action Selection and Prioritization

Mitigation Action Selection and Prioritization

STAPLEE

- **S**ocial
- **T**echnical
- **A**dministrative
- **P**olitical
- **L**egal
- **E**conomic
- **E**nvironmental

Other Things to Consider

- Life Safety
- Vulnerable Populations
- Addressing High Risk Hazards
- Protect Critical Facilities/Assets
- Multiple Goals/Hazards

Review of Progress on Existing Mitigation Actions

Prior Mitigation Actions – Action Status Tracker

- **Not Started:** Work has not begun
- **In Progress:** Work has begun but is not completed
- **Completed:** The action has been finished
- **Annual Implementation:** Ongoing with no specific end date
- **Deleted:** The action is no longer relevant or cancelled due to changing priorities, lack of funds, etc.

There is no requirement or expectation to have completed any/all previous actions.

Prior Mitigation Actions – Progress So Far

County	Completed	Deleted	Continuing	New Actions in 2023	Total New/Continuing Actions
Campbell	4		58		58
Crook	3	3	19		19
Johnson	3	5	28	7	35
Sheridan	9		21		21
Weston	4	5	4		4
Total	**23**	**13**	**130**	**7**	137

Development of New Mitigation Actions

Mitigation Strategy Elements

Goals

General guidelines that explain what you want to achieve

Usually broad policy/vision statements

Objectives (optional)

Define strategies or implementation steps to attain goals

Specific and measurable

Actions

Specific projects/activities to achieve goals & objectives

Disaster Mitigation Act Requirements

- Adopting jurisdictions must have at least one new action
- Must have at least one action for each applicable hazard
- Must be “true” mitigation to meet FEMA requirements
  - Preparedness & response actions may also be included, but won’t count
- Actions must be prioritized
- Actions must have detail on implementation & administration
- Actions must have a basic review of benefit vs. cost
- Must include actions that address existing and future development

New Mitigation Actions Are Not “Binding”

The mitigation strategy is a “wish list”

not a commitment of resources.

DRAFT Wyoming Region 1 Mitigation Goals- Johnson

1. To protect life and property hazards.
2. Increase public awareness and education about hazards.
3. Strengthen and improve disaster resistance of public and privately owned facilities and infrastructure.

DRAFT Wyoming Region 1 Mitigation Goals- Sheridan

1. Mitigate the effects of hazards through education, ordinances, resolutions, and clear definition and implementation of mitigation projects to reduce the loss of property and enhance life-safety.
2. Coordinate mitigation activities with all entities and stakeholders of Sheridan County to access the hazards and take various actions to reduce or eliminate the risk factors of those hazards.
3. Reduce the economic impact on the local economy caused by the effects of hazards in the communities.
4. Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

DRAFT Wyoming Region 1 Mitigation Goals- Campbell

1. Reduce the impact of severe weather on people, property, or natural resources.
2. Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.
3. Maintain the reliability and resilience of critical infrastructure.
4. Reduce the impact of human-caused incidents, emergencies, or disasters.
5. Reduce loss of life and property from fire.
6. Increase resilience through coordination of governmental policies, procedures, codes, and regulations.

DRAFT Wyoming Region 1 Goals- Crook

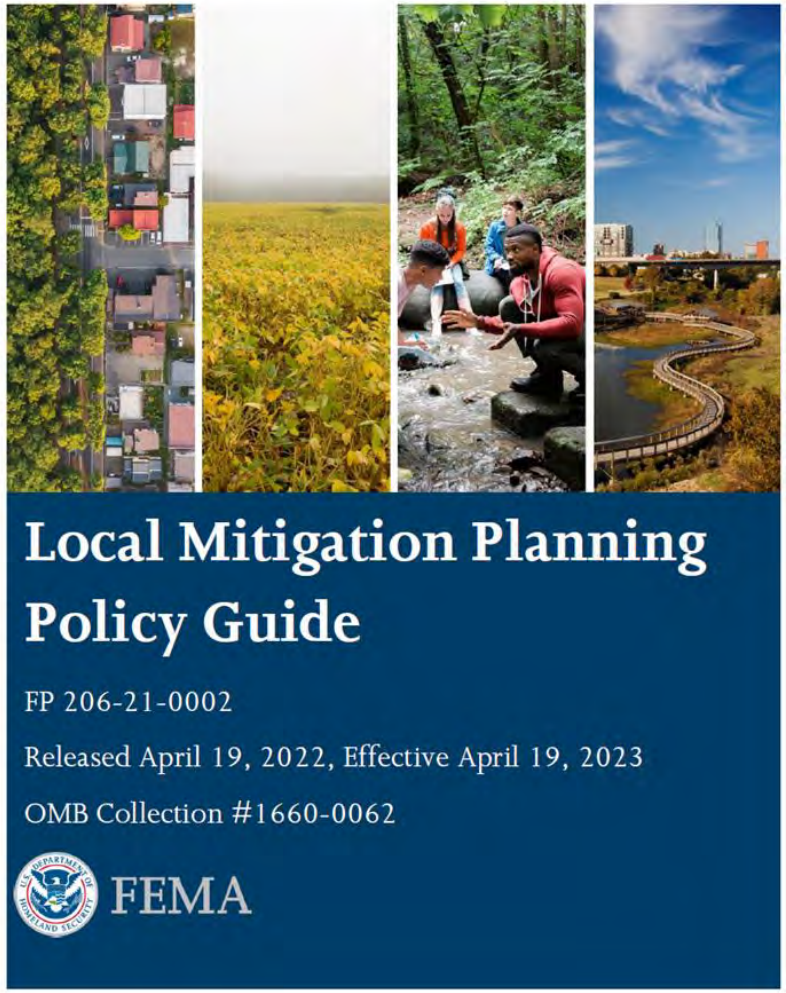
1. Mitigate hazards to reduce the potential for property loss or damage, injury and loss of life in the Town of Hulett.
2. Mitigate hazards to reduce the potential for property loss or damage, injury, and loss of life in the Town of Moorcroft.
3. Mitigate hazards to reduce the potential for property loss of damage, injury and loss of life in the Town of Pine Haven.
4. Mitigate hazards to reduce the potential for property loss of damage, injury and loss of life in the City of Sundance.
5. Mitigate hazards to reduce the potential for property loss of damage, injury and loss of life in Crook County
6. Increase resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.

DRAFT Wyoming Region 1 Goals - Weston

1. Reduce the impact of severe weather on people, property, or natural resources.
2. Increase the resilience of citizens by embracing their personal responsibility to be prepared and involved through education and volunteering.
3. Maintain the reliability and resilience of critical infrastructure.
4. Reduce the impact of human-caused incidents, emergencies, or disasters.
5. Increase resilience through coordination of governmental policies, procedures, codes, and regulations.

Sources of Ideas for Mitigation Actions

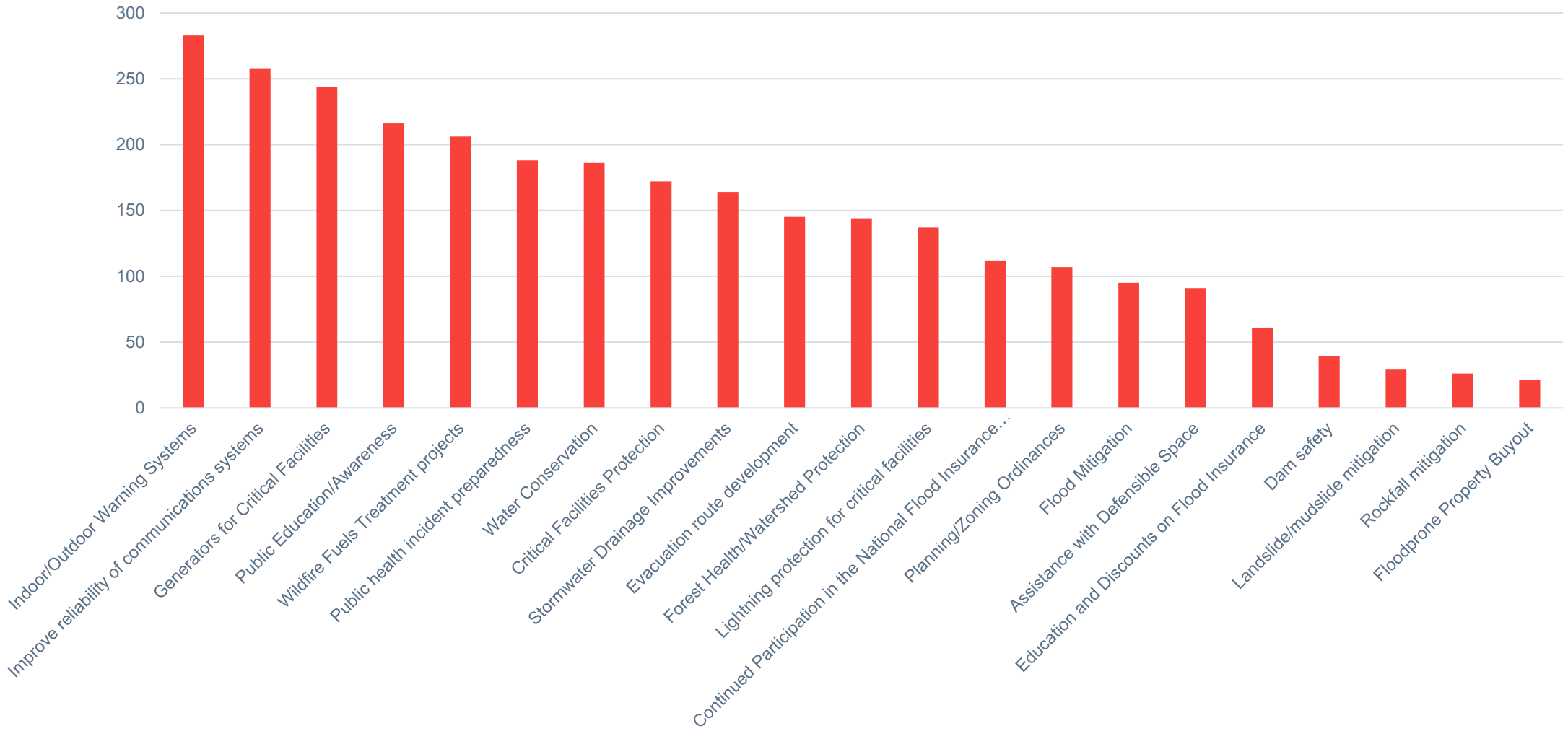
- Draft Hazard Identification & Risk Assessment
- Handout on action alternatives by hazard & category
- Public survey input (see handout)
- Water protection & usage plans, watershed plans, drainage plans, etc.
- Capital Improvement Plans
- Community Wildfire Protection Plan
- FEMA ‘Mitigation Action Portfolio’ publication
  https://www.fema.gov/sites/default/files/2020-08/fema_mitigation-action-portfolio-support-document_08-01-2020_0.pdf



FEMA Community Lifelines

Public Survey Results

Please indicate the types of mitigation actions that you think should have the highest priority.

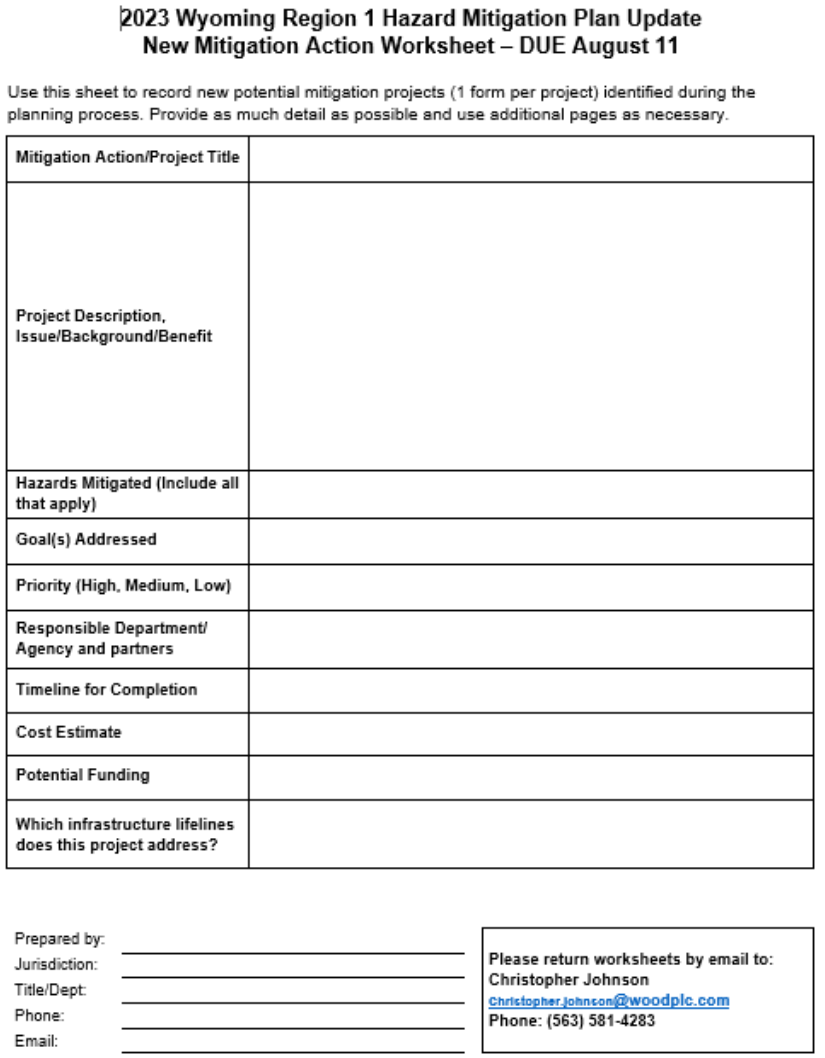


Suggested Ideas for New Mitigation Actions

- Install additional snow fences at strategic locations to minimize roadway impacts and transportation incidents
- Create a water conservation public awareness and educational campaign, including educational materials on water conservation measures to implement during drought periods.
- Implement the high priority projects identified in CWPPs
- Strategic grassland/forest fuels reduction efforts surrounding vulnerable communities
- Ensure critical communication infrastructure is grounded to mitigate lightning strikes.
- Underground utility lines
- Consult with USACE on potential large-scale flood mitigation projects
- Resource Conservation District actions related to drought, flood, winter storm

Activity: Develop New Mitigation Actions

- What new mitigation actions should be added to the Plan?
- Write one idea for each new action on a blank worksheet
- You are encouraged to collaborate with other agencies or jurisdictions
- Include details where you can, but it's okay if you don't know or can elaborate later.
- Include the Jurisdiction and Lead Agency
- Feel free to submit more than one
- Review each other's suggestions



2023 Wyoming Region 1 Hazard Mitigation Plan Update
New Mitigation Action Worksheet – DUE August 11

Use this sheet to record new potential mitigation projects (1 form per project) identified during the planning process. Provide as much detail as possible and use additional pages as necessary.

Mitigation Action/Project Title	
Project Description, Issue/Background/Benefit	
Hazards Mitigated (Include all that apply)	
Goal(s) Addressed	
Priority (High, Medium, Low)	
Responsible Department/ Agency and partners	
Timeline for Completion	
Cost Estimate	
Potential Funding	
Which infrastructure lifelines does this project address?	

Prepared by: _____
Jurisdiction: _____
Title/Dept: _____
Phone: _____
Email: _____

Please return worksheets by email to:
Christopher Johnson
christopher.johnson@woodplc.com
Phone: (563) 581-4283

Prioritization of Mitigation Actions

Mitigation Action Selection and Prioritization

STAPLEE

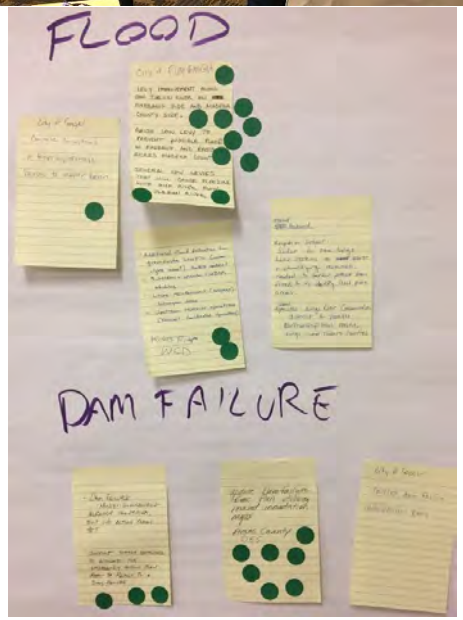
- Social
- Technical
- Administrative
- Political
- Legal
- Economic
- Environmental

Other Factors to Consider

- Life safety
- Addressing high risk hazards
- Protect critical facilities
- Multiple goals/hazards
- Vulnerable populations and equity

Activity: New Mitigation Action Prioritization

- Connect the Dots!
- 4 Dots per Person
- Indicate which should be priority mitigation actions with a dot, keeping STAPLEE Criteria in mind
- Dots will later be converted into a High, Medium, Low initial prioritization



Plan Implementation and Maintenance

Plan Implementation & Maintenance

The plan must describe how, when, and by whom the plan will be:

- Monitored:
  - Tracking implementation of mitigation actions
  - Identifying new actions as needed
  - Losses avoided due to mitigation activities
- Evaluated
  - Effectiveness at achieving goals and objectives
  - What hindered implementation?
  - What factors contributed to success?
- Updated
  - Reviewed & revised at least once every five years.
- Continued Public Involvement
  - Engaged and given opportunity to provide input

Plan Implementation & Maintenance

The following tasks should be conducted “regularly”, at least annually

- HIRA review – changes to hazards or vulnerabilities
- Review of recent hazard incidents
- Updates on mitigation actions
- Assess effectiveness of completed mitigation actions

Annual face to face meeting of Hazard Mitigation Planning Team to discuss updates on mitigation actions and/or significant impactors/events

- Target is first quarter of each year?

Job aids:

- Sample agenda for annual meeting in appendix

Incorporation into Other Planning Mechanisms

- Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development.
- Implementation through existing plans and/or programs is recommended wherever possible:
  - Comprehensive Plan
  - Zoning/Subdivision Ordinances
  - Floodplain Ordinance
  - Capital Improvements Plan
  - Emergency Operations Plan
- Discussion: Provide at least one opportunity to incorporate or cross reference the HMP into other planning mechanisms

FEMA Requirement – Element C6
a. Does the plan identify the local planning mechanisms where hazard mitigation information and/or actions may be incorporated?
b. Does the plan describe each community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms?
c. The updated plan must explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts.

Next Steps

Project Schedule

Project Milestones	Anticipated Timeline
Meeting #2 HIRA review	May 2023
HIRA Draft for HMPC review	August 2023
Meeting #3 Mitigation Strategy	July 2023
Full Draft for HMPC review	Late September/Early Oct 2023
Public Review Draft	October 2023
DHSEM Review Draft	November 2023
Final Plan for FEMA Review (estimated)	November 2023
Final Approved HMP for local adoption	December 2023

Next Steps

- Submit additional new mitigation actions
- Review and comment on HIRA when available
- Review and comment on draft Regional Plan and County Annex when available
- Stay informed by email of upcoming meetings

Questions? Thank you!

Project Manager
Jeff Brislawn
WSP
Jeff.Brislawn@wsp.com
303-704-5506

Hazard Mitigation Planner
Christopher Johnson
WSP
Christopher.johnson@wsp.com

wsp.com

SIGN-IN SHEET

Johnson County Hazard Mitigation Plan Update

Hazard Mitigation Planning Team Meeting #3 (Mitigation Strategy Meeting)

Tuesday, July 25th, 2023, 9:00 – 11:00am

Buffalo City Council Meeting Room, 46 N Main Street, Buffalo, WY

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
Myra Canino	myra.canino@cityofbuffalowy.com	620-6412	City Council	Council Woman
Terry Asay	Planningdirector@cityofbuffalo.com	217 3406	Building/ Planning	Building Inspector / Planner
Anita Bartlett	anita.bartlettewy.rr.com	307-738-2321	PRCD	District Manager
Robin King	robin.king@wyo.gov	684-2564	JCPH	PHRC
Jim Walker	jwalker@johnsoncowy.us	684-1907	JC Planning Dept	County Planner
Marilyn Connolly	emc@johnsoncowy.us	217-1879	Emergency Management	Coordinator
Jeff Brislawn	Jeff.brislawn@WSP.com	303-704-5506	WSP	Project Mgr

SIGN-IN SHEET
Sheridan County Hazard Mitigation Plan Update
Hazard Mitigation Planning Team Meeting #3 (Mitigation Strategy Meeting)
Tuesday, July 25th, 2023, 2-4pm

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
EDWARD HINZMAN	edward.hinzman@wyo.gov	307 672 5769	SHERIDAN COUNTY PUBLIC HEALTH	PUBLIC HEALTH RESPONSE COORDINATOR
Allen Thompson	athompson@sheridancountywy.gov	672-2900	Sheridan County Commission	Commissioner
Peter Clark	MAyor@Ranchester.wy.gov	307-655-2283	Town of Ranchista	MAYOR
Carrie Rogaczewski	carrie.rogaczewski@scedwy.org	307-672-5820x.3	Sheridan County Conservation District	District Manager
Chris Thomas	on file	307-752-9464	SHX Fire Warden	Fire Warden
STEVE SMALL	smallsr@vcn.com	(307) 752-1321	SHERIDAN COUNTY LEPC CHAIRMAN	CHAIRPERSON
Spencer Kukuchka	marshal@ranchesterwy.gov	307 461-2694	Town of Ranchester	Town Marshal
Jesse Ludikhuize	JLudikhuize@sheridancountywy.gov	307-675-2569	Sheridan County EM	Emergency management Coordinator
Levi Dominguez	levi.dominguez@scsowy.us	307-672-3455	Sheridan County Sheriff office	Sheriff
MARK REID	mreid@sheridancountywy.gov	752-1508	PUBLIC WORKS/PLANNING	COUNTY PLANNER
GENE HALE	GENE.HALE@VA.GOV	307-675-3660	VETERANS ADMIN. HOSP.	EMERGENCY MANGR
DAN COUGHLIN	dcoughlin@sheridancountywy.gov	307-675-2931	SHERIDAN AREA WATER SUPPLY JOINT POWERS BOARD	ADMINISTRATOR
Jeff Brislawn	jeff.brislawn@wsp.com	303-704-5506	WSP- PLANNING CONSULTANT	Jeff.brislawn@wsp.com

SIGN-IN SHEET
Campbell County Hazard Mitigation Plan Update
Hazard Mitigation Planning Team Meeting #3 (Mitigation Strategy Meeting)
Wednesday, July 26th, 2023, 9-11am
Cottonwood Room at George Amos Memorial Building (GAMB)
412 S Gillette Avenue, Gillette, WY

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
Robby Gallob	Robby@wrightwyoming.com	(307) 622-7411	Town of Wright	Emergency Manager
Chris Schneider	christen.schneider@wyo.gov	689-8168	WYDOT Gillette Reno Moorcroft	AMS
Michael Phipps				
Cheyenne Love	clove.cccd@gmail.com	(307) 682-1824	CCCD	District Manager
Howard Jones	howardj@gillettewy.gov	(307) 391-1063	COG	Water Mgr.
Scott Ostlund	scotto@gillettewy.gov	696-5675	ST - COG	Streets Mgr
Brandon Price	brandon@gillettewy.gov	307 257-0740	COG - WWTF CCCD-BOS	Wastewater Mgr. Board Chairman
Kelly Alger	kelly@gillettewy.gov	307-682-5155	Gillette Pd	Capt.
Sam Pruh	sprotter@campbellcounty	688-1252	County	Planner
Jeff Brislawn	jeff.brislawn@wsp.com	720-308-1187	WSP Consultant Project Mgr	Project Mgr

SIGN-IN SHEET
Campbell County Hazard Mitigation Plan Update
Hazard Mitigation Planning Team Meeting #3 (Mitigation Strategy Meeting)
Wednesday, July 26th, 2023, 9-11am
Cottonwood Room at George Amos Memorial Building (GAMB)
412 S Gillette Avenue, Gillette, WY

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
JR Fox	jfox@ccfire.us	307-682-5312	Fire	Deputy Chief
Joe Kuchler	Joseph.Kuchler@campbellcountywy.gov		Public Health	PHRC

SIGN-IN SHEET

Crook County Hazard Mitigation Plan Update

Hazard Mitigation Planning Team Meeting #3 (Mitigation Strategy Meeting)

Thursday, July 27th, 2023, 9:00 – 11:00am

Community Room, 309 E Cleveland St, Sundance, WY 82729

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
Jenny Eatherton	jenny.eatherton@wyo.gov	307-670-2844	Wyoming State Parks	Assistant Superintendent
Ed Robinson	edr@crookcounty.wy.gov	307-290-2772	Crook Co. E.M.	Em. M. Coor.
Matthias Barton	matthias.barton@neiman.com	307-315-0944	Neiman Enterprises	Environmental Manager
Alex Jessen	alexj@crookcounty.wy.gov	307-283-1225	Crook Co. Sheriffs	Undersheriff
Bob Latham	bobl@crookcountywy.gov	307-756-2662	Crook Co. Commissioners	
Derric Culey	derricculey@gmail.com	3077703499	Kare EMS Communication Specialist	
Bill Bryant	wbryant@townofmoorcroft.com	307 756 3301	Moorcroft PD	chief
Jeff Brislawn	Jeff.brislawn@wsp.com	303-704-5586	WSP - Plan Consistency	Project MGR

SIGN-IN SHEET
Weston County Hazard Mitigation Plan Update
Hazard Mitigation Planning Team Meeting #3 (Mitigation Strategy Meeting)
Thursday, July 27th, 2023, 2:00 – 4:00pm
Weston County Emergency Management Office, 1 Main St, Newcastle, WY

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
SHERIE HILGENKAMP	sherie.hilgenkamp@usda.gov	307-746-2701 EXT 2	USDA FARM SERVICE AGENCY	COUNTY EXECUTIVE DIRECTOR
Derek Thompson	NADThompson@rtconnect.net	307-746-8281	Newcastle Police Dept.	Patrol Sergeant
DAN FIELDS	DFields@westongov.com	307-746-4441	Weston County Sheriffs Office	Patrol Sergeant
Ashley Anglen	ashley.anglen@usda.gov	307 780 6755	USDA Farm Service Agency	CED T
VERA HUBER	vhuber@westongov.com	307-941-1137	WC Commissioner	
Becky Hadlock	clerk@westongov.com	746-4744	WC Clerk	WC Clerk
Scott E Beachler	sbnwy@outlook.com	746-5610	WCSSR — Weston County Coroner	Sec./Treas Coroner
Randy Bury	randy.bury1@wyo.gov	746-4475	WCPO	PIO RC
Gilbert Nelson	gilbert.nelson@westongov.com	746-4315	WCEM	EM
Caleb Carter	ccarter.ward@gmail.com	406-539-2712	Weston County Natural Resource District	District Manager
Jeff Brislawn	Jeff.brislawn@wsp.com	303-704-5506	WSP — PLANNING CONSULTANT	project mgr

Example Mitigation Actions by Hazard

Alternative Mitigation Actions	Dam Incidents	Floods	Epidemic/ Pandemic HazMat	Expansive Soils, Land Subsidence	Weather Extremes: (drought and extreme temps; hail, lightning, severe wind; tornado)	Earthquakes	Fire	Winter Storm
PLANS and REGULATIONS								
Building codes and enforcement		■		■	■	■	■	■
Comprehensive Watershed Tax		■						
Density controls	■	■		■			■	
Design review standards		■		■		■	■	
Easements		■		■			■	
Environmental review standards		■		■		■	■	
Floodplain development regulations	■	■						
Hazard mapping	■	■		■			■	
Fluvial Hazard Zone mapping and regulations		■		■				
Floodplain zoning	■	■						
Forest fire fuel reduction							■	
Housing/landlord codes					■			
Slide-prone area/grading/hillside development regulations				■			■	
Manufactured home guidelines/regulations		■			■	■		
Multi-Jurisdiction watershed protection	■	■						
Open burning regulations							■	
Open space preservation	■	■		■			■	
Performance standards	■	■		■	■	■	■	■
Special use permits	■	■		■			■	
Stormwater management regulations		■						
Subdivision and development regulations	■	■		■		■	■	
Surge protectors and lightning protection					■			
Tree Management					■		■	■
Transfer of development rights		■		■			■	
Utility location		■		■	■		■	■

Alternative Mitigation Actions	Dam Incidents	Floods	Epidemic/ Pandemic HazMat	Expansive Soils, Land Subsidence	Weather Extremes: (drought and extreme temps; hail, lightning, severe wind; tornado)	Earthquakes	Fire	Winter Storm
STRUCTURE AND INFRASTRUCTRE PROJECTS								
Acquisition of hazard prone structures	■	■		■			■	
Facility inspections/reporting	■	■				■		
Construction of barriers around structures	■	■						
Elevation of structures	■	■						
Relocation out of hazard areas	■	■		■			■	
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■
Channel maintenance		■		■				
Dams/reservoirs (including maintenance)	■	■						
Levees and floodwalls (including maintenance)		■						
Safe room/shelter					■	■		■
Secondary containment system								
Site reclamation/restoration/revegetation		■		■				
Snow fences					■			■
Water supply augmentation					■			
Debris Control/Debris basins		■		■				
Defensible Space							■	
Stream stabilization		■		■				
Biomass Plant							■	
Microgrids	■	■			■	■	■	■
Power line hardening/burial	■	■			■	■	■	■

Alternative Mitigation Actions	Dam Incidents	Floods	Epidemic/ Pandemic HazMat	Expansive Soils, Land Subsidence	Weather Extremes: (drought and extreme temps; hail, lightning, severe wind; tornado)	Earthquakes	Fire	Winter Storm
EDUCATION AND AWARENESS								
Flood Insurance	■	■						
Hazard information centers	■	■	■	■	■	■	■	■
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure	■	■		■	■	■	■	■
Crop Insurance					■	■		
Lightning detectors in public areas					■			
Disease contact tracing protocols and tools			■					
NATURAL SYSTEMS PROTECTION								
Best Management Practices (BMPs)		■		■	■		■	
Forest and vegetation management	■	■		■	■		■	■
Hydrological Monitoring	■	■		■	■			
Sediment and erosion control regulations	■	■		■				
Stream corridor restoration		■		■				
Stream dumping regulations		■						
Urban forestry and landscape management		■		■	■		■	■
Wetlands development regulations		■		■			■	
Aquifer recharge/recovery					■			
OPERATIONAL RESILIENCY								
Critical facilities protection	■	■	■	■	■	■	■	■
Emergency response services	■	■	■	■	■	■	■	■
Facility employee safety training programs	■	■	■	■	■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■	■	■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■		■	■	■	■	■
Evacuation planning	■	■	■	■			■	

Mitigation Action Selection and Prioritization Criteria

- Does the proposed action protect lives?
- Does the proposed action address hazards or areas with the highest risk?
- Does the proposed action protect critical facilities, infrastructure, or community assets?
- Does the proposed action meet multiple objectives (multi-objective management)?
- Is there a strong advocate for the action or project that will support the action's implementation?
- Does the project address equity or protect vulnerable populations?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

Social - Does the measure treat people fairly (different groups, different generations)? Does it consider social equity, disadvantaged communities, or vulnerable populations?

Technical - Will it work? (Does it solve the problem? Is it feasible?)

Administrative - Is there capacity to implement and manage project?

Political - Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal - Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic - Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental - Does it comply with environmental regulations or have adverse environmental impacts?

From:	Johnson, Christopher
To:	jludikhuize@sheridancountywy.gov; david.king@campbellcountywy.gov; edr@crookcounty.wy.gov; gnelson@westongov.com; mconnolly@johnsoncowy.us
Cc:	Brislawn, Jeff
Subject:	Public Input Survey
Date:	Thursday, March 2, 2023 3:20:00 PM
Attachments:	image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello all,

Here is a link to our draft survey for public input: https://forms.office.com/r/rwML1dDL4z

If everyone could please review this and let me know if there are any changes/edits/additions you would like by **March 7th**, then we can finalize the survey and push the link out through your available public info channels and social media. Below is also some draft language to be used for the public survey advertisement:

"We need your input!

Campbell, Crook, Johnson, Sheridan, and Weston Counties (Collectively known as Wyoming Region 1) are in the process of updating the Wyoming Region 1 Hazard Mitigation Plan. The Multi-Jurisdictional Hazard Mitigation Plan analyzes the region's vulnerabilities to natural hazards and identifies mitigation actions the jurisdictions in the region can take to minimize property damage, reduce injuries and loss of life, and lessen the overall impacts of disasters.

If you live, work, or play in the Region 1 counties, please help us incorporate your experience and opinions into the plan by taking this short online survey. This will help the planning team better understand the vulnerabilities across Region 1's counties and communities, as well as solicit input on ways to best mitigate, or reduce, the impacts of hazards before they occur.

The survey consists of 11 questions, and should take less than 10 minutes to complete. Please complete this survey by April 30, 2023. Thank you for your participation!
You can take the survey here: https://forms.office.com/r/rwML1dDL4z"

Let me know if there are any questions!
Thank you,

Christopher Johnson
Associate Consultant – Environmental Planner
He/Him/His

WSP USA
2000 S. Colorado Blvd., Ste. 2-1000
Denver, CO 80222

wsp.com

Sheridan County Government
Published by Sheridan Sheridan · Just now ·

SHERIDANCOUNTY.COM

Wyoming Region 1 Hazard Mitigation Plan - Sheridan County Wyoming

Campbell, Crook, Johnson, Sheridan, and Weston Counties (Collectively known as Wyoming Re...

See insights and ads

Boost post

Like Comment Share

Regional Hazard Mitigation Plan Available For Public Review And Comment

December 19, 2023 News Release

Would you like to learn more about what Campbell, Crook, Johnson, Sheridan and Weston counties are doing to minimize the impacts of floods, wildfires, winter storms, hazardous materials incidents, and other hazards?

A draft of the Regional Hazard Mitigation Plan is being made available for public review and comment.

The plan assesses the risks posed by hazards, identifies ways to reduce those risks, and allows each participating county and municipality to be eligible for mitigation grant funding from FEMA.

County planning teams, including representatives from all municipalities, developed the plan over the past 12 months with assistance from a consultant.

The plan identifies hazard mitigation goals and mitigation projects for the counties, with the intent of reducing losses from hazard events before they occur again.

A public survey was used during the planning process to solicit input on the hazards and ideas for mitigation projects.

The counties in the Region are now soliciting public comment on the plan before it is finalized and submitted for FEMA review and approval.

The final plan will be adopted by each participating county and municipality before it becomes official.

More information can be obtained from your local emergency management office.

In Sheridan County contact Sheridan County Emergency Management at 307-675-2569 or scema@sheridancountywy.gov.

The comment period will be December 18-31, 2023.

Earth View 3D
Earth View 3D
View Earth Maps
Open

BE THE FIRST TO COMMENT

Leave a Reply

Your email address will not be published.

Comment

Name *

Email *

Save my name, email, and website in this browser for the next time I comment.

POST COMMENT

Pine Haven Fire Department Auxiliary
11m ·

Crook County Emergency Management
42m ·

"We need your input!

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CC Lepc
Just now ·

"We need your input!

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Send

From: edr@crookcounty.wy.gov

To: Doug Leis; Dusty Downey <dustydowney@hotmail.com>; kdmaston88 <kdmaston88@yahoo.com>; Katie Allen <katie.allen@wyo.gov>; Jason Campbell <jecampbell2@live.com>; Amber Mathews <ambermathews6@gmail.com>; Carlisle (Fonzy) Haskell <fonzy702@hotmail.com>; **+15 others**

Cc:

Bcc:

Subject: Survey

"We need your input!

Campbell, Crook, Johnson, Sheridan, and Weston Counties (Collectively known as Wyoming Region 1) are in the process of updating the Wyoming Region 1 Hazard Mitigation Plan. The Multi-Jurisdictional Hazard Mitigation Plan analyzes the region's vulnerabilities to natural hazards and identifies mitigation actions the jurisdictions in the region can take to minimize property damage, reduce injuries and loss of life, and lessen the overall impacts of disasters.

If you live, work, or play in the Region 1 counties, please help us incorporate your experience and opinions into the plan by taking this short online survey. This will help the planning team better understand the vulnerabilities across Region 1's counties and communities, as well as solicit input on ways to best mitigate, or reduce, the impacts of hazards before they occur.

The survey consists of 11 questions, and should take less than 10 minutes to complete. Please complete this survey by April 30, 2023. Thank you for your participation! You can take the survey here: https://forms.office.com/r/rwML1dDL4z"

(Ctrl)

Ed Robinson, AWEM
Patrol Deputy/Emergency Management Coordinator
Crook County Sheriff's Office
PO Box 339
Sundance, WY 82721
Phone: 307-283-1225 / 307-290-2772 (Cell)
Fax: 307-283-2990

Crook County Emergency Management
Just now ·

"We need your input!

Campbell, Crook, Johnson, Sheridan, and Weston Counties (Collectively known as Wyoming Region 1) are in the process of updating the Wyoming Region 1 Hazard Mitigation Plan. The Multi-Jurisdictional Hazard Mitigation Plan analyzes the region's vulnerabilities to natural hazards and identifies mitigation actions the jurisdictions in the region can take to minimize property damage, reduce injuries and loss of life, and lessen the overall impacts of disasters.

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The survey consists of 11 questions, and should take less than 10 minutes to complete. Please complete this survey by April 30, 2023. Thank you for your participation!

You can take the survey here: https://forms.office.com/r/rwML1dDL4z"

Wyoming Region 1 Hazard Mitigation Plan

March 9, 2023

Campbell, Crook, Johnson, Sheridan, and Weston Counties (Collectively known as Wyoming Region 1) are in the process of updating the Wyoming Region 1 Hazard Mitigation Plan. The Multi-Jurisdictional Hazard Mitigation Plan analyzes the region's vulnerabilities to natural hazards and identifies mitigation actions the jurisdictions in the region can take to minimize property damage, reduce injuries and loss of life, and lessen the overall impacts of disasters.

If you live, work, or play in the Region 1 counties, please help us incorporate your experience and opinions into the plan by taking this short online survey. This will help the planning team better understand the vulnerabilities across Region 1's counties and communities, as well as solicit input on ways to best mitigate, or reduce, the impacts of hazards before they occur.

The survey consists of 11 questions and should take less than 10 minutes to complete. Please complete this survey by April 30, 2023. Thank you for your participation!

You can take the survey at: https://forms.office.com/r/rwML1dDL4z

You can the link to the survey also at the Sheridan County website https://www.sheridancounty.com

← Sheridan County Attainable Housing Council Meeting Agenda for March 8, 2023

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CROOK CO EMERGENCY MANAGMENT
PO BOX 475
SUNDANCE WY 82729-0475

Wyoming Pioneer

Thursday, March 16, 2023 www.wyopio.com

The week ahead

Crafty Stitchers
Sat., Mar. 18, 10 a.m., Hulett Civic Center

Hulett Food Pantry
Wed., Mar. 22, 11 a.m.-1 p.m., GHCC

See **Hulett Area Happenings** page 2 for more.

All-Conference basketball players announced

The 1A Northeast All-Conference players have been announced for boys' and girls' basketball teams. For the girls, Kaydence Olson and McKenna Kromarek were both placed on the honor team.

For the boys, Aiden McAmis, Hunter Reilly and Kyle Smith were nominated and placed on the All-Conference team. Coach for the Red Devils, Brandon Ackerman was also named Coach of the Year for Boys 1A Northeast District.

Melissa Bear/photos

Coach of the year, Brandon Ackerman.

All-Conference Red Devil players, left to right: Aiden McAmis, Hunter Reilly and Kyle Smith.

Girls' basketball All-Conference, McKennah Kromarek; not pictured: Kaydence Olson.

Input needed for hazard mitigation plan

Northeast Wyoming is in the process of updating the plan used to protect this area against natural hazard and is seeking input from the public to assist in identifying both risks and the best way to reduce their potential hazards.

The Wyoming Region 1 Hazard Mitigation Plan encompasses Campbell, Johnson, Sheridan and Weston counties, as well as Crook County. Its purpose, says Emergency Management Coordinator Ed Robinson, is to analyze the region's vulnerabilities to natural and human-caused hazards and identify mitigation actions that jurisdictions can take to minimize property damage, reduce injuries and loss of life and lessen the overall impacts of disasters.

The Federal Emergency Management Agency (FEMA) and

Commission hears two

From: Ed Robinson <edr@crookcounty.wy.gov>
Sent: Tuesday, January 2, 2024 4:05 PM
To: Brislawn, Jeff
Subject: Re: Region 1 Hazard Mitigation Plan Public Review Draft for posting and press release

Jeff our local newspapers, in Moorcroft/Pine Haven, Sundance, and Hulett all published notices of the comment period and how to access it.

I don't have copies of those ads. I didn't save the newspapers.

Ed Robinson, AWEM
Patrol Deputy/Emergency Management Coordinator
Crook County Sheriff's Office
PO Box 339
Sundance, WY 82721
Phone: 307-283-1225 / 307-290-2772 (Cell)
Fax: 307-283-2990
edr@crookcounty.wy.gov,emergencymanagement@crookcounty.wy.gov

---

From: Brislawn, Jeff <jeff.brislawn@wsp.com>
Sent: Tuesday, January 2, 2024 3:00 PM
To: jludikhuize@sheridancountywy.gov <jludikhuize@sheridancountywy.gov>; Ed Robinson <edr@crookcounty.wy.gov>; gnelson@westongov.com <gnelson@westongov.com>; Michael A. Phipps <Michael.Phipps@campbellcountywy.gov>; Marilyn Connolly <mconnolly@johnsoncowy.us>; david.king@campbellcountywy.gov <david.king@campbellcountywy.gov>
Cc: Johnson, Christopher <christopher.johnson@wsp.com>; Ashley Paulsrud <ashley.paulsrud@wyo.gov>
Subject: RE: Region 1 Hazard Mitigation Plan Public Review Draft for posting and press release

We have not received any public comments yet. That is not out of the ordinary, but we are going to extend the comment period one week to January 9th to give a little more time due to the holidays.
Also please send me any documentation of how the public comment period was advertised.
I will also send an email to your neighboring county emergency managers to provide an opportunity to comment so we can meet that FEMA requirement.
Regards,
Jeff

Jeff Brislawn, CFM
Project Manager
Hazard Mitigation and Emergency Management

T+ 1 303-704-5506

From: Ashley Paulsrud <ashley.paulsrud@wyo.gov>
Sent: Monday, December 18, 2023 1:44 PM
To: Brislawn, Jeff <jeff.brislawn@wsp.com>
Cc: Johnson, Christopher <christopher.johnson@wsp.com>; jludikhuize@sheridancountywy.gov; Ed Robinson <edr@crookcounty.wy.gov>; gnelson@westongov.com; Michael A. Phipps <Michael.Phipps@campbellcountywy.gov>; Marilyn Connolly <mconnolly@johnsoncowy.us>; david.king@campbellcountywy.gov
Subject: Re: Region 1 Hazard Mitigation Plan Public Review Draft for posting and press release

Good afternoon,
The draft plan is now available on our website: https://hls.wyo.gov/

Thanks,
Ashley

On Fri, Dec 15, 2023 at 3:36 PM Brislawn, Jeff <jeff.brislawn@wsp.com> wrote:

> Ashley,
> The public review draft can be accessed from this Google Drive in two PDFs, one of the base plan and the other for the county annexes.
> https://drive.google.com/drive/folders/1atK7Z1tkktdAGh4JR_SmdgPqv8J3O2o1?usp=sharing
> Please post on your website and let the EM coordinators that are cc'd here know when ready. Please also post the link to the online comment form in the attached press release with the draft plan.
> *Region 1 Coordinators:*
> Attached is a press release to announce the draft plan review period. When the plan is posted at WOHS please share broadly through your typical public information channels, social media, etc, and share with your local HMPC's and encourage them to share as well.
> I'm going to be on PTO the week of the 18th, so let Chris Johnson know if there are any issues or questions.
> Regards,
> Jeff
>
> **Jeff Brislawn,** CFM
> Vice President
> Hazard Mitigation and Emergency Management
>
> T+ 1 303-704-5506
>
> ---
>
> NOTICE: This communication and any attachments ("this message") may contain information which is privileged, confidential, proprietary or otherwise subject to restricted disclosure under applicable law. This message is for the sole use of the intended recipient(s). Any unauthorized use, disclosure, viewing, copying, alteration, dissemination or distribution of, or reliance on, this message is strictly prohibited. If you have received this message in error, or you are not an authorized or intended recipient, please notify the sender immediately by replying to this message, delete this message and all copies from your e-mail system and destroy any printed copies.
>
> -LAEmHhHzdJzBlTWfa4Hgs7pbKl

--
Ashley Paulsrud

Grants/Finance Section Chief
Wyoming Office of Homeland Security
5500 Bishop Blvd. Cheyenne, WY 82002
Office: 307-777-4907
Cell: 307-214-9716
Fax: 307-635-6017

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of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

Regional Hazard Mitigation Plan Available For Public Review And Comment

December 19, 2023 News Release

Would you like to learn more about what Campbell, Crook, Johnson, Sheridan and Weston counties are doing to minimize the impacts of floods, wildfires, winter storms, hazardous materials incidents, and other hazards?

A draft of the Regional Hazard Mitigation Plan is being made available for public review and comment.

The plan assesses the risks posed by hazards, identifies ways to reduce those risks, and allows each participating county and municipality to be eligible for mitigation grant funding from FEMA.

County planning teams, including representatives from all municipalities, developed the plan over the past 12 months with assistance from a consultant.

The plan identifies hazard mitigation goals and mitigation projects for the counties, with the intent of reducing losses from hazard events before they occur again.

A public survey was used during the planning process to solicit input on the hazards and ideas for mitigation projects.

The counties in the Region are now soliciting public comment on the plan before it is finalized and submitted for FEMA review and approval.

The final plan will be adopted by each participating county and municipality before it becomes official.

More information can be obtained from your local emergency management office.

In Sheridan County contact Sheridan County Emergency Management at 307-675-2569 or scema@sheridancountywy.gov.

The comment period will be December 18-31, 2023.

Earth View 3D
Earth View 3D
View Earth Maps
Open

BE THE FIRST TO COMMENT

Leave a Reply

Your email address will not be published.

Comment

Name *

Email *

Save my name, email, and website in this browser for the next time I comment.

POST COMMENT

From: Brislawn, Jeff
Sent: Tuesday, January 2, 2024 3:44 PM
To: shill@natronacounty-wy.gov; niobraracountyema@gmail.com; russ.dalgarn@conversecountywy.gov; ema.ohs@washakiecounty.net; emc@bhcounty.com; Ccdes42@gmail.com; bmischel@bighorncountymt.gov; prcdes@gmail.com
Cc: jludikhuize@sheridancountywy.gov; Ed Robinson; gnelson@westongov.com; Michael A. Phipps; Marilyn Connolly; david.king@campbellcountywy.gov
Subject: WY Region 1 Hazard Mitigation Plan draft available for comment - neighboring jurisdictions

WSP is the consultant working with Wyoming Region 1 Hazard Mitigation Plan update (Campbell, Crook, Johnson, Sheridan and Weston Counties). As the emergency managers in neighboring counties, we are extending an invitation to review and comment on this draft plan before it gets finalized. There is a comment form on the website noted below.

The public review draft can be accessed from the link below.

https://hls.wyo.gov/

Please provide comments by January 8th if possible.
Regards,
Jeff

Jeff Brislawn, CFM
Vice President
Hazard Mitigation and Emergency Management

T+ 1 303-704-5506

Wyoming Region 1
Regional Hazard Mitigation Plan

APPENDIX B: RECORDS OF ADOPTION (ELECTRONIC)

CITY OF SHERIDAN, WYOMING

55 Grinnell Street, P.O. Box 848, Sheridan Wyoming 82801
Ph (307) 674-6483 Fax (307) 674-2195

Public Works

MEMORANDUM

RE: Discussion of Bid Award to Wyoming Machinery Company for Two (2) Wheel Loaders in the Amount of $287,418.00 - Utilities Director Dan Roberts

From: Heather Czaplinski, PW Administrative Coordinator

To: City Council

CC:

Date: 08/06/2024

Recommendation:

Staff recommends that the Mayor and City Council approve the purchases of two (2) Wheel Loaders from Wyoming Machinery Company in the amount of $287,418.00; one for the Sheridan Water Treatment Plant and one for the Solid Waste Landfill Division.

Background:

The fleet replacement plan within the Utilities Department identifies the schedule and projected cost for replacing each of its fleet assets on a prescribed basis. Some of the main criteria which establish an asset's schedule for replacement are utilization, (mechanical hours of use) mileage, age, and cost of maintenance. The main goal of the plan is to provide City operations with a dependable fleet at the lowest "cost to own" for the City.

The purchase of a wheel loader was approved in the FY25 budget for the Sheridan Water Treatment Plant (SWTP) and the Solid Waste Landfill Division. In accordance with the City's Vehicle and Equipment Replacement Plan, these new loaders will replace the SWTP's 2005 Terex Loader with 2,022 hours and unobtainable replacement parts; and it will replace the Landfill's 2016 Cat Loader with 10,551 hours.

Discussion:

Before going out for Request for Bids, the Fleet Manager sent the loader specifications to the division supervisors and superintendents to review, edit, and confirm the specifications needed for their operations.

The Fleet Manager solicited bids utilizing the Sourcewell Cooperative Purchasing process. Bid pricing was solicited and received from Sourcewell vendors in compliance with Wyoming State Statutes for competitive bidding. Through the process, the City received four (4) bids to supply two (2) loaders:

- Torgerson's Equipment $244,730.00
  - Did not meet the required minimum specs (bucket clearance level of 11ft and 9ft at 45º)
- C&B Operations $263,422.56
  - Did not meet the required minimum specs (bucket clearance level of 9ft at 45º and engine HP)
- Wyoming Machinery Co. $301,168.00
- Arnold Machinery $305,052.00

The fleet manager met with the respective division superintendents and supervisors on Friday, August 16, to review the bids. The staff follows the same process each time there is a bid opening, or when reviewing Sourcewell bids.

The bids were evaluated based on whether the equipment met the minimum bid specifications and on price. Equipment bids that did not meet the minimum specifications were considered a “nonqualified” bid. All qualified bids were ranked in order based on price with the lowest qualified bid being recommended for award.
The Wyoming Machinery Company was the lowest responsive, responsible bidder whose bid met the minimum required specifications. As such, Wyoming Machinery Company is recommended for a bid award of $287,418.00 for the two (2) CAT loaders proposed in their bid. The bids from Torgerson’s Equipment and C&B Operations were lower in price, but neither of these vendors bid equipment that met the minimum specifications required.

Funding:

The Solid Waste Capital Outlay-Equipment/Machinery/Vehicles Budget for FY25 includes $145,000.00 for its loader purchase. The final price for this loader is $150,584.00, which includes the pre-delivery of the machine, freight, an extended warranty, and onboard full-loader scales. The Solid Waste Division budget for FY25 capital equipment purchases was able to realize a savings of $36,638.00 with the recent purchase of its front and rear load refuse trucks. The resulting budget surplus is recommended to be utilized to cover the $5,584.00 shortfall needed in order to purchase the $150,584.00 loader from Wyoming Machinery Company for the Landfill.

The Sheridan Water Treatment Capital Outlay-Equipment/Machinery/Vehicles Budget for FY25 includes $140,000.00 for this purchase. The final price for this loader is $136,834.00, which includes the cost of the loader, pre-delivery of the machine, and freight.

Attachments

WY Machinery Bid

CITY OF Sheridan

WYOMING

Request for Cooperative Purchasing Bid Pricing

WHEEL LOADERS

BID NO. SW-7-11-2024

PREPARED BY:

CITY OF SHERIDAN
55 GRINNELL PLAZA
SHERIDAN, WY 82801

BIDS DUE:

AUGUST 2, 2024 BY 5:00 P.M. (MST)

I. SUBMISSION OF BID PRICING

Bid pricing for the equipment specified here will be received on or before **August 2, 2024 by 5:00 p.m., Mountain Daylight Time (MDT)**. Cooperative Purchasing Bid pricing may be delivered in person to the City of Sheridan's Customer Service Department located on the 1st floor of City Hall or mailed to the address listed below, or an electronic copy can be sent via email to Heather Czaplinski, Fleet Manager, at hczaplinski@sheridanwy.gov.

City of Sheridan
Customer Service
Attn: Heather Czaplinski, Fleet Manager
Wheel Loaders, Bid No. SW-7-11-2024
55 Grinnell Plaza
Sheridan, WY 82801

Submission of bid pricing indicates acceptance by the vendor of the conditions contained in the Cooperative Purchasing Contract. Bid pricing offered directly from a manufacturer shall indicate if a local dealer/representative will be involved.

II. SCOPE OF SPECIFICATIONS

The performance and equipment specification listed below represent the Best Management Practices (BMP) of the City's Waste Collection and Water Treatment Divisions with respect to the appropriate uses.

EQUIPMENT SPECIFICATIONS:

The equipment specifications listed below represent the City's minimum standards for the Wheel Loader in which bid pricing is requested. All bid pricing must include the Cooperative Purchasing Contract ID, cooperative purchasing equipment specifications, and the specifications listed below as required by the City of Sheridan.

1	Qty. **2** Caterpillar 908M Wheel Loader or equivalent
2	Minimum 74 HP engine
3	Ride Control
4	Cab: ROPS SAE J1040 May94, ISO 3471-1994 or equivalent
5	External Knock Back Mirrors

6	Lockable Storage Box
7	Bucket Clearance Level 11ft (Level Bucket); 9ft (45 degrees)
8	Coupler must accommodate quick connect skid steer attachments with hydraulics
9	Minimum Bucket Capacity 1.4 CY
10	Transportation for off-site warrantied repairs or maintenance shall be included on the equipment as long as the equipment is under warranty
11	Onboard full-loader scales
12	Camera, Rear View, w/o Mirror
13	Keypad 8, Rim Pull/Creep CTL
14	Seat, Deluxe Plus, Air, Heat
15	Air Condition, Auto Temp Control
16	Fan, Demand, STD, Precleaner
17	Weather, Cold Start, 120V
18	Filter, Fuel, Electric
19	Trans 25 MPH Diff Lock
20	Beacon, Magnet, LED, Amber
21	Alarm, Back Up
22	Minimum Tire Size 405/70 R20, tire tread must be suitable for earthwork and compost yard work

23	Warranty: 7 years - 7,000 hr. including Standard Manufacturer Warranty

III. QUESTIONS

All questions concerning the above specifications in which bid pricing is being requested can be directed to:

City of Sheridan
Attn: Charles Martineau, Solid Waste Superintendent
Phone: (307) 674-8461
E-mail: cmartineau@sheridanwy.gov
or Jerrod Trangmoe, Water Treatment Supervisor
Phone: (307) 674-9833
E-mail: jtrangmoe@sheridanwy.gov

MANDATORY RFQ SUBMITTAL FORM
Bid No. SW-7-11-2024
Wheel Loaders

The undersigned, on behalf of the vendor, certifies that: (1) this Cooperative Purchasing Bid Pricing is made without previous understanding, agreement or connection with any person, firm or corporation making an offer on the same equipment; (2) is in all respects fair and without collusion or fraud; (3) the person whose signature appears below is legally empowered to bind the firm in whose name the Cooperative Purchasing bid is entered (4) they have read the complete Request for Cooperative Purchasing bid and understand all provisions: (5) if accepted by the City, this bid is guaranteed as written and amended and will be implemented as stated; and (6) mistakes in writing of the submitted Bid Pricing will be the vendor's responsibility.

City of Sheridan
Sourcewell Member ID: 2439
HGACBuy Member ID: 21-11277

1. Name of Company submitting Cooperative Purchasing bid: Wyoming Machinery Company
2. Contact Address: 5300 Yellowstone Casper WY
3. Contact Person: Scott Jensen
4. Telephone Number: 307-215-6704 Fax Number: _____
5. E-Mail address: scjensen@wyomingcat.com
6. Remittance Address: _____
7. Is your place of business located in Wyoming? X Yes _____ No
8. Total Proposal Cost: $ 134,834.00
9. Accounting Contact: Tessa Pulsipher
10. Telephone Number: 307-472-1000 Fax Number: _____
11. E-Mail: TEPulsipher@wyomingcat.com
12. Cooperative Purchasing Contracting Agency: Source Well
13. Cooperative Purchasing Contract ID: SW-7-11-2024
14. Cooperative Purchasing Contract Maturity Date: _____

- ***Attach Contract Pricing (Required)***

STATE OF WYOMING

CERTIFICATE OF RESIDENCY

Contractor Number: 1119

WYOMING MACHINERY COMPANY

HAS BEEN GRANTED RESIDENCY STATUS PURSUANT TO WYOMING STATUTE 16-6-101, AS AMENDED. FIVE PERCENT PREFERENCE SHALL BE ALLOWED WHEN BIDDING ON ANY PUBLIC WORKS CONTRACT FOR A PERIOD OF ONE (1) YEAR FROM THE DATE CERTIFICATION IS GRANTED.

GRANTED THIS 2ND DAY of JULY TWO THOUSAND AND 24

Michele Johnson, Program Manager

EXPIRATION DATE: 7/1/2025

To verify the authenticity of the certificate, please contact our office at 307-777-7261 or visit wyomingworkforce.org/businesses/labor/info

CERTIFICATE SERIAL NUMBER: 0207202425

231887-01

Jul 21, 2024

CITY OF SHERIDAN-LANDFILL

55 GRINNELL PLAZA
SHERIDAN, Wyoming 82801

Attention: CHARLES MARINEAU

Dear Charles Marineau,

Thank you for this opportunity to quote Caterpillar products for your business needs. We are pleased to quote the following for your purchase consideration.

One (1) New Caterpillar Inc. Model: 908 Wheel Loaders with all standard equipment in addition to the additional specifications listed below:

STOCK NUMBER: **SERIAL NUMBER:** **YEAR:** **SMU:**

Thank you for your interest in Dealership and Caterpillar products for your business needs. This quotation is valid for 30 days, after which time we reserve the right to re-quote. If there are any questions, please do not hesitate to contact me.

Sincerely,

Scott Jensen
Sales and Support Rep
Wyoming Machinery Company
Scjensen@Wyomingcat.com
Mobile 307-215-6704
Office 307-472-1000 Ext 1197

One (1) New Caterpillar Inc. Model: 908 Wheel Loaders with all standard equipment in addition to the additional specifications listed below:

Standard Equipment

POWERTRAIN

- Emissions compliant, two options
- U.S EPA Tier 4 Final and EU Stage V*
- U.S. EPA Tier 3 and EU Stage IIIA**
- C2.8 DIT engine (Turbocharger)
- Diesel particulate filter (DPF)*
(Fit for Life) or exhaust muffler**
- Fuel, diesel, ultra low sulphur,
@ < 15 ppm (stage V)*
- Fuel, diesel, standard sulphur,
@ < 500 ppm (stage IIIA)**
- Hydrostatic transmission, 2 speed,
with inching function, shift on the go
- Powertrain mode, hystat
- Air cleaner, two stage filter, with in
cab audio/visual indicator on display
- Axles, heavy duty, frame mounted
with outboard planetary reduction
- Closed circuit breather
- Coolant, extended life, -36C (-33F)
- Drive shaft, maintenance free,
sealed for life, universal joints
- Engine, auto idle shutdown,
ultra low idle, hibernation mode
- Engine oil, ECO drain tap and hose
- Fuel pump, priming (manual) with
water separator & drain port

HYDRAULICS

- Caterpillar HYDO Adv. 10 hydraulic oil
- Coupler/pin on attachment ready
- Demand cooling fan, hyd. driven
- Dead engine lower, lift valve, manual
- EH fully proportional controls
- Hydraulic pilot shut off switch,in cab
- Hystat pump, infinitely variable,
- Implement valve, anti drift
and pressure compensated
- Joystick, single auxiliary roller
- Lift and tilt control
- Loader arm float function
- Motor, single drive with dedicated
implement and steering pumps
- Oil Sampling SOS ports,

ELECTRICAL

- Alternator, 100 amp sealed
- Battery, heavy duty, 12V, 90Ah&1000CCA
- Battery disconnect switch
- Cab mounted fuse panel
- Lights, rear stop and turn, LED
- Lights, roading, front halogen
- Service port, electronic diagnostic,ET
- Product link (PL243)

OPERATOR ENVIRONMENT

- ROPS/FOPS certified canopy/cab
- 12V power outlets, interior/exterior
- Pedals, brake/inching, accelerator
- Lever, parking brake
- Cup holders (2)
- CB radio clip, phone holder
- Door release, internal (left/right)
- Hook, large, coat and hard hat
- Floormat, easy clean, raised pedals
(canopy) vinyl, no left arm rest
(cab) fabric, adjustable left arm rest
- Seat, manual height adjust/suspension,
- Right Arm rest, padded, multi height
speed range, cont flow, diff lock, horn
- Forward/neutral/reverse, aux roller,
- Joystick, seat mounted, multifunction
security passcode (multiple languages)
hyd/powertrain perf and aggr settings,

- Mirrors, 2 external, 1 internal
- Steering wheel, spinner knob, horn
- Seat belt, orange, 51mm (2 in)
- Storage, cab (trays x3, seat pocket)
- Radio ready, speakers and wiring
- Air vents, 4 screen, 7 directional
- Heating, mechanical control unit
- Window, rear heated
- Windshield, front single piece
- Wipers , front/rear, full coverage
- Doors, (2), fixed glass
- Cab

service hour meter, service/ maint info,
fuel level, speed range, speedometer,
- Digital with soft touch buttons,
- Gauges (2), hyd oil, engine coolant
- Display, analog and digital
- Quick coupler switch, in cab
self cancelling turn signals
control: lights, roading, wipers,
- Column mounted multi function
- Steering column, tilt adjusted
- Sun Visor, solid, front full width
- Interior light (incandescent)

OTHER STANDARD EQUIPMENT

- Cat optimized Z-bar loader linkage
- Fenders, front and rear
- Ground level daily service points
- Loader arm safety brace
- Lockable engine enclosure/side access

fuel filler cap, nose cone, HVAC filters
- Machine lifting/tie down points
- Paint, E-Coat primer, gloss top coat
- Recovery hitch with pin

MACHINE SPECIFICATIONS

908 14A CWL AM-N/AM-S	572-7978	MIRROR, EXT, STD	577-7161
LANE 2 - AVAILABLE FROM LEICESTER FACTORY		CAMERA, REAR VIEW, W/O MIRROR	602-2629
LANE 3 - AVAILABLE FROM LEICESTER FACTORY		STORAGE, BOX WITH LOCK	580-0597
SERIAL NUMBER PREFIX = MZ8		KEYPAD 8, RIM PULL/CREEP CTL	580-0522
Base machine for use with Stage V certified engines.		SEAT, DELUXE PLUS, AIR, HEAT	573-4006
BUCKET-GP, 1.4 YD3, SSL, BOCE	569-6178	SEAT BELT, 2"	595-3363
LANE 2 ORDER	0P-9002	AIR CON, AUTO TEMP CONTROL	587-6908
PREPARATION PKG-USA, ANSI	601-2045	DOOR STOP, CAB	600-3116
FAN, DEMAND, STD, PRECLEANER	581-4771	PRODUCT LINK, CELLULAR PL243	636-6174
WEATHER, COLD START, 120V	580-6299	TIRES 405/70 R20,GY,POWERLOAD	617-3232
ENGINE, C2.8, STAGE V	607-1279	FENDERS, STANDARD	579-9894
FILTER, FUEL, ELECTRIC	569-2571	HITCH, REAR RETRIEVAL, STD	580-0511
TRANS 25 MPH DIFF LOCK	597-1180	HYDRAULIC OIL, STANDARD	577-6969
COUPLER, SSL,HL	577-6124	SERIALIZED TECHNICAL MEDIA KIT	421-8926
RIDE CONTROL, HIGH LIFT	588-8903	BEACON, MAGNET, LED, AMBER	561-0644
LIGHTS, ROAD, FN, HAL, RH DIP	573-3913	HYD, 3V, STD FLOW, HIGH LIFT	598-2563
CAB, STD, FIXED DOOR GLASS	577-7152	AUX, STD FLOW, 3 VALVE, HL	607-6812
KEY START, PASSCODE SECURITY	580-0524	ALARM, BACK UP	580-0537

SELL PRICE	$134,834.00
EXT WARRANTY	$0.00
NET BALANCE DUE	**$134,834.00**
AFTER TAX BALANCE	**$134,834.00**

See add-ons below and on worksheet

WARRANTY & COVERAGE

Standard Warranty:	Caterpillar Limited Warranty: New Machines Only Earthmoving, Construction, Material Handling, Forestry Products, and Paving Product Machines for selected models designated by Caterpillar.
Extended Warranty:	WMC GOV TOTAL MACHINE WARRANTY PLUS FIELD SERVICE MILEAGE AND TRANSPORTATION FOR 84 MONTH/7000 HOURS

F.O.B/TERMS:
Casper

Pre-delivery of machine	$1,400.00
Freight for both machines to Sheridan	$1,200.00
Extended warranty	$4,000.00
Loadrite Force scale system. No printer.	$9,750.00

aftermarket, includes training

NOTE: Yellow fields must have input

	Steps for Pricing New Caterpillar Equipment		Model: CAT 908 Wheel Loader Bid SW-7-11-2024	
Start:	Machine Total Suggested Consumer List Price (SCLP)		$ 182,208.00	Discount % off list below
Less:	Source Well		$ 41,907.84	23.00%
		Subtotal:	$ 140,300.16	
Less:	Additional Dealer Discount- OTO		$ 5,466.24	3%
		Subtotal:	$ 134,833.92	
Add:	Caterpillar work tool list price		Work tool list price	Work tool description
		Work Tool List Price Subtotal:	$ -	Discount % off list below (same as above)
Less:	Discount on work tools sold with machine		$ -	
		Work Tool Subtotal:	$ -	Note: claim work tool support using program COR-13-WTL
Subtotal:	Equipment Unit Price, FOB source locations plus work tools		$ 134,834	
	Please Show All Items As Separate Line Items.			
	Pre-Delivery, Freight, assembly, and other applicable expense items		$ 1,400	Pre-Delivery Inspection
	Itemize each separate		$ 1,200	Freight for both machines
			$ 4,000	Warranty
			$ 9,750	Loadrite Scales. No printer
			$ -	itemize
			$ -	itemize
			$ -	itemize
			$ -	itemize
			$ -	itemize
Add:			$ -	
		Subtotal:	$ 16,350	
Subtotal:	Total unit price, delivered to site		$ 151,184	Net Cost Before Trade
Less:	Trade-in Allowance (If Applicable)		$0	
Result:	Net unit price delivered to site, taxes not included, freight included		$ 151,184	Net Transaction Cost w/o Tax

DATASHEET

Loadrite Force

Wheel Loader Scales

Dynamic, accurate weighing with tip-off and split loading.

Now every machine operator can quickly and easily load trucks exactly to their target weight. The Loadrite™ Force™ helps gauge accurate loading through its no-frills interface. Industry leading weighing accuracy ensures trucks are correctly loaded before they get to the weighbridge (truck scale). This cuts down on congestion and reduces waiting time increasing your customer's satisfaction.

Built on reliable field proven hardware, the Force is a user-friendly, high performance weighing system.

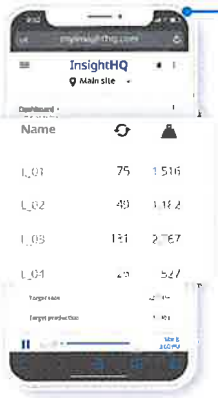
Features

- Accurate and consistent weighing to ± 1% of payload reduces haulage costs by eliminating both overloading fines and unnecessary trips caused by under loading.
- Simple to use interface makes weighing fast and easy for all machine operators.

LOADRITE®

DATASHEET

Optional Accessories & Integrations



InsightHQ

Connecting your scale to InsightHQ brings all your quarry productivity information into one easy-to-use dashboard, enabling your team to see progress against targets. You can collect productivity data from your belts, loaders, excavators, haul trucks and more into one location and access it from your desktop or smart device anywhere, anytime.

LP950/LP930 In-cab Printer

Get a hard copy record/customer receipt printed directly from the loader.

Specifications

Weighing Functions

- Dynamic Weighing, Tip-Off Weighing, Split Weighing (e.g. truck and trailer), Target Weighing mode, Over Target Warning, Bucket Overload Warning, Zero, Undo, Auto-Add, Remote-Add, up to 4 different attachments (bucket, forks etc).

Data/Metrics Functions

- Product Short Total, Long Total (Shift) and Bucket Count

Power Requirements

Supply voltage ..... 12 to 32 V DC
Current consumption ..... 160 mA typical, 350 mA max. 3 A max. with LP950 printer
Power supply protection ..... Automotive power supply transient suppression exceeds SAE specifications for DC automotive power supply transients

Physical Specifications

Indicator weight ..... 1.5 kg (3.3 lbs)
Indicator dimensions ..... W145 x L240 x D110 mm (5.7 x 9.4 x 4.3 in)
Indicator operating temperature ..... -10°C to 50°C (14°F to 122°F)
Environmental protection ..... IP69K protected trigger and pressure transducers IP54 protection for indicator

Other Information

- **Supported languages:** Danish, Dutch, English, French, German, Hungarian, Italian, Norwegian, Portuguese (Br), Spanish, Swedish
- **Supported printing languages:** Dutch, English, French, German, Hungarian, Italian, Portuguese (Br), Spanish, Swedish
- **Warranty:** 1 year parts and labor

Contact your local dealer today

Desert Basin Companies, LLC
5526 W 13400 S #317
Herriman, UT 84096
801-253-2133
loadriteguy@gmail.com

For More Information
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PN 2022-0005A (05/22)

LOADRITE®

Cat®
908

Compact Wheel Loader

Features:

CONFIGURED FOR SUCCESS

- Cat® wheel loaders set the standard for productivity, fuel efficiency and operator comfort. The Cat 908 Compact Wheel Loader has a high torque C2.8 engine that works in conjunction with an intelligent hystat power train to deliver exceptional fuel efficiency. Dependent on regional requirements our engines meet U.S. EPA Tier 4 Final and EU Stage V emission standards with a clean emission module designed to manage itself so you can concentrate on the task at hand or emit equivalent to U.S. EPA Tier 3 and EU Stage IIIA.

ENJOY ALL DAY COMFORT

- All new cab is spacious, quiet and comfortable with all around 360° visibility to keep you productive throughout the day. Seat-mounted controls feature a multifunction joystick for lift and tilt functions with an integrated thumb operated speed range, forward/neutral/reverse (FNR) switch, trigger operated differential lock and constant flow. Optional fourth function joystick also available.
- Digital display with soft touch buttons for customized settings to easily control linkage and drive train to further enhance operator comfort and safety.

EFFICIENTLY POWERFUL

- Cat C2.8 engine provides a cleaner, quieter operation while delivering superior performance and durability through a high torque, low speed design. Caterpillar's exclusive Intelligent Power Management system monitors operator input and available power to keep the machine working at peak efficiency.
- "Shift on the go" locking differentials and hydrostatic transmission provide smooth and powerful operation while increasing the efficiency of machine cycles. Single Pedal Mode via the display enables right pedal machine operation giving further improved operator controllability of attachment RPM versus machine ground speed over creep control and inching pedal.

WORK MADE EASY

- All-in-one joystick to keep eyes on the work while maximizing operation of hydro-mechanical attachments with a state of the art pressure compensated electro-hydraulic system. Optimized Z-bar linkage for great performance and versatility with buckets that now have the DNA of the larger Cat loaders, such as curved side plates and a flat torque tube for parallel reference to the cutting edge.

CUSTOMIZE YOUR EXPERIENCE

- Work as one with your machine by customizing the controls. Operator can adjust machine responsiveness with the push of a button based on the attachment or application. Once customized, settings can be locked with "simplified mode" to ensure the machine is consistent and intuitive for every user.
- Machine security is enhanced with a standard keycode or optional Bluetooth® technology.

PURPOSE BUILT SPECIALITY MODELS

- Machines can be built to meet industry and application specific needs: Agriculture, General Construction, Industrial and Waste, Landscaping or Snow Removal.
- The 908 has the following specific handler arrangements:
  - Ag Handler
  - Waste Handler

AFTERMARKET AND SERVICES

- Range of services and aftermarket retrofits and upgrades available to keep your machine going and configured for your application.
- Service and maintenance parts available, including a range of self-service options (SSO) and dealer installed kits.
- Integrated Technology available to reduce service costs and maintenance.

CAT®

908 Compact Wheel Loader

Purpose Built Specific Handlers

A complete range of optional equipment and work tool attachments gives you the versatility to configure a handler package to be successful in your business. Get with Caterpillar to configure yours.

AG HANDLER

Recommended options for an AG Handler:

- High lift
- Reversing fan
- AG tires
- LED roading lights
- LED work lights
- Camera, front or rear
- Full range of work tool attachments

WASTE HANDLER

Recommended options for a Waste Handler:

- High lift
- Reversing fan
- Light guarding, front and rear
- Tire options (solid or pneumatic)
- LED work lights
- Camera, front or rear
- Seatbelt notification, green beacon option
- Backup alarm
- Light material or grapple buckets

Specifications

Engine

Engine Model	Cat® C2.8*	
Maximum Engine Speed	2,550 rpm	
Maximum Gross Power		
Rated Engine Speed	2,400 rpm	
SAE J1995	55.7 kW	74.7 hp
ISO 14396	55.4 kW	74.3 hp
ISO 14396 (metric)	75.3 mhp	
Rated Net Power		
Rated Engine Speed	2,400 rpm	
SAE J1349	54.2 kW	72.7 hp
ISO 9249	53.8 kW	72.1 hp
ISO 9249 (metric)	73.1 mhp	
Maximum Gross Torque#		
SAE J1995	300 N·m	222 lb-ft
ISO 14396	300 N·m	221 lb-ft
Maximum Net Torque#		
SAE J1349	296 N·m	218 lb-ft
ISO 9249	295 N·m	217 lb-ft

Engine *(continued)*

Displacement	2.8 L	171 in³
Bore	90 mm	3.54 in
Stroke	110 mm	4.33 in

- Advertised power is tested per the specified standard in effect at the time of manufacture.
- Net power advertised is the power available at the flywheel.

*Two Cat C2.8 engine emission options are available:

1) Meets U.S. EPA Tier 4 Final, EU Stage V.
2) U.S. EPA Tier 3 and EU Stage IIIA equivalent. Tier 3 engine specs are 0.3 kW/0.4 hp more gross power (SAE J1995), 0.2 kW/0.3 hp on net power (SAE J1349) and 1 N·m/0.7 lb-ft higher on gross torque (SAE J1995).

#Maximum gross and net torque measured at 1,600 rpm.

Specifications *(continued)*

Buckets

Bucket Capacities – General Purpose	0.80-1.35 m^3	1.0-1.7 yd^3
Bucket Capacities – Multi Purpose	0.75-1.1 m^3	1.0-1.4 yd^3
Bucket Capacities – Light Material	1.25-1.55 m^3	1.6-2.0 yd^3

- Bucket selection must be made with an understanding of the material density and application to ensure machine stability is maintained within the tipping loads stated per model and configuration.
- Bucket capacities stated include bolt-on cutting edge (BOCE), in line with ISO 7546.

Transmission

Forward and Reverse:		
Speed Range Creep#	10 km/h	6 mph
Speed Range 1*	10 km/h	6 mph
Speed Range 2** – High Speed	17 km/h	10.5 mph
Speed Range 2** – Standard	20 km/h	12 mph
Speed Range 3***	40 km/h	25 mph

#Factory default shown, can be adjusted to any speed up to 19 km/h (12 mph).
*Creep function not available in this gear or above.
**Max speed dependent on model and configuration (standard vs. high speed transmission).
***Reverse is 30 km/h (19 mph).

Tires

Standard Size	405/70 R20 Powerloads*
Other Choices Include:	400/70 R20 XMCL/Bibload 360/80 R20 TRI 2 40X14-20 TL, SM/TR

- Other tire choices are available. Contact your Cat dealer for details.
- Caterpillar recommends that you consult a tire supplier to evaluate all conditions before selecting a tire model.

*This tire has been used for all dimension, stability and performance data.

Service Refill Capabilities

Fuel Tank (including filter and lines)	90 L	24 gal
Cooling System	12 L	3.2 gal
Engine Crankcase	8.8 L	2.3 gal
Axles – Front Center Differential	8.8 L	2.3 gal
Axles – Rear Center Differential	8.8 L	2.3 gal
Hydraulic System (including tank)	70.5 L	18.6 gal
Hydraulic Tank	44.6 L	11.8 gal
Transmission	2.4 L	0.6 gal

- No Diesel Exhaust Fluid (DEF) fluid needed on this size engine.

Axles

Front	Fixed (standard) Locking Differential (optional)
Rear	Fixed (standard) Locking Differential (optional)

- Oscillation of ±11 degrees via hitch between front and rear frames.

Steering

Steering Articulation Angle (each direction)	39°	
Maximum Flow – Steering Pump	46.7 L/min	12.3 gal/min
Maximum Working Pressure – Steering Pump	23 000 kPa	3,336 psi
Steering Cycle Times – (full left to full right) – at High Idle	2.8 sec	
Number of Steering Wheel Turns – Full Left to Full Right	3.25 turns	
or Full Right to Full Left	4.00 turns	

Cab

ROPS ISO 3471:2008
FOPS ISO 3449:2005 Level II

- Canopy and cab, Rollover Protective Structures (ROPS) are available worldwide. Canopy not available in Europe (EU).

Loader Hydraulic System

Main Relief – 1st Auxiliary (3rd slice)	23 500 kPa	3,408 psi
Standard Flow*	90 L/min	24 gal/min
High Flow*	125 L/min	33 gal/min
Main Relief – 2nd Auxiliary (4th slice)	23 500 kPa	3,408 psi
Flow	45 L/min	12 gal/min
Hydraulic Cycle Time		
Rack Back	2.5 seconds	
Lift	5.8 seconds	
Dump	1.8 seconds	
Float down	3.6 seconds	

*Maximum flow stated, actual flow delta could be 6% from data shown. Also adjustable from 20% to 100% of maximum flow through display.

AFTERMARKET, RETROFIT and UPGRADE KITS

Machine upgrade and aftermarket kits are available for retrofit, either as a self-service option or dealer installed.

Dealer Installed Kits/Upgrades

Couplers
Joystick Kits
Keypad Options
Reversing Fan
Ride Control
Rotary Sensor and Kickouts
Work Tool Harness
Auxiliary Hydraulics Kits
Product Link™ Elite
Starting Aids
Electric Fuel Priming Pump
Camera (front or rear)
Bluetooth® Security

Self-service or Dealer Installed Kits/Upgrades

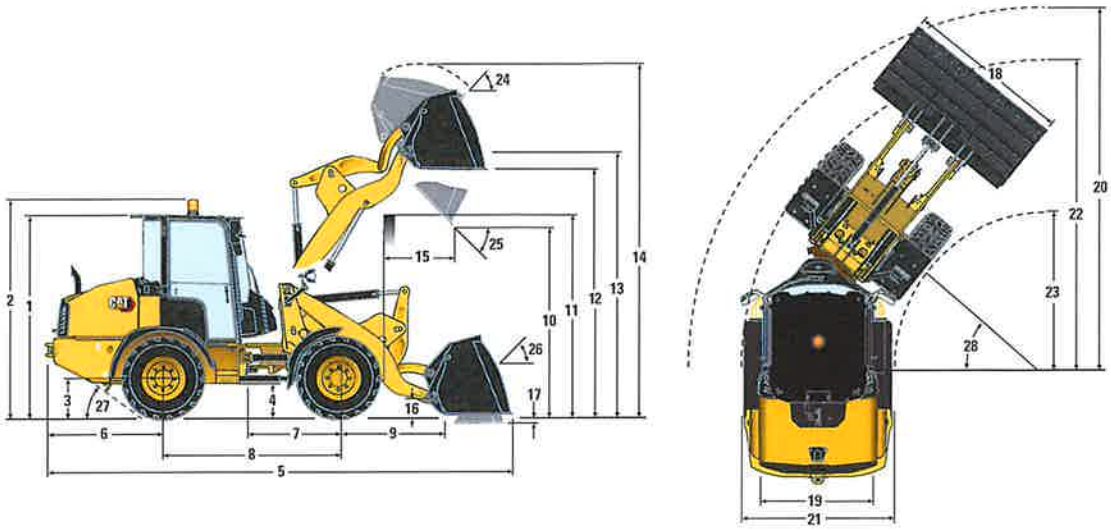
Lighting Packages
Storage Box or Cool Storage Box
Toolbox
Seatbelt Packages
Cab Filters Kits
Cell Phone Holder Options
Radio Kit
Engine Pre-cleaner
Push to Start Kit
Mirror Packages
Rear Hitch Ready Kit
Engine Sound Suppression

ATTACHMENTS

Get more from your machine with Cat attachments. Choose from a wide variety of options and tailor your machine to different tasks and conditions.

Augers
Bale Grabs
Bale Spears
Blades
Brooms
Brushcutters
Buckets
Cold Planers
Compactors
Fork Tines and Carriages
Material Handling Arm
Nursery Forks
Rakes, Landscape and Power Box
Snow Blowers
Snow Plows
Snow Pushes
Snow Wings
Stump Grinders
Tillers
Trenchers
Wheel Saws

908 Compact Wheel Loader



Dimensions

	908				908 High Lift			
	Horizontal Pin Lock Coupler (HPL-V)#		Vertical Pin Coupler (SSL)		Horizontal Pin Lock Coupler (HPL-V)#		Vertical Pin Coupler (SSL)	
	mm	ft/in	mm	ft/in	mm	ft/in	mm	ft/in
**1 Height: Ground to Cab	2645	8'8"	2645	8'8"	2645	8'8"	2645	8'8"
**2 Height: Ground to Beacon	2824	9'3"	2824	9'3"	2824	9'3"	2824	9'3"
**3 Height: Ground Axle Center	494	1'7"	494	1'7"	494	1'7"	494	1'7"
**4 Height: Ground Clearance	295	1'0"	295	1'0"	295	1'0"	295	1'0"
*5 Length: Overall	5544	18'2"	5705	18'9"	6000	19'8"	6157	20'2"
6 Length: Rear Axle to Bumper	1391	4'7"	1391	4'7"	1302	4'3"	1302	4'3"
7 Length: Hitch to Front Axle	1085	3'7"	1085	3'7"	1085	3'7"	1085	3'7"
8 Length: Wheel Base	2170	7'1"	2170	7'1"	2170	7'1"	2170	7'1"
9 Length: Front Axle to Front of Coupler	1200	3'11"	1436	4'9"	1698	5'7"	1948	6'5"
*10 Clearance: Bucket at 45°	2589	8'6"	2486	8'2"	3313	10'10"	3156	10'4"
**11 Clearance: Load over Height	2935	9'8"	2935	9'8"	3257	10'8"	3257	10'8"
**12 Clearance: Level Bucket	3181	10'5"	3172	10'5"	3668	12'0"	3659	12'0"
**13 Height: Bucket Pin	3387	11'1"	3387	11'1"	3873	12'8"	3873	12'8"
**14 Height: Overall	4288	14'1"	4378	14'4"	4744	15'7"	4834	15'10"
*15 Reach: Bucket at 45°	681	2'3"	811	2'8"	965	3'2"	1048	3'5"
16 Carry Height: Bucket Pin	342	1'1"	363	1'2"	342	1'1"	363	1'2"
**17 Dig Depth	134	0'5"	142	0'6"	134	0'5"	142	0'6"
18 Width: Bucket	2080	6'10"	2080	6'10"	2045	6'9"	2045	6'9"
19 Width: Tread Center	1570	5'2"	1570	5'2"	1570	5'2"	1570	5'2"
20 Turning Radius: Over Bucket	4493	14'9"	4607	15'1"	4825	15'10"	4919	16'2"
21 Width: Over Tires	2005	6'9"	2025	6'10"	2005	6'9"	2025	6'10"
22 Turning Radius: Outside of Tires	3979	13'1"	3979	13'1"	3979	13'1"	3979	13'1"
23 Turning Radius: Inside of Tires	1974	6'3"	1974	6'3"	1974	6'3"	1974	6'3"
24 Rack Angle at Full Lift	53°		50°		69°		66°	
25 Dump Angle at Full Lift	45°		48°		40°		40°	
26 Rack Angle at Carry	51°		54°		48°		42°	
27 Departure Angle	30°		30°		30°		30°	
28 Articulation Angle	39°		39°		39°		39°	

	908				908 High Lift			
	Horizontal Pin Lock Coupler (HPL-V)#		Vertical Pin Coupler (SSL)		Horizontal Pin Lock Coupler (HPL-V)#		Vertical Pin Coupler (SSL)	
	kg	lb	kg	lb	kg	lb	kg	lb
Operating Weight: Bucket^	6637	14,633	6723	14,822	6735	14,848	6836	15,070
Tipping Load – Straight – ISO 14397-1†	4890	10,780	4425	9,755	4237	9,341	3874	8,539
Tipping Load – Full Turn – ISO 14397-1†	4175	9,204	3770	8,311	3608	7,954	3289	7,252
Operating Weight: Carriage and Tines^^	6467	14,257	6530	14,396	6596	14,542	6674	14,714
Tipping Load – Straight – ISO 14397-1†	3990	8,796	3719	8,199	3264	7,196	3051	6,726
Tipping Load – Full Turn – ISO 14397-1†	3437	7,577	3225	7,110	2808	6,191	2621	5,778
80% of Full Turn Tip: Firm and Level EN474-3††	2750	6,062	2580	5,688	2246	4,952	2097	4,623

* Vary with bucket

** Vary with tire

^ HPL-V or SSL, general purpose bucket (908 = 1.15 m³ [1.5 yd³], 908 High Lift = 1.05 m³ [1.4 yd³]).

^^ HPL-V or SSL, class II carriage, 1220 mm (4 ft) tines (500 mm [20 in] load center).

† Full compliance to ISO 14397-1 (2007) Sections 1 thru 6 (fork 500 mm [20 in] load center), which requires 2% verification between calculation and testing.

†† Full compliance to EN474-3 and SAE J1197.

HPL-A weight, tipping and rated loads are within 1% of the HPL-V.

Dimensions listed are for a machine configured with standard cab, heater, 20 km/h (12 mph), standard guarding, 80 kg (176 lb) operator, full fluids, Goodyear POWERLOAD® 405/70 R20 tires and general purpose bucket (908 = 1.15 m³ [1.5 yd³], 908 High Lift = 1.05 m³ [1.4 yd³]) with bolt-on cutting edge or a class III fork carriage and tines (tire supplier variability can impact dimensions by 2%).

908 Compact Wheel Loader

STANDARD EQUIPMENT

POWER TRAIN

- Emissions compliant, two options*
  - U.S. EPA Tier 4 Final and EU Stage V#
  - U.S. EPA Tier 3 and EU Stage IIIA equivalent^
- Cat C2.8 engine
  - Diesel particulate filter (Fit for Life)# or muffler^
  - Fuel, diesel, ultra low# or low Sulphur^
  - Hydrostatic transmission, two speed, with inching function, "shift on the go"
  - Power train mode, hystat
- Air cleaner, two stage filter, with in cab audio/visual indicator on display
- Axles, heavy duty, frame mounted with outboard planetary reduction
- Closed circuit breather
- Coolant, extended life, –36° C (–33° F)
- Drive shaft, sealed for life, universal joints
- Engine, auto idle shutdown, hibernation mode
- Engine oil, ECO drain tap and hose
- Fuel pump, priming (manual)/water separator/drain

HYDRAULICS

- Caterpillar HYDO™ Advanced 10 hydraulic oil
- Coupler/pin on attachment ready
- Demand cooling fan, hydraulically driven
- Dead engine lower, lift valve, manual
- Electro-hydraulic, fully proportional controls
- Hydraulic pilot shut off switch, in cab
- Hystat displacement pump, infinitely variable
- Implement valve, pressure compensated
- Joystick, single lever, single auxiliary roller
- Multi-function lift and tilt with loader arm float
- Motor, single drive with dedicated implement and steering pumps

ELECTRICAL

- Alternator, 100 amp sealed
- Battery, heavy duty, 12V, 90Ah and 1,000 CCA
- Battery disconnect switch
- Cab mounted fuse panel
- Lights, rear stop and turn, LED
- Lights, roading, front halogen
- Service (Electronic Technician™)
- Product Link™

OPERATOR ENVIRONMENT

- ROPS/FOPS certified canopy/cab
  - 12V power outlets, interior/exterior
  - Pedals, raised, foot, brake/inching, accelerator
  - Lever, parking brake
  - Cup holders (2)
  - CB radio clip, phone holder
  - Door release, internal (left and right)
  - Hook, large, coat and hard hat
  - Floormat, heavy duty, easy clean
  - Mirrors, (2) external breakaway, (1) internal
  - Operator station on isolation mounts
  - Steering wheel, spinner knob, horn in center
  - Seat belt, orange, retractable, 51 mm (2 in)
  - Storage, personal (trays [3], seat pocket)
  - Steering column, tilt adjusted
  - Column mounted multi function control: lights, roading, wipers, self cancelling turn signals
  - Quick coupler switch, in cab
- Display, analog and digital
  - Gauges (2), hydraulic oil, engine coolant
  - Digital with soft touch buttons – fuel level, speed range, speedometer, service hour meter, service/maintenance information, hydraulic and power train performance and aggressiveness settings, security passcode (multiple languages)
- Joystick, seat mounted, standard multifunction
  - FNR, auxiliary roller, speed range select, continuous flow, differential lock, horn
  - Arm rest, padded right, multiple position vertical height
- Seat, manual height adjustment, (cab) fabric with adjustable left arm rest, (canopy) vinyl
- Cab
  - Doors (2), fixed glass
  - Wipers, front and rear, full front coverage
  - Windshield, front single piece
  - Window, rear heated
  - Radio ready, speakers and wiring
  - Air vents, (4) screen, (7) directional
  - Heating, mechanical control unit
  - Sun visor, solid, front full width
  - Interior light (incandescent)

OTHER

- Fenders, front and rear
- Ground level easy access daily service points
- Loader arm safety brace
- Lockable main and side engine enclosures
- Lockable, fuel cap, HVAC filters, nose cone
- Machine lifting/tie down points
- Paint, Electro-Coat primer, gloss topcoat
- Recovery hitch with pin
- Scheduled Oil Sampling (S·O·S℠) ports, engine oil and hydraulic oil

Dependent on regional regulations.
#Higher regulated countries.
^Lesser regulated countries.

OPTIONAL EQUIPMENT

POWER TRAIN

- Antifreeze, extended life coolant, –50° C (–58° F)
- Cold start – jacket water heater, bypass valve
- Creep and throttle lock function
- Fuel pump, priming, manual#/electric^
- 40 km/h (25 mph) hydrostatic transmission, 3-speed, "shift on the go", secondary steering and boosted brakes
- Single Pedal mode (includes keypad)

ELECTRICAL

- Lighting packages, multiple; front, rear, engine bay (LED or HAL)
- Push to start
- Work tool wiring harness, (3) in cab switches

HYDRAULICS

- Auxiliary flow, single standard (3) valve, single high flow (3) valve, dual high flow (4) valve
- Caterpillar Bio HYDO Advanced hydraulic oil
- Connect under pressure and case drain
- Ride Control or load check valves*
- Reversing fan
- Quick disconnect auxiliary hydraulics

OPERATOR STATION

- Air Conditioning, automatic temperature control (ATC)
- Doors, sliding windows (left and right)
- Interior light, door activated
- Joystick, FNR, twin auxiliary roller, differential lock, horn
- Mirrors (2) electronically adjustable, heated external, plus lower parabolic mirror
- Phone holder, spring loaded
- Radio, FM or digital audio broadcast
- Seat belt options, multiple
- Seat packages; deluxe or premium
- Secondary display, front or rear view camera
- Soft touch keypad options, 8 or 16 button
- Storage, lockable box or lockable cooled box
- Sun visor, rear perforated
- USB ports (2), interior

OTHER

- Couplers, vertical (SSL), horizontal (HPL-V, HPL-A)
- Rotary sensors (snubbing, kickouts, parallel)
- High lift option

908 Environmental Declaration

The following information applies to the machine at the time of final manufacture as configured for sale in the regions covered in this document. The content of this declaration is valid as of the date issued; however, content related to machine features and specifications are subject to change without notice. For additional information, please see the machine's Operation and Maintenance Manual.

For more information on sustainability in action and our progress, please visit https://www.caterpillar.com/en/company/sustainability.

Engine

- The Cat® C2.8 engine meets U.S. EPA Tier 4 Final and EU Stage V emission standards.
- Cat diesel engines are required to use ULSD (ultra-low sulfur diesel fuel with 15 ppm of sulfur or less) or ULSD blended with the following lower-carbon intensity fuels up to:
  - ✓ 20% biodiesel FAME (fatty acid methyl ester)
  - ✓ 100% renewable diesel, HVO (hydrotreated vegetable oil) and GTL (gas-to-liquid) fuels

  Refer to guidelines for successful application. Please consult your Cat dealer or "Caterpillar Machine Fluids Recommendations" (SEBU6250) for details.

Air Conditioning System

- The air conditioning system on this machine contains the fluorinated greenhouse gas refrigerant R134a (Global Warming Potential = 1430). The system contains 0.83 kg (1.8 lb) of refrigerant which has a CO_2 equivalent of 1.216 metric tonnes (1.34 tons).

Paint

- Based on best available knowledge, the maximum allowable concentration, measured in parts per million (PPM), of the following heavy metals in paint are:
  - Barium < 0.01%
  - Cadmium < 0.01%
  - Chromium < 0.01%
  - Lead < 0.01%

Sound Performance

With cooling fan speed at maximum value:
Operator Sound Pressure Level (ISO 6396:2008) – 71 dB(A)*
Exterior Sound Power Level (ISO 6395:2008) – 101 dB(A)**
Exterior Sound Pressure Level (SAE J88:2013) – 99 dB(A)**

*Measurements were conducted with properly installed and maintained cab doors and windows closed.

**The labeled sound power level for the CE and UK marked configurations when measured according to the test procedure and conditions specified in 2000/14/EC and UK Noise Regulation 2001 No. 1701.

Oils and Fluids

- Caterpillar factory fills with ethylene glycol coolants. Cat Diesel Engine Antifreeze/Coolant (DEAC) and Cat Extended Life Coolant (ELC) can be recycled. Consult your Cat dealer for more information.
- Cat Bio HYDO Advanced is an EU Ecolabel approved biodegradable hydraulic oil.
- Additional fluids are likely to be present, please consult the Operations and Maintenance Manual or the Application and Installation guide for complete fluid recommendations and maintenance intervals.

Features and Technology

- The following features and technology may contribute to fuel savings and/or carbon reduction. Features may vary. Consult your Cat dealer for details.
  - Engine Idle Hibernate Mode
  - Engine Idle Shutdown
  - Advanced Electro Hydraulics
  - Efficient HVAC
  - Engine Demand Fan
  - Aftertreatment Low Idle Regeneration Strategy
  - Hydrostatic Transmission
  - Shift On the Go Transmission
  - Remote Flash and Remote Troubleshoot
  - Long Life Structural Durability

Recycling

- The materials included in machines are categorized as below with approximate weight percentage. Because of variations of product configurations, the following values in the table may vary.

Material Type	Weight Percentage
Steel	60.35%
Iron	16.88%
Nonferrous Metal	3.48%
Mixed Metal	1.05%
Mixed-Metal and Nonmetal	0.91%
Plastic	2.24%
Rubber	4.25%
Mixed Nonmetallic	0.04%
Fluid	3.35%
Other	3.72%
Uncategorized	3.71%
Total	100.00%

- A machine with higher recyclability rate will ensure more efficient usage of valuable natural resources and enhance End-of-Life value of the product. According to ISO 16714 (Earthmoving machinery – Recyclability and recoverability – Terminology and calculation method), recyclability rate is defined as percentage by mass (mass fraction in percent) of the new machine potentially able to be recycled, reused, or both.

  All parts in the bill of material are first evaluated by component type based on a list of components defined by the ISO 16714 and Japan CEMA (Construction Equipment Manufacturers Association) standards. Remaining parts are further evaluated for recyclability based on material type.

  Because of variations of product configurations, the following value in the table may vary.

Recyclability – 93%

CITY OF SHERIDAN, WYOMING

55 Grinnell Street, P.O. Box 848, Sheridan Wyoming 82801
Ph (307) 674-6483 Fax (307) 674-2195

Public Works

MEMORANDUM

RE: Discussion of Award to Prospect Construction for the Clarifier Replacement Project in the Amount of $2,651,753 - Project Manager David Ford

From: Thomas Morneau, City Engineer

To: City Council

CC:

Date: 07/22/2024

Recommendation:

Staff recommends that the Mayor and City Council award the Clarifier Replacement Project to Prospect, the lowest qualified bid, in the amount of $2,651,753.

Staff requests that for the Clarifier Replacement Project, the Mayor and City Council authorize the Public Works Director, Hanns Mercer, to act on behalf of the Council and Mayor on all matters related to this project.

Background:

The Clarifier Replacement Project includes the removal and replacement of two secondary clarifier mechanisms within existing concrete clarifier basins including center support columns, access bridges, clarifier drives, sludge collector headers, scum collection arms and scum box, inlet baffles, FRP scum baffles, FRP v-notch effluent weirs, stairs, replacement of existing hydrostatic relief floor valves, scum pump installation, associated electrical improvements, and associated concrete and asphalt improvements.

This project was advertised in the Sheridan Press on July 23, 30, and August 6, 2024, and bids were due on August 29. A pre-bid conference was held on August 8.

Bids Received

- Velocity Constructors, Inc. $2,811,970.00
- Dick Anderson Construction $2,860,163.00
- Prospect Construction $2,651,753.00

Funding:

Sewer Enterprise Funds and Clean Water SRF Loans fund this project.

CITY OF SHERIDAN, WYOMING

55 Grinnell Street, P.O. Box 848, Sheridan Wyoming 82801
Ph (307) 674-6483 Fax (307) 674-2195

Planning

MEMORANDUM

RE: Discussion of PL-24-24, Resolution 34-24, Subdivide 25.99 Acres into 5 Lots Located at 60 Industrial Lane as a County Subdivision - City Planner Kelly Schroeder
From: Kelly Schroeder, Planning Director
To: City Council
CC:
Date: 08/30/2024

Recommendation:

Staff recommends that City Council certify that the application for WLM Enterprises Subdivision is in conformance with all rules and regulations governing the Joint Planning Area between City and County, and is in agreement with the Future Land Use Plan for the area.

Background:

Randal Engineering Surveys, on behalf of WLM Enterprises, LLC, has submitted an application for WLM Enterprises Subdivision, located at 60 Industrial Lane (PIN 56842540000933). The subject property is currently unplatted land and is zoned I-1 Industrial in the County. The applicant seeks to divide 25.99 acres into five industrial use lots with the following proposed lot sizes:

- Lot 1: 6.57 acres
- Lot 2: 4.00 acres
- Lot 3: 5.65 acres
- Lot 4: 5.75 acres
- Lot 5: 4.02 acres

The subject property is located east of the City of Sheridan and adjacent to Burlington Northern rail right-of-way. City limits lie just beyond the rail right-of-way to the south of the subject property, and approximately one-quarter of a mile to the west and north.

The proposed subdivision is on Industrial Lane, which is a 60’ wide non-exclusive access roadway easement. A proposed internal private road to be known as WLM Drive will be constructed after subdivision approval to give legal access to the proposed 5 lots. This road will also lie in a 60’ access easement and have a hammerhead turnaround that meets the design parameters for fire apparatus access.

The proposed subdivision is currently and will continue to be served by private wells and private, on-site small wastewater systems.

The property has four existing commercial shop/office buildings on separate lease areas, which follow the bounds of Lots 1 through 4 as proposed. Lot 5 is proposed as a pond area. The proposed lots are intended to be used in a similar manner to how they are currently leased, resulting in minimal change in traffic, drainage, and other impacts.

Discussion:

The Memorandum of Understanding Between Sheridan County and the City of Sheridan Regarding the Subdivision of Land within One Mile of the Contiguous Corporate Limits, dated April 27, 2022, outlines the responsibilities of the two jurisdictions in reviewing and taking action on development proposals within the Joint Planning Area. The MOU stipulates that City staff and the City Governing Body shall have the opportunity to make comments and suggestions on development plans in the area.

The City of Sheridan Municipal Code Appendix B, Section 202B Review of County Subdivisions Conditions lists the following criteria for subdivisions of land located within the Joint Planning Area. City staff comments regarding the proposed subdivision in relation to these requirements are in italics.

2. The City shall not recommend to the Sheridan County Board of Commissioners approval of any proposed subdivision of land within 1 mile of the City limits which, by itself, or as a part of a larger tract is completely surrounded by the boundaries of the City, unless the application is accompanied by a properly acknowledged petition for annexation to the City.

The proposed subdivision is not completely surrounded by City limits, therefore a petition for annexation was not required.

3. Every plat shall conform to the Zoning Ordinance currently adopted at the time of final plat approval.

The proposed plat conforms to the City of Sheridan Zoning Ordinance.

4. The City shall not recommend to the Sheridan County Board of County Commissioners approval of a proposed plat if the plat application:
    1. Is not consistent with the applicable city and county land use or comprehensive plan;
    2. Is not in conformity with any adopted street plan of the City, town or county;
    3. Does not contain dedicated rights-of-way for all streets, roads, and alleys;
    4. Does not contain dedicated easements for all existing and proposed utilities; and
    5. Fails to contain any additional criteria established by the current Memorandum of Understanding Between Sheridan County and City of Sheridan Regarding Subdivision of Land within One Mile of the Contiguous Corporate Limits.

The Future Land Use Map of the Joint Planning Area identifies this area as appropriate for heavy industrial use. The proposed subdivision is in line with this vision, as it is located away from residential areas and has access to major transportation facilities. Adjacent City zoning is M-1 Industrial, which is also intended for industrial uses.

The proposed subdivision will be accessed off an existing 60' wide private easement known as Industrial Lane. An internal 60' private access easement known as WLM Drive will be established for access to each new lot. The applicant submitted a waiver request to the County for the requirement of having this internal road be a public right-of-way. All other County road requirements including fire apparatus access will be met. The County approved this waiver request on June 24, 2024. With the granted waiver request, staff finds that the proposed subdivision access is in conformance with street plans for both jurisdictions.

The proposed subdivision contains dedicated easements that are appropriate for all existing and proposed utilities. No other criteria outlined in the MOU apply.

5. All new subdivision developments within the Airport Influence Area within the city limits of the City of Sheridan shall grant an Avigation Easement to the Sheridan County Airport.

The proposed subdivision lies outside of the Airport Influence Area.

6. The City shall not recommend to the Sheridan County Board of County Commissioners approval of a proposed plat unless City Utilities Director concludes that an adequate long-term water supply and adequate sewer capabilities exist to support the proposed use and density of the subdivision in accordance with City adopted policy.

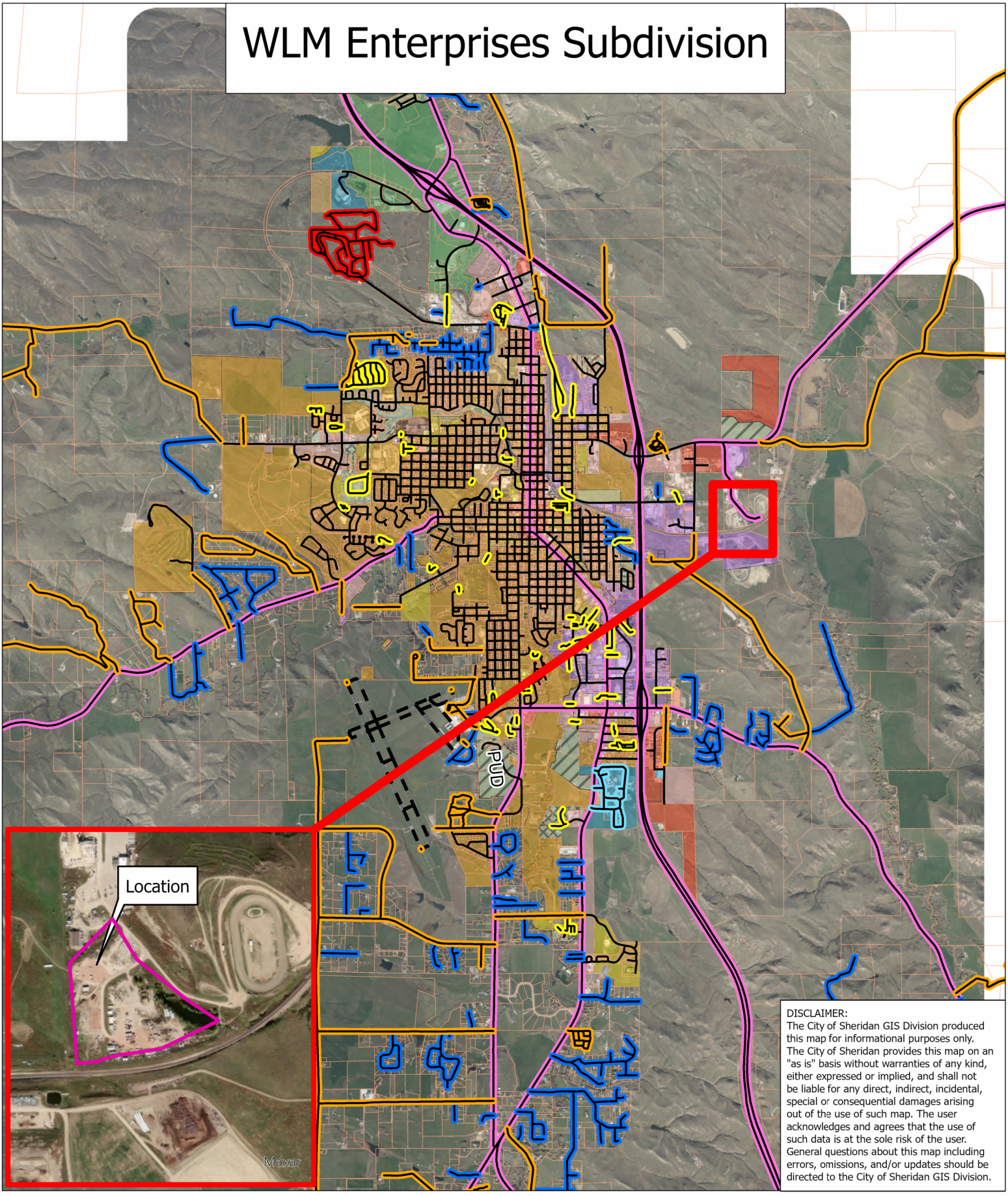
During the City review process, the Utilities Department did not express any concerns regarding long-term water supply or sewer capabilities for the proposed subdivision. The Utilities Director stated in a letter to the applicant dated April 18, 2024 that there were no plans to make water, sewer, or waste collection available to the property at this time, but that service may be provided at a later date when utilities have been extended to the area.

City staff sent letters to five property owners within 300 feet of the property notifying them of the City Public Hearing for the proposed subdivision. No comments have been received on this application to date.

Attachments

Aerial
Subdivision Plat
Exhibit
Drainage Analysis
Access Letter
Draft Resolution
Memorandum of Understanding

WLM Enterprises Subdivision



DISCLAIMER:
The City of Sheridan GIS Division produced this map for informational purposes only. The City of Sheridan provides this map on an "as is" basis without warranties of any kind, either expressed or implied, and shall not be liable for any direct, indirect, incidental, special or consequential damages arising out of the use of such map. The user acknowledges and agrees that the use of such data is at the sole risk of the user. General questions about this map including errors, omissions, and/or updates should be directed to the City of Sheridan GIS Division.

CITY OF Sheridan WYOMING

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Date: 8/30/2024 8:13 AM User: sgoodman

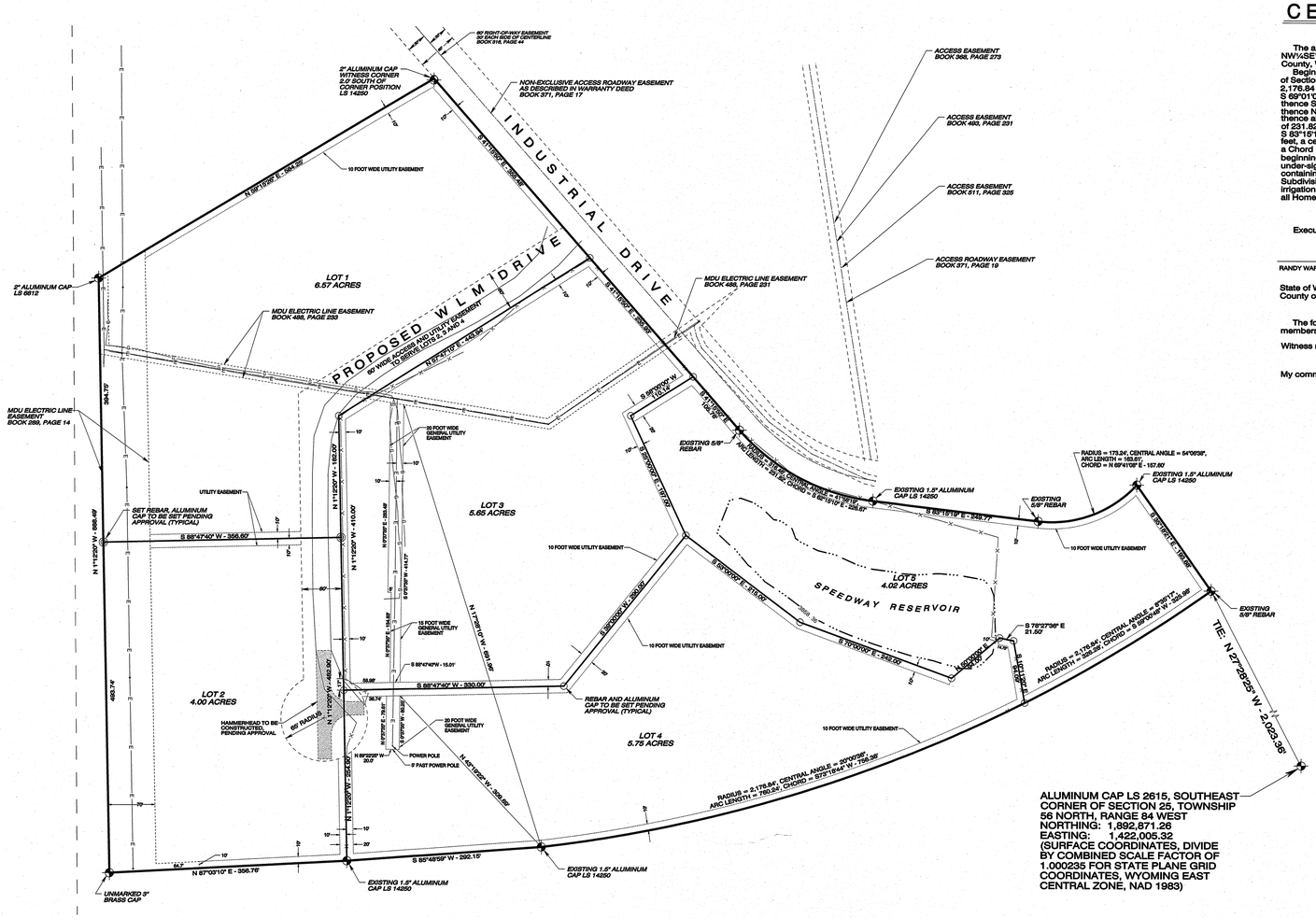
FINAL PLAT
of the
WLM ENTERPRISES SUBDIVISION
being a
MINOR SUBDIVISION
consisting of
5 LOTS COMPRISING 25.99 ACRES

DETAIL

GRAPHIC SCALE 1"= 100'
0 100 200 300

BASIS OF BEARING IS WYOMING STATE PLANE NAD 1983 (EAST CENTRAL ZONE).

PROPERTY IS ZONED I1 - INDUSTRIAL



CERTIFICATE of DEDICATION

The above or foregoing subdivision, being a minor subdivision of a portion of the NE¼SE¼ and the NW¼SE¼, Section 25, Township 56 North, Range 84 West of the Sixth Principal Meridian in Sheridan County, Wyoming, more particularly described as follows:

Beginning at a point that bears N 27°29'25" W a distance of 2,023.36 feet from the Southeast corner of Section 25, Township 56 North, Range 84 West; thence on a curve to the right having a radius of 2,176.84 feet, a central angle of 28°35'53", an arc length of 1,086.52 feet, with a Chord Bearing of S 69°01'06" W and Chord Length of 1,075.28 feet; thence S 85°48'59" W for adistance of 292.15 feet; thence S 87°03'10" W for a distance of 356.76 feet; thence N 1°12'20" W for a distance of 888.49 feet; thence N 59°15'26" E for a distance of 384.25 feet; thence S 41°15'00" E for a distance of 697.19 feet; thence along a curve to the left having a radius of 316.46 feet; a central angle of 41°58'19", an arc length of 231.82 feet, with a Chord Bearing of S 62°15'10" E and a Chord Length of 226.67 feet; thence S 83°15'19" E for a distance of 249.77 feet; thence through a curve to the left having a radius of 173.24 feet, a central angle of 54°09'38", an arc length of 163.81 feet, with a Chord Bearing of N 69°41'09" E and a Chord Length of 157.80 feet; thence S 35°16'21" E for a distance of 193.68 feet to the point of beginning, as appears on this plat, is with free consent, and in accordance with the desires of the under-signed owners and proprietors;
containing 25.99 acres more or less; have by these present laid out, and surveyed as WLM Enterprises Subdivision, and do reserve perpetual easements for the installation and maintenance of utilities and for irrigation and drainage facilities as are laid out and designated on this plat hereby releasing and waiving all Homestead Rights.

Executed this _____ day of _____, 2024, by:

RANDY WARNKE, MEMBER, WLM ENTERPRISES, LLC

MIKE MORGAREIDGE, MEMBER, WLM ENTERPRISES, LLC

State of Wyoming } ss
County of Sheridan }

The foregoing plat was acknowledged before me this _____ day of _____, 2024, by the members of WLM ENTERPRISES, LLC.

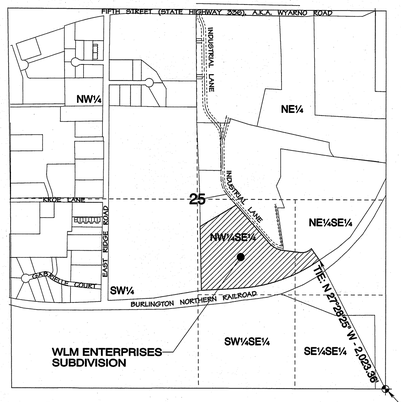
Witness my hand and official seal.

My commission expires: _____.

NOTARY PUBLIC

LOCATION

SCALE : 1" = 1000'



TOWNSHIP 56 NORTH, RANGE 84 WEST

SOUTHEAST CORNER OF SECTION 25 ALUMINUM CAP LS 2615

NOTES :

1. *NO PROPOSED CENTRALIZED SEWAGE SYSTEM.*
2. *NO PROPOSED CENTRAL WATER SUPPLY SYSTEM.*
3. *THE SURFACE ESTATE OF THE LAND TO BE SUBDIVIDED IS SUBJECT TO FULL AND EFFECTIVE DEVELOPMENT OF THE MINERAL ESTATE.*
4. *NO PUBLIC MAINTENANCE OF STREETS OR ROADS.*
5. *ANY PURCHASER DOES NOT HAVE THE RIGHT TO THE NATURAL FLOW OF ANY STREAM WITHIN, OR ADJACENT TO THE SUBDIVISION, SINCE WYOMING WATER ADMINISTRATION LAWS DO NOT RECOGNIZE ANY RIPARIAN RIGHTS WITH REGARD TO NATURAL FLOW FOR PERSONS LIVING ON THE BANK OF ANY STREAM OR RIVER.*
6. *ALL NEW CONSTRUCTION, REMODELING, ADDITIONS OR REPAIRS TO ANY PUBLIC OR PRIVATE BUILDINGS WITHIN THE SUBDIVISION SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SHERIDAN COUNTY BUILDING STANDARDS REGULATIONS AND BUILDING PERMITS AND INSPECTIONS ARE REQUIRED.*

CERTIFICATE of SURVEYOR

State of Wyoming } ss
County of Sheridan }

I, David L. Randall, a duly registered Professional Engineer and Land Surveyor in the State of Wyoming, do hereby certify that this plat of WLM Enterprises Subdivision truly and correctly represents the results of a survey made by me or under my direct supervision.

Registration No. 3159 PE & LS

Professional Engineer (Civil) & Land Surveyor — DAVID L. RANDALL — 3159 — ENGINEER — SURVEYOR — WYOMING — Date

CERTIFICATE of RECORDER

State of Wyoming } ss
County of Sheridan }

This plat was filed for record in the Office of the Clerk and Recorder at _____ O'Clock _____ M., this _____ day of _____, 2024, and is duly recorded in Plat Book _____, Page No. ____ with Receiving Number _____.

COUNTY CLERK

SHERIDAN COUNTY BOARD of COMMISSIONERS CERTIFICATE of APPROVAL

Plat approved and Subdivision Permit issued by the Board of County Commissioners of Sheridan County, Wyoming, this _____ day of _____, 2024.

Attest: COUNTY CLERK

CHAIRMAN

ENGINEER/SURVEYOR

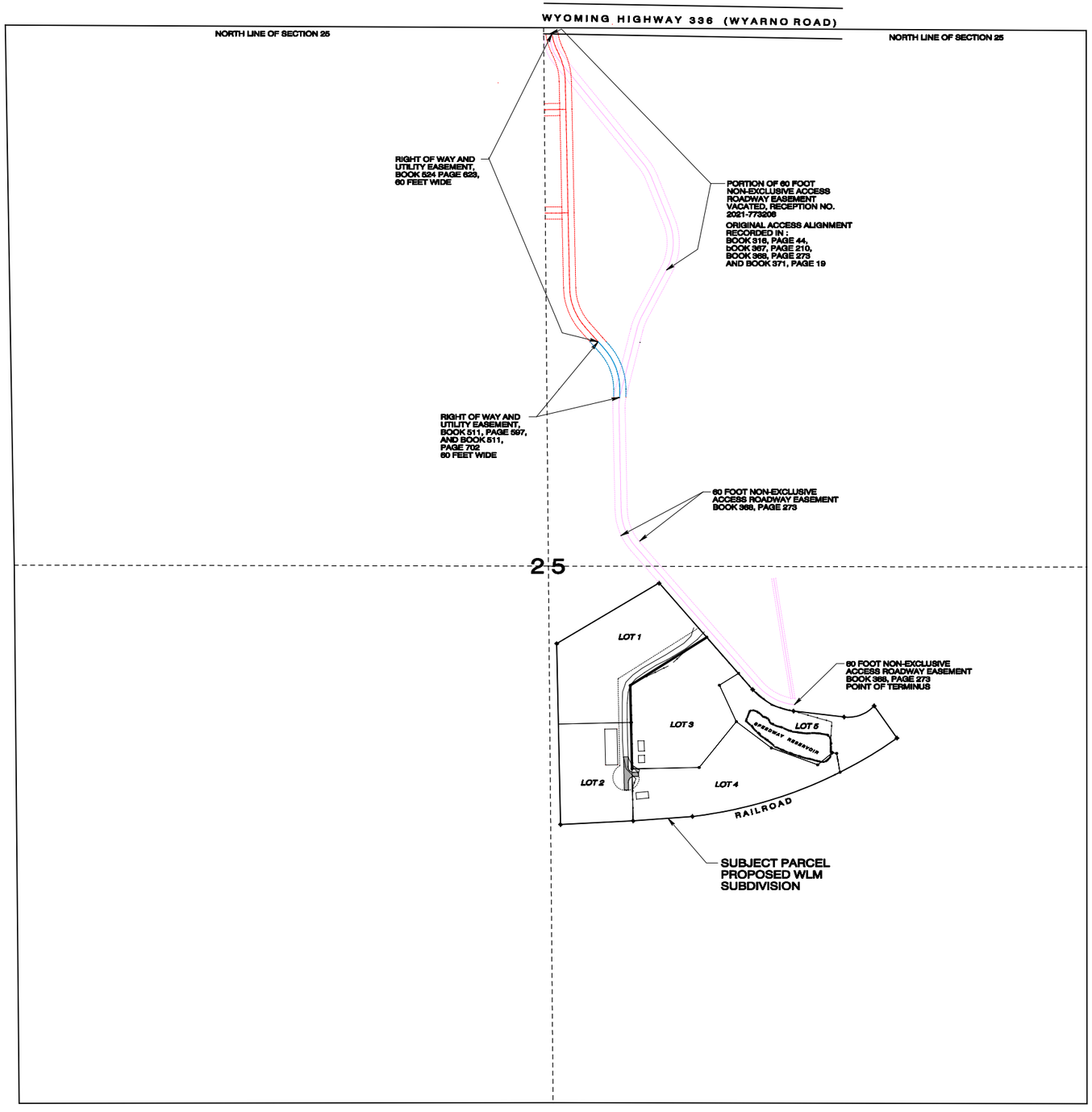
DAVID L. RANDALL
RANDALL ENGINEERING SURVEYS
722 MONTE VISTA
SHERIDAN, WYOMING, 82801
(307) 672-6003

OWNER

WLM ENTERPRISES LLC, A WYOMING LIMITED LIABILITY COMPANY
P.O. BOX 4007
SHERIDAN, WYOMING 82801

FINAL PLAT
of the
WLM ENTERPRISES SUBDIVISION
being a
MINOR SUBDIVISION
situated in the
NE¼SE¼ and the NW¼SE¼ of SECTION 25, TOWNSHIP 56 NORTH, RANGE 84 WEST
of the
SIXTH PRINCIPAL MERIDIAN
SHERIDAN COUNTY, WYOMING
for
WLM ENTERPRISES LLC,
A WYOMING LIMITED LIABILITY COMPANY
P.O. BOX 4007
SHERIDAN, WYOMING 82801

REVISED - JULY 8,2024
DRAWN BY REX RANDALL - FEBRUARY 22, 2024
RANDALL ENGINEERING SURVEYS - SHERIDAN, WYOMING



TOWNSHIP 56 NORTH, RANGE 84 WEST

N

DELINEATION

of

ACCESS EASEMENTS

serving

PROPOSED WLM SUBDIVISION TRACT

from

WYOMING HIGHWAY 336

to

60 INDUSTRIAL LANE

SHERIDAN COUNTY, WYOMING

RANDALL ENGINEERING SURVEYS, JUNE 19, 2024

Drainage Analysis

for the

Proposed WLM Enterprises Subdivision

Sheridan County, Wyoming

for

WLM Enterprises, LLC
60 Industrial Lane
P.O. Box 4007
Sheridan, Wyoming 82801

By: Rex Randall, P.E.
Randall Engineering Surveys

Date: February 23, 2024

Introduction:

This document is a drainage analysis of the proposed WLM Enterprises Subdivision. The proposal is to split a 25.99 Acre Industrial tract (zoned I-1) into 5 lots. Currently the property has lease areas which will be consistent in use and area to the proposed lots, simply adding the option of property ownership to the areas. Lot 1 (6.57 Acres) is currently being used as a construction equipment and materials storage yard, ground cover consists of gravel, crushed concrete and minimal native vegetation. The proposed Lot 2 (4.00Acres) currently has a 10,560 square foot manufacturing building, gravel areas and some native vegetation along the Western edge. Lot 3 (5.65 Acres) currently has two buildings and is being used as a construction yard with equipment storage, it includes gravel drives, some native vegetation and grassy areas to the Northeast. Lot 4 (5.75 Acres) currently has a shop building as well as material and equipment storage. Ground cover consists of gravel and some native vegetation. Lot 5 (4.02 Acres) consists of native vegetation ground cover and a reservoir having a surface area, when full, of 1.34 Acres. The reservoir is used as water storage for both construction activities and to water the dirt race track on an adjacent property. The property is bordered on the South by the Burlington Northern Rail Road. To the East/Northeast is a property used as a dirt race track. To the North and West are adjacent industrial operations.

Existing Conditions:

The property is very flat with average slopes of <1%. The majority of storm runoff goes to the reservoir on the proposed Lot 5. Storm runoff is the only source for the reservoir. Considerable onsite ponding also occurs due to the low slopes, limiting runoff from the property. According to the NRCS Soil Survey for Sheridan County, the property is 97.1% type C soils and 2.9% Type B soils. Type B soils have a moderate infiltration rate when thoroughly wet. These consist of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission. Type C Soils have a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Proposed Development Conditions:

The proposed development will divide the property into 5 lots ranging from 4.00 to 6.57 Acres. These lots will be divided along current lease area boundaries. The proposed lots intended uses are consistent with current uses with no proposed changes at this time.

Conclusion:

Due to the broad coverage of I-1 Industrial zoning and possible potential future usage of the proposed lots, individual lot drainage would be best addressed in the future at the time any building permits are proposed which indicate substantial changes in impervious areas or direction of flow.

Hydrologic Soil Group

⚠ *Warning: Soil Ratings Map may not be valid at this scale.*

Tables — Hydrologic Soil Group — Summary By Map Unit

Summary by Map Unit — Sheridan County Area, Wyoming (WY633)

Summary by Map Unit — Sheridan County Area, Wyoming (WY633)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
129	Cushman-Forkwood association, moist, 9 to 15 percent slopes	C	4.7	17.9%
148	Hargreave-Moskee sandy loams, 3 to 9 percent slopes	B	0.8	2.9%
213	Platmak loam, 3 to 6 percent slopes	C	1.3	4.9%
237	Renohill, moist-Ulm association, 3 to 10 percent slopes	C	19.4	74.3%
258	Shingle-Nihill complex, moist, 3 to 80 percent slopes	B	0.0	0.0%
Totals for Area of Interest			**26.1**	**100.0%**

Description — Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Mark Gordon
Governor

WYOMING Department of Transportation

"Provide a safe and effective transportation system"

10 E. Brundage Lane, Sheridan, Wyoming 82801

Darin J. Westby, P.E.
Director

April 17, 2024

Randall Engineering Surveys
Attn: David Randall
722 Monte Vista
Sheridan, WY 82801

RE: WY 336 Access

David,

Thank you for contacting the Wyoming Department of Transportation to verify the existing access on WY 336. The intent of this letter is to provide documentation from the state to any party requesting information on an existing access within WYDOT's road system. Please see the description of the existing access, listed below.

The existing access located on the south side of the road at reference marker 1.68 on WY 336 is classified as a commercial approach in WYDOT's Access Database. Per WYDOT's 2014 Access Manual, that classification states that the access provides an entrance to and/or exit from any business, commercial development, cultural or institutional complex, public establishment, or any development serving 10 or more family residences.

If a new access is proposed, any of the existing accesses are to be upgraded or the land use is proposed to change from its current use (e.g. if the property were to be subdivided), an access application (M-3A) is to be filled out by the property owner(s) and/or easement users and then submitted to the Area Maintenance Supervisor. Upgrades to the access can include its classification, paving, widening, removing, relocating, or fence work.

There is no cost to process the application. WYDOT may have additional requirements before the permit is issued, such as a traffic impact study, drainage report, etc. Once the access has been built to WYDOT's standards and has been approved, the access then becomes the property of the state. Once it becomes the property of the state, WYDOT will provide maintenance and repair to the access with the exception of debris and snow removal.

If you have any additional questions, please feel free to contact me.

Respectfully,

Paul Miller
WYDOT District 4 Senior Traffic Tech

cc: Michelle Edwards, PE, PTOE, WYDOT District 4 Traffic Engineer, Sheridan WY
Dustin Hockett, Area Maintenance Supervisor, Sheridan WY

CITY OF SHERIDAN

RESOLUTION 34-24

A RESOLUTION certifying PL-4-24 is in accordance with the Sheridan Joint Planning Area Land Use Plan Appendix adopted in 2017, and the Memorandum of Understanding between Sheridan County and the City of Sheridan regarding extra-territorial jurisdiction within one mile of the contiguous corporate limits dated April 27, 2022.

WHEREAS, Sheridan County has jurisdiction and final approval of the proposed WLM Enterprises Subdivision; and

WHEREAS, the final plat of the WLM Enterprises Subdivision has been reviewed for consistency with Appendix B (Subdivision Regulations) and other applicable City code; and

WHEREAS, all applicable requirements for a final plat, have been met and all documents meet the applicable requirements in Appendix B (Subdivision Regulations); and

WHEREAS, the WLM Enterprises Subdivision is a joint City-County subdivision due to its location within 1 mile of City limits requiring City Council approval; and

Now, therefore, be it resolved by the City Council of the City of Sheridan:

This RESOLUTION finds the review of the final plat of WLM Enterprises Subdivision, a joint City-County subdivision, subdividing 25.99 acres into 5 lots, located at 60 Industrial Lane to be complete.

In certifying WLM Enterprises Subdivision, the City Council finds the following as required by Sheridan City Code Appendix B §202:

A. The plat is not completely surrounded by City limits, therefore a signed pre-annexation agreement is not required.

B. The lots as platted conform to the requirements of the City Zoning Ordinance.

C. The subdivision falls outside of the Airport Influence Area.

D. As concluded by City staff, there is adequate long-term water supply to serve this subdivision as of the time of this resolution.

PASSED, CERTIFIED, AND ADOPTED this the 16th day of September, 2024.

City of Sheridan

_____

Richard Bridger, Mayor

Attest:

_____

Candace Ainslie, Deputy City Clerk

State of Wyoming)

)SS

County of Sheridan)

Subscribed and sworn to (or affirmed) before me this _____day of _____, 2024 by _____.

_____ Notary Public

My commission expires _____.

Memorandum of Understanding
Between Sheridan County and the City of Sheridan
Regarding Subdivision of Land
Within One Mile of the Contiguous Corporate Limits

An MOU between the City of Sheridan (City) and Sheridan County (County) related to the subdivision of land within one mile of the contiguous corporate limits.

WHEREAS, the *Sheridan County Comprehensive Plan, 2020*, encourages well-designed, compact urban growth and sets forth the following:

· The County will continue to jointly plan for orderly growth at the edge of the City of Sheridan.

· The County will maintain a compact development pattern within or near communities where adequate services are available.

· Urban growth will be located in defined areas around incorporated towns and cities and unincorporated places, based on existing community expansion patterns and the ability of municipal systems to accommodate future development.; and

WHEREAS, both the City and County have adopted the *Sheridan Joint Planning Area – Land Use Plan* 2017 for which coordination will occur for the area surrounding the City of Sheridan.

WHEREAS, subdivision ordinances, rules and regulations adopted by the City and County are important and enforceable tools in shaping development and implementing the visions set forth in the community's plans; and

WHEREAS, the subdivision standards of the City are appropriate for areas within one mile of the contiguous corporate limits of the City suitable for future annexation while the subdivision standards of the County are suitable for rural development in areas beyond the one-mile area adjacent to the City (County subdivision standards may be appropriate in those portions of the one-mile area not planned to be served by public water and sewer); and

WHEREAS, it is in the interest of promoting logical, efficient and sequential urban development for the City and County to commit to a single subdivision review and approval process within the one-mile area, as provided herein;

NOW, THEREFORE, BE IT RESOLVED:

1. The City and County shall have joint meetings when requested by the County or City.

2. The County will invite City staff to pre-application meetings and provide City staff with copies of all applications, plats, plans, staff memos, and similar documentation. City staff members and members of the public will be afforded the opportunity to comment at public meetings.

3. City staff shall prepare and arrange for the City Governing Body to make comments and suggestions relating to the potential impacts to City infrastructure, considerations defined in

W.S. 34-12-103(b)(i) through (v) or other development plans.

4. The County shall respond to the City in writing regarding any disagreement between the parties prior to approval of the final plat.

5. To the extent possible, the County shall ensure that the final plat meets the considerations defined in W.S. § 34-12-103 (b)(i) through (v).

6. The County shall require public dedication of rights-of-way for any existing county roads, subdivision roads and adjacent roads that are currently in easement only, and are under the ownership or control of the subdivider.

7. The design, layout and construction of subdivisions shall adhere to the higher or most rigorous of the City or County standards. All negotiations, deliberations and design determinations pertaining to required city infrastructure shall be conducted between the subdivider and City staff. City staff shall notify the County in writing once the subdivision adequately meets City standards.

8. Any provision of City services shall be conditioned on the subdivider signing a pre-annexation agreement, the form and substance of which as determined by the City.

9. The City, at its expense, shall oversee, inspect, and recommend acceptance for all City owned/operated onsite and offsite subdivision infrastructure. The County, at its expense, shall oversee, inspect, and recommend acceptance for County onsite and offsite subdivision infrastructure. Financial assurances provided for the completion of subdivision infrastructure shall list: 1) Sheridan County as the beneficiary in the case of default for County required infrastructure, and 2) the City of Sheridan as the beneficiary in the case of default for City required infrastructure. Where the subdivider has been found in default of the subdivision improvement agreement, Sheridan County may contract for and oversee the construction of County infrastructure, and the City of Sheridan may contract for and oversee the construction of City infrastructure.

10. City subdivision standards can only be achieved in areas where wastewater collection and treatment are planned for extension. The City will adopt a rural-type road section suitable for the one-mile area where wastewater services are not planned.

11. This Memorandum of Understanding may be amended by written consent of the Sheridan City Governing Body and the Sheridan Board of County Commissioners.

13. This Memorandum of Understanding may be terminated at any time by resolution by either Party upon 90-days written notice. Any subdivision application submitted within 90 days of termination shall be resolved regardless of this termination clause.

14. This Memorandum of Understanding shall become effective only upon approval of the City Governing Body and upon County adoption of an amendment to its Rules and Regulations Governing the Division of Land that incorporates this agreement as an appendix to said resolution.

15. This Memorandum of Understanding shall supersede any and all previous Memorandum of Understanding addressing the same.

SHERIDAN COUNTY

Lonnie Wright, Chairman

Dated: 5-17-22

ATTEST:

Eda Schunk Thompson, Sheridan County Clerk

CITY OF SHERIDAN

Richard Bridger, Mayor

Dated: April 27, 2022

ATTEST:

Cecilia Good, City Clerk