WESTERN MONTANA

Regional Hazard Mitigation Plan

2024-2029

- Broadwater County
- Butte-Silver Bow City and County
- Lake County
- Lincoln County
- Mineral County
- Park County
- Sanders County
- Beaverhead County
- Confederated Salish and Kooteani Tribes of the Flathead Reservation
- Granite County
- Lewis and Clark County
- Meagher County
- Ravalli County
- Flathead County
- Jefferson County
- Madison County
- Powell County
- Sweet Grass County

Table of Contents

Figures

Tables

Jurisdictional Annexes

Appendices:

1 Introduction

1.1 Executive Summary

The Western Montana Region Hazard Mitigation Plan (HMP) is the product of a regional planning process coordinated by Montana Disaster & Emergency Services (MT DES) in 2022-2024 to develop regional hazard mitigation plans covering the entire state of Montana. The following jurisdictions have prepared this Plan and will adopt it once it has received final approval:

- Beaverhead County
    - City of Dillon
    - Town of Lima
- Broadwater County
    - City of Townsend
- Butte-Silver Bow County
    - Town of Walkerville
- Confederated Salish and Kootenai Tribes of the Flathead Reservation
- Flathead County
    - City of Columbia Falls
    - City of Kalispell
    - City of Whitefish
- Granite County
    - Town of Drummond
    - Town of Philipsburg
- Jefferson County
    - City of Boulder
    - Town of Whitehall
- Lake County
    - City of Polson
    - City of Ronan
    - Town of St. Ignatius
- Lewis and Clark County
    - City of Helena
    - City of East Helena
    - Helena School District
- Lincoln County
    - City of Libby
    - City of Troy
    - Town of Eureka
    - Town of Rexford
- Madison County
    - Town of Ennis
    - Town of Sheridan
    - Town of Twin Bridges
    - Town of Virginia City
- Meagher County
    - City of White Sulphur Springs
- Mineral County
    - Town of Alberton
    - Town of Superior
    - Unincorporated Town of St. Regis
- Park County
    - City of Livingston
    - Town of Clyde Park
- Powell County
    - City of Deer Lodge
- Ravalli County
    - City of Hamilton
    - Town of Darby
    - Town of Stevensville
    - Town of Pinesdale
- Sanders County
    - City of Thompson Falls
    - Town of Plains
    - Town of Hot Springs
- Sweet Grass County
    - City of Big Timber

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from disasters or hazard events. The impacts of hazards can often be lessened or even avoided if appropriate actions are taken before events occur. Studies have found that hazard mitigation is extremely cost-effective, with every dollar spent on mitigation saving an average of $6 in avoided future losses. By reducing exposure to known hazard risks, communities will save lives and property and minimize the social, economic, and environmental disruptions that commonly follow hazard events.

The 2024 Western Montana Region HMP (also referred to as "Plan") will serve as a blueprint for coordinating and implementing hazard mitigation policies, programs, and projects across the Region. It identifies mitigation goals and related actions to assist the participating jurisdictions in reducing risk and preventing loss from future hazard events. The goals of the 2024 Western Montana Region HMP are:

Goal 1: Reduce impacts to people, property, the environment, and the economy from hazards.

Goal 2: Protect community lifelines and critical infrastructure to ensure the continuity of essential services.

Goal 3: Promote education and outreach to the public around hazards and mitigation.

Goal 4: Promote regional cooperation and leverage partnerships in mitigation solutions.

Goal 5: Sustain and enhance jurisdictional capabilities to enact mitigation activities.

Goal 6: Integrate hazard mitigation into other plans, processes, and regulations.

Goal 7: Ensure local mitigation programs address underrepresented groups and protect socially vulnerable populations.

Goal 8: Incorporate the potential impacts of climate change into all mitigation activities.

This Plan was also developed to maintain the participating jurisdictions' eligibility for federal disaster assistance, specifically the FEMA Hazard Mitigation Assistance (HMA) grants including the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) program, and Building Resilient Infrastructure and Communities (BRIC) grant program, as well as the Rehabilitation of High Hazard Potential Dam (HHPD) grant program.

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

- Chapter 1: Introduction
- Chapter 2: Region Profile
- Chapter 3: Planning Process
- Chapter 3.4: Hazard Analysis and Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption, Implementation, and Maintenance
- County and Tribal Annexes
- Appendices

Each annex provides a more detailed assessment of each jurisdiction's unique risks as well as their mitigation strategy to reduce long-term losses. Each annex contains the following:

1. Mitigation Planning and County Planning Team
2. Community Profile
3. Hazard Identification and Risk Assessment
4. Vulnerability to Specific Hazards
5. Mitigation Capabilities Assessment
6. Mitigation Strategy

Plan Implementation and Maintenance

It is important that local decision-makers stay involved in mitigation planning to provide new ideas and insight for future updates to the Regional HMP. As a long-term goal, the HMP and the mitigation strategies identified within will be fully integrated into the daily decisions and routines of local government. This will continue to require dedication and hard work, and to this end, this Plan update continues efforts to further strengthen the resiliency of the Region.

1.2 Purpose

The participating jurisdictions of the Western Montana Region prepared this regional hazard mitigation plan to guide hazard mitigation planning and to better protect the people and property of the planning area from the effects of hazard events. This plan demonstrates the Region's commitment to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources. This plan also maintains the jurisdictions' eligibility for federal disaster assistance under the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grant programs including the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) and Building Resilient Infrastructure and Communities (BRIC) program. This plan demonstrates the Region and participating jurisdictions' commitment to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources.

1.3 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.

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 (hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA)). While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Because the planning area is subject to many kinds of hazards, access to these programs is vital.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to 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 thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

1.4 Multi-Jurisdictional Planning

This plan was prepared as a regional, multi-jurisdictional plan. The Western Montana Region is comprised of seventeen (17) participating counties and one tribal reservation, as established by MT DES. All tribes, counties, and incorporated municipalities in the Region were invited to participate in the planning process. Both Gallatin and Missoula Counties elected not to participate in the Regional plan, having begun their own updates to their respective county HMPs. The City and County of Anaconda-Deer Lodge also elected not to participate in the regional planning process, as did the Town of Neihart due to limited staff and resources. All other tribes, counties, and incorporated municipalities fully participated in the planning process, and have committed to adopt and implement the Regional HMP. The participating jurisdictions seeking FEMA approval of this plan are listed in Section 1.1.

2 Region Profile

This section provides a brief overview of the geography of the planning area. A base map of the planning region is illustrated in Figure 2-1 below.

2.1 Geography and Climate

For the purposes of this planning process, the Western Montana Region is comprised of the following seventeen counties and one tribal reservation:

- Beaverhead County
- Broadwater County
- Butte-Silver Bow County
- Confederated Salish and Kootenai Tribes of the Flathead Reservation
- Flathead County
- Granite County
- Jefferson County
- Lake County
- Lewis and Clark County
- Lincoln County
- Madison County
- Meagher County
- Mineral County
- Park County
- Powell County
- Ravalli County
- Sanders County
- Sweet Grass County

The City and County of Anaconda-Deer Lodge, as well as Gallatin and Missoula Counties, are all located in the Western Region's geographic area, however they are not participants or adoptees of this planning process. The Western Region is dominated by the Rocky Mountains, river valleys, and vast evergreen forests of Ponderosa Pine and Rocky Mountain Douglas-fir. The Region can be prone to some of the state's heaviest spring snowfalls as well as severe summer thunderstorms. The Western Montana Region is also a large tourist destination in Montana and contains a portion of Glacier National Park. Elevations in Western Montana range from the lowest point in the state, 1,804 feet above sea level where the Kootenai River exits the state at the Idaho border, to the highest point in the state, 12,807 feet Granite Peak in Park County.

The majority of the region lies to the west of the Continental Divide, and eventually drains to the Columbia River and the Pacific Ocean. Beaverhead, Gallatin, Jefferson, Lewis and Clark, Madison, Park, and Sweet Grass Counties are part of Western Montana, but instead drain to the Missouri River, the longest river in the United States. Other major rivers in Western Montana include the Flathead, Kootenai, Clark Fork, Bitterroot, and Jefferson Rivers. Flathead Lake, the largest natural body of freshwater by surface area in the western U.S., is another important resource located in Western Montana.

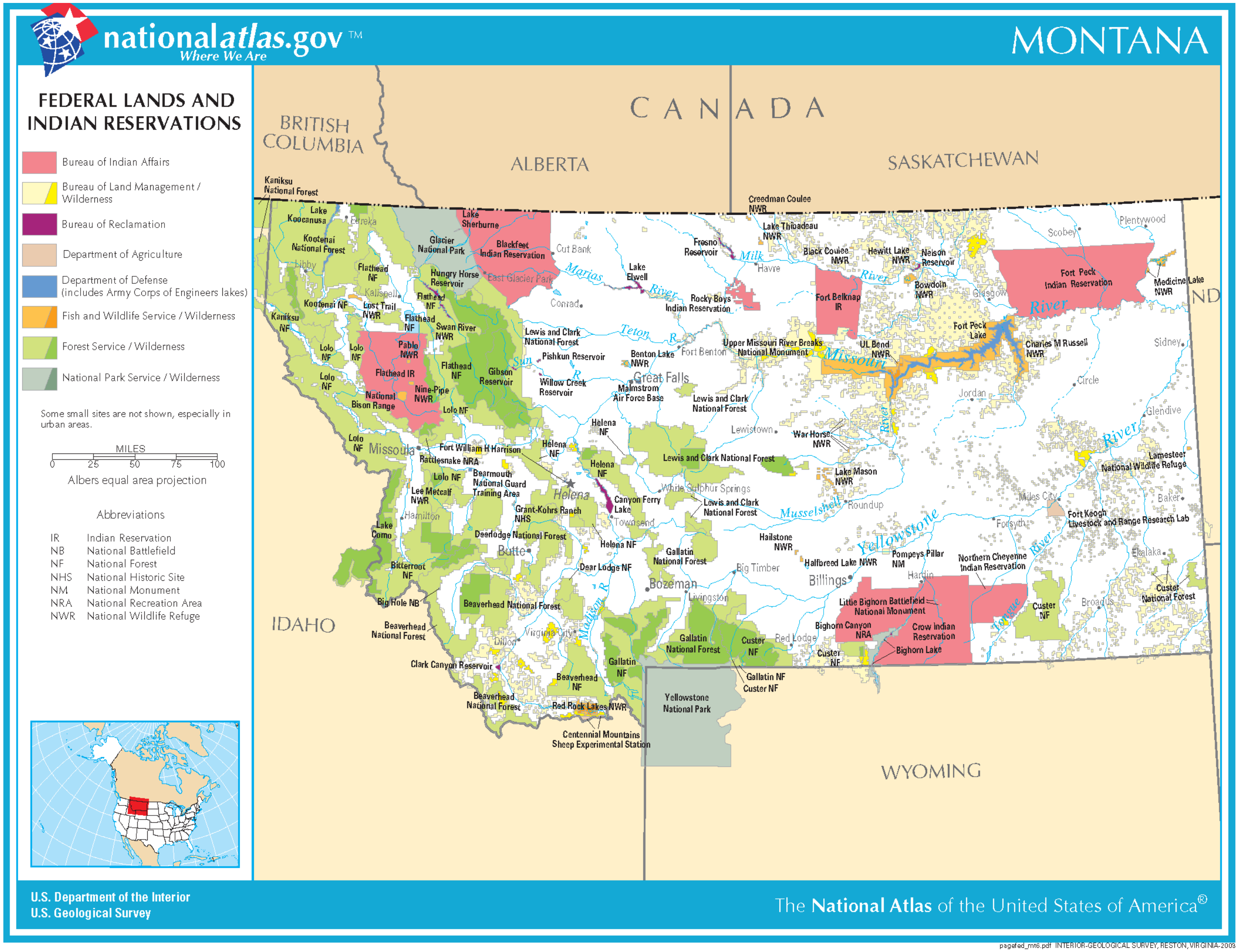
Major roadways include Interstate 15, Interstate 90, Highway 93, Highway 287, Highway 12, Highway 2, Highway 191, and Highway 89. Figure 2-2 below shows the location of Federal Lands within Montana.

The climate of the Region varies depending on location and time of year. Temperature extremes range from over 100˚F in the summer, to as low as –35 ˚F in the winter. Precipitation is typically lower in the valleys, which are mostly semiarid and receive 8 to 25 inches of precipitation annually, mostly in the form of snow. Precipitation is higher in the mountains, enough for some areas around Glacier National Park to qualify as temperate rainforests. Total annual snowfall varies considerably, but a significant amount of precipitation is accumulated in the mountains in the form of snow. In the higher regions, snowfall averages often reach 100 inches. Additional geography and climate data for each jurisdiction within the Region can be found in Section 2 of each jurisdictional annex.

Figure 2-1 Western Montana Region Base Map

Map compiled 10/2022;
intended for planning purposes only.
Data Source: Montana State Library

Figure 2-2 Federal Lands and Indian Reservations Montana



2.2 Population

Table 2-1 summarizes the estimated population and population change for the planning region as a whole and individual counties. Data in the table is based on the American Community Survey data from the US Census Bureau. Every county in Western Montana, besides Powell County, has experienced relatively significant population growth over the past decade, with many counties outpacing the overall growth rate of the state. The Western Region is also the most densely populated region in Montana and was home to more than half (Approximately 59.4%) of Montana's total population of 1,104,271 in 2021. Anaconda-Deer Lodge, Gallatin, and Missoula Counties are included in these population counts, and in Table 2-1 below, however they are not participating in this regional planning process. Overall, the Western Region is growing rapidly in population, with a region-wide increase of 15.73% since 2010, but percent change varies by county within the Region.

Table 2-1 Western Region Population Change

County	2010 Census	2016 Estimate	2017 Estimate	2018 Estimate	2019 Estimate	2020 Census	2021 Estimate	% Change 2010 to 2021
Anaconda-Deer Lodge County	9,291	9,071	9,122	9,159	9,207	9,413	9,491	**2.15%**
Beaverhead County	9,257	9,462	9,436	9,413	9,474	9,372	9,524	**2.88%**
Broadwater County	5,632	5,787	5,922	6,043	6,203	6,846	7,288	**29.40%**
Butte-Silver Bow County	34,235	34,768	34,859	34,768	34,901	35,168	35,411	**3.44%**
Flathead County	90,863	97,901	100,272	102,100	103,880	104,773	108,454	**19.36%**
Gallatin County	89,662	104,999	108,850	111,878	114,472	119,502	122,713	**36.86%**
Granite County	3,073	3,276	3,343	3,355	3,335	3,308	3,344	**8.82%**
Jefferson County	11,406	11,774	11,918	12,084	12,211	12,133	12,470	**9.33%**
Lake County	28,792	29,722	30,277	30,346	30,586	31,259	32,033	**11.26%**
Lewis and Clark County	63,578	67,001	67,988	68,775	69,578	71,093	72,223	**13.60%**
Lincoln County	19,693	19,332	19,589	19,862	20,099	19,731	20,525	**4.22%**
Madison County	7,696	8,074	8,280	8,586	8,749	8,657	8,917	**15.87%**
Meagher County	1,878	1,851	1,856	1,847	1,841	1,925	1,964	**4.58%**
Mineral County	4,230	4,129	4,240	4,314	4,422	4,565	4,860	**14.89%**
Missoula County	109,471	116,587	118,068	118,959	120,066	118,238	119,533	**9.19%**
Park County	15,595	16,138	16,392	16,662	16,612	17,193	17,473	**12.04%**
Powell County	7,019	6,837	6,785	6,920	6,854	6,934	6,999	**-0.28%**
Ravalli County	40,323	41,975	42,617	43,377	44,149	44,351	45,959	**13.98%**
Sanders County	11,395	11,472	11,702	11,744	11,946	12,451	12,959	**13.73%**
Sweet Grass County	3,617	3,610	3,668	3,701	3,717	3,671	3,723	**2.93%**
Total	**566,706**	**603,766**	**615,184**	**623,893**	**632,302**	**640,583**	**655,863**	**15.73%**

Source: US Census Bureau ACS 5-year Estimates

2.3 Development Trends

The population of the Western Region has been consistently growing since 2010, and the Montana Department of Commerce projects that this growth will continue through the year 2040. Population change projections for the tribal reservation was not available. Table 2-2 below lists the projected 2040 populations of each county within the Western Region. Counties such as Gallatin, Flathead, Missoula, and Lewis & Clark have seen some of the greatest concentrations of population growth and urban development in the region and the state. Based on the estimates from the Montana Department of Commerce, through the year 2040 Madison, Meagher, Gallatin, Broadwater, and Ravalli Counties are projected to see the highest rates of population increase. Additional details on specific growth and development trends are provided in each county's respective annex.

Table 2-2 Western Montana 2020 Census and 2040 Projections

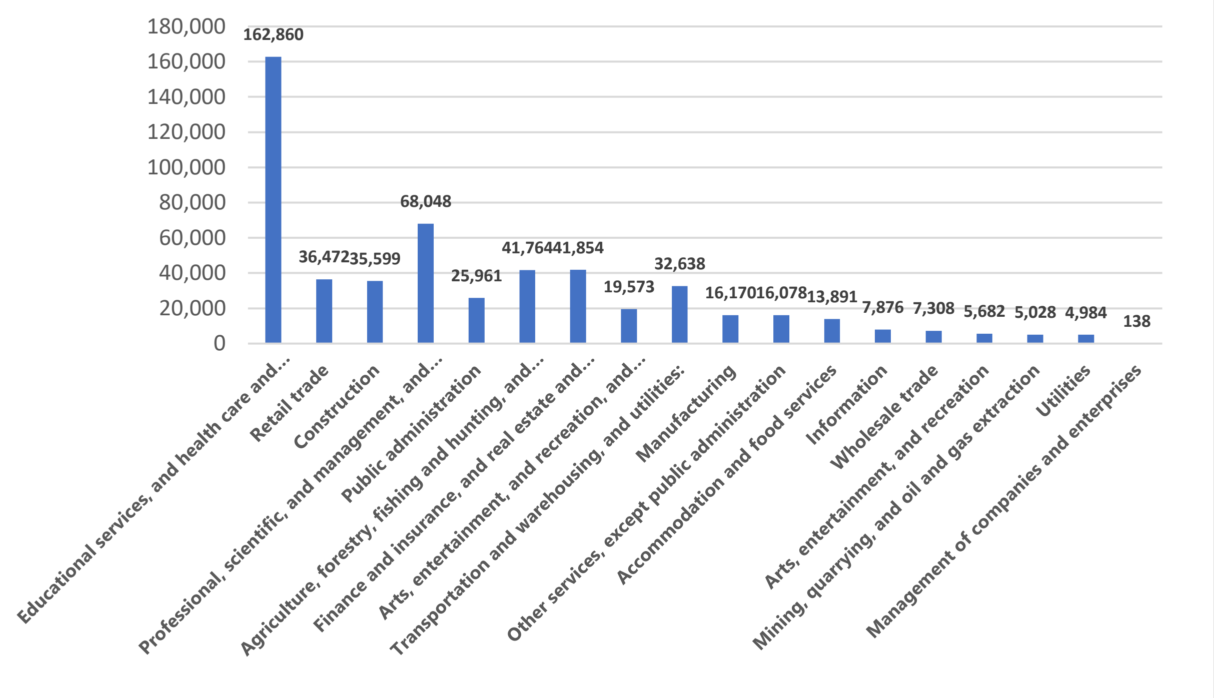
County	2020 Census	2040 Projections
Anaconda-Deer Lodge County	9,413	9,994
Beaverhead County	9,372	10,295
Broadwater County	6,846	8,136
Butte-Silver Bow County	35,168	38,372
Flathead County	104,773	125,329
Gallatin County	119,502	165,173
Granite County	3,308	3,503
Jefferson County	12,133	11,931
Lake County	31,259	33,141
Lewis and Clark County	71,093	82,336
Lincoln County	19,731	23,294
Madison County	8,657	13,582
Meagher County	1,925	2,639
Mineral County	4,565	5,314
Missoula County	118,238	141,601
Park County	17,193	19,150
Powell County	6,934	8,425
Ravalli County	44,351	55,716
Sanders County	12,451	12,967
Sweet Grass County	3,671	3,707
Total	**640,583**	**774,605**

Source: US Census Bureau ACS 5-year Estimates, Workbook: CEIC_REMI_POPULATION_PROJECTION_COUNTY_AGE_RACE_SFE (mt.gov)

2.4 Economy

Figure 2-3 displays a breakdown of the total employment by industry statewide. According to the 2020 US Census, Montana's economy is largely based in the educational services, health care and social assistance industry with 162,860 people. This is followed by professional, scientific, management, administrative, technical, and waste management services with 68,048 total people. Third is finance, insurance, real estate, rental, and leasing with 41,854, followed closely by 41,764 people employed in agriculture, forestry, fishing and hunting, and mining services. These four sectors comprise 58% of employment in Montana.

Figure 2-3 Montana Industry Type by Percentage of Total Workers Employed



Data Source: US Census, 2020, Figure by WSP

2.5 Capability Assessment

Included in this Hazard Mitigation Plan is a capability assessment to review and document the planning area's current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about local/tribal existing government programs, policies, regulations, ordinances, and emergency plans, the planning team and MT DES can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. The capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, financial mitigation capabilities, education and outreach, and mitigation partnerships. The results of this assessment are captured in each jurisdictional annex.

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 non-profit 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.

i. *Tribal Requirement §201.7(c)(1): Documentation of 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. This shall include:*
ii. *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval, including a description of how the Indian tribal government defined "public;"*

As appropriate, an opportunity for neighboring communities, tribal 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 non-profit interests to be involved in the planning process.

3.1 Background on Mitigation Planning in Western Montana

The 2024 Western Montana Regional Hazard Mitigation Plan is the first regional hazard mitigation plan for Western Montana. The plan's creation over 2022-2024 will comply with the five-year update cycle required by the DMA 2000 going forward and reflects mitigation priorities for the five-year span between 2024-2029.

Prior to 2024, the counties and tribes of Western Montana had adopted jurisdictional-specific hazard mitigation plans over the years. Table 3-1 provides a summary of when each jurisdictions' hazard mitigation plan was originally developed, including the most recent adoption. Information on how the jurisdictions integrated the mitigation plan into other planning mechanisms can be found in Section 7 of each jurisdictional annex.

Table 3-1 Western Montana Local and Tribal HMP History, Adoption, and Integration

County/Tribe	Original Plan Approval	Last Adoption
Beaverhead	2004	2017
Broadwater	2009	2016
Butte-Silver Bow County	2010	2016
Confederated Salish and Kootenai Tribes of the Flathead Reservation	2005	2016
Flathead	2009	2014
Granite County	2013	2021
Jefferson	2011	2017
Lake	2012	2019

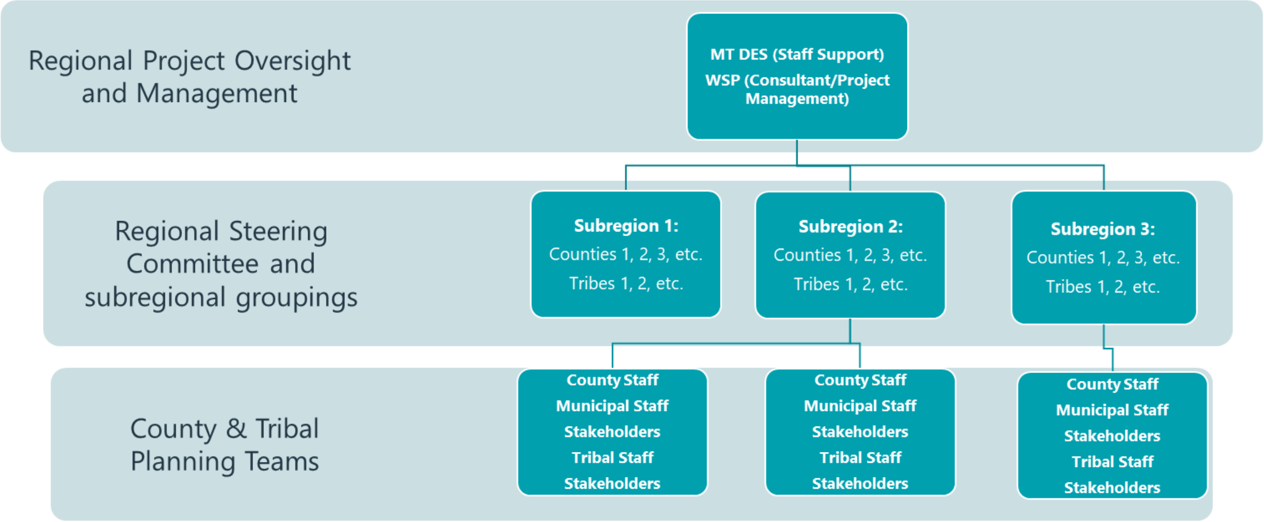
County/Tribe	Original Plan Approval	Last Adoption
Lewis and Clark	2011	2017
Lincoln	2011	2018
Madison	2004	2017
Meagher		?
Mineral	2012	2020
Park	2005	2018
Powell	2012	2017
Ravalli	2012	2017
Sanders	2012	2019
Sweet Grass	2014	2021

Regional Planning. While each county and tribe in Montana has an Emergency Management Coordinator, MT DES has recognized that the process of developing and updating DMA 2000 compliant hazard mitigation plans can often be beyond local and tribal capabilities and expertise. Instead of each county and tribe hiring their own consultant, MT DES took the lead in procuring and funding a professional hazard mitigation planning consultant through a competitive bid process. In 2022, WSP USA Environment & Infrastructure Inc. (WSP) was selected by MT DES to provide assistance to the Region under a multi-year, multiple region contract. 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, tribes, 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 MT DES and FEMA Region VIII.

Prior to initiating the development of this regional HMP in 2022, a substantial coordination effort took place to ensure the participation of the counties and tribes within Western Montana. Each jurisdiction designated the Emergency Management Coordinator as the primary point of contact. Each Coordinator was required to undertake a coordination role within their respective counties to help fulfill 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 Regional Hazard Mitigation Plan. Most incorporated communities within the counties, as well as the tribes, chose to participate in the development of this Regional Plan. A graphic illustrating the regional planning framework is shown below.

Figure 3-1 Western Montana Regional Hazard Mitigation Planning Committee Framework



The Emergency Management Coordinator from each participating county and tribe served on the Regional Hazard Mitigation Planning Committee (HMPC), as well as convening and facilitating a County Planning Team (CPT) or Tribal Planning Team (TPT) in concert with MT DES and the consultant team.

3.2 Government Participation

The Disaster Mitigation Act (DMA) planning regulations and guidance stress that each local and tribal 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 Regional Hazard Mitigation Planning Committee (HMPC) through participation on a County Planning Team (CPT) or Tribal Planning Team (TPT),
- 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 Western Montana Regional Hazard Mitigation Plan's HMPC, "participation" meant:

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

This Regional Plan includes the participation of all counties and most of the municipalities in Western Montana as noted in Chapter 1 and detailed further in Section 3.3.1. Documentation of participation is included in Appendix B in the form of meeting sign-in sheets, meeting summaries, and more.

3.3 The 10-Step Planning Process

The HMPC established the planning process for the Western Montana 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 by 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 all of FEMA's Hazard Mitigation Assistance (HMA) grant programs, the CRS program, and flood control projects authorized by the US Army Corps of Engineers. Additionally, FEMA's March 2013 Local Mitigation Planning Handbook recommends a nine-task process within the four-phase process. Table 3-2 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. Tribal elements of the Regional HMP were designed to be fully compliant with the requirements of 44 CFR 201.7 as detailed in FEMA's 2019 Tribal Multi-Hazard Mitigation Planning Guidance. The sections that follow describe each planning step in more detail.

Table 3-2 Mitigation Planning Process Used to Develop the Regional Hazard Mitigation Plan

FEMA 4 Phase Guidance	CRS Planning Steps (Activity 510)	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 5.3.3 and annexes

FEMA 4 Phase Guidance	CRS Planning Steps (Activity 510)	FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)	Location in Plan
Phase IV: Adopt and Implement the Plan	Step 9. Adopt the plan	8: Review and Adopt the Plan	Chapter 6
	Step 10. Implement, evaluate, revise	7: Keep the Plan Current	Chapter 6
		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 MT DES and each County and Tribal 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 and need for the regional hazard mitigation plan. The planning consultant held an initial conference call using Microsoft Teams (Teams) to discuss the organizational aspects of the planning process with the Emergency Management Coordinators. Following FEMA planning guidance, MT DES and the consultant directed each participating county and tribe to develop their respective planning teams, comprised of representative county, tribal, and municipal staff members, prior to this meeting to ensure complete representation and active participation in the plan update process. 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 non-profit interests were also invited to participate and provide input. Additional invitations were extended as appropriate to other federal, state, tribal, and local stakeholders, as well as to members of the public, throughout the planning process. A full list of local government departments and stakeholders that participated can be found in Appendix A. More details with documentation of participation included are in Appendix B.

In the planning meetings and the online public survey outreach, community-based organizations and underserved and socially vulnerable populations throughout the region were actively engaged and participated in the planning process. This allowed for a more comprehensive understanding of the diverse needs and perspectives of vulnerable populations, such as the elderly, veterans, homeless population, and low-income families, facilitating the development of more equitable and effective interventions and policies. Community-based organizations invited to participate in the planning process are shown below. Those noted with an asterisk also participated in the meetings. These groups were also asked to pass information on to the communities they serve, including encouraging participation in the public survey as a method to directly provide feedback into the planning process.

- American Red Cross
- Salvation Army
- Boulder-Basin Senior Citizens
- Bear Grass Suites Assisted Living
- Elkhorn Treatment Center
- Elkhorn Health & Rehab Center
- Montana VA
- Meadowlark Manor Assisted Living
- Youth Dynamics – Boulder
- School Districts throughout the Region

Through targeted outreach efforts, stakeholders were informed throughout the plan development process. The intent of the outreach was to facilitate partnerships and collaboration among various stakeholders, fostering a sense of shared responsibility and collective action towards mitigation goals. This can result in greater resource mobilization, improved coordination of efforts, and a better approach to risk reduction.

Throughout the plan development process, communication amongst the county and tribal planning teams occurred through a combination of face-to-face meetings, virtual meetings, conference calls, phone interviews, and email correspondence. The Region involved vulnerable populations in the plan development to ensure meaningful participation and representation. During the kickoff 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. A plan 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 jurisdiction and the Region and refined the list of identified hazards to mirror that of the Montana Hazard Mitigation Plan. In follow-up to the meeting, participants were provided a GIS needs worksheet to facilitate the collection of information needed to support the plan update, and a summary of the conference call.

Following the initial coordination efforts, a series of planning workshops were held during the plan's development between March 2022 and May 2023. The meeting schedule and topics are listed below. In addition, monthly conference calls were held with the Emergency Management Coordinators, MT DES and WSP to discuss the process including upcoming milestones and information needs. The sign-in sheets, meeting summaries, and agendas for each of the meetings are documented in Appendix B. HMPC planning workshops were scheduled as follows.

- Workshop #1: Kickoff meeting
  - May 26, 2022
- Workshop #2: Hazard Identification and Risk Assessment and Goals update
  - September 12, 2022
  - The purpose of this workshop was to review the results of the risk assessment and review and update/develop goals.
- Workshop #3: Mitigation Strategy update
  - Three in person workshops were held in the Region:
    - January 17, 2023 – Helena, Montana
    - January 18, 2023 – Kalispell, Montana
    - January 20, 2023 – Livingston, Montana
  - This workshop focused on the update of the mitigation strategy and brainstorming new mitigation actions to include in the HMP.

To further supplement the meetings, the consultant developed a project website to help explain the background details of the project, provide education and information on the processes of hazard mitigation planning, advertise public outreach efforts, and post meeting materials and plan documents to be available for review. Figure 3-2 shows a snapshot of the homepage of the project website, which is also available at mitigationplanmt.com.

In some cases, HMPC meetings were supplemented with additional meetings, emails, and telephone discussions to further engage the municipalities in the process. As previously mentioned, Anaconda-Deer Lodge, Gallatin, and Missoula Counties did not participate in the regional planning process.

Figure 3-2 Montana Hazard Mitigation Project Website

Welcome to the Montana Regional Hazard Mitigation Project

Hazard mitigation means actions taken to reduce or eliminate long-term risks to life and property from hazards such as floods, wildfires, tornadoes, and earthquakes.

The State of Montana Disaster and Emergency Services (MT DES) is coordinating the creation of new Regional Hazard Mitigation Plans that will encompass all counties, municipalities, and tribal nations in Montana. This will support consistency across the state, lighten the administrative burden on local and tribal governments, be cost effective, and ensure comprehensive eligibility for FEMA mitigation grant funding. The Regional Plans will build off existing local hazard mitigation plans and be developed in accordance with the Disaster Mitigation Act of 2000. Three regions (Central, Western, Eastern) have been established. Each will go through a phased planning process in 2022-2023, starting with the Central Region, followed by the Western and Eastern Regions. Refer to the map below for the jurisdictions within each region.

This site contains the latest information on this planning project, to include upcoming and past meetings, hazard information, planning documents, and how you can participate in the process.

Regions

The Montana Regional Hazard Mitigation Program is split by region: Western, Central, and Eastern. Each planning region has its own schedule, meeting materials, common hazards, and information.

Select a region below to learn more.

Planning Step 2: Involve the Public

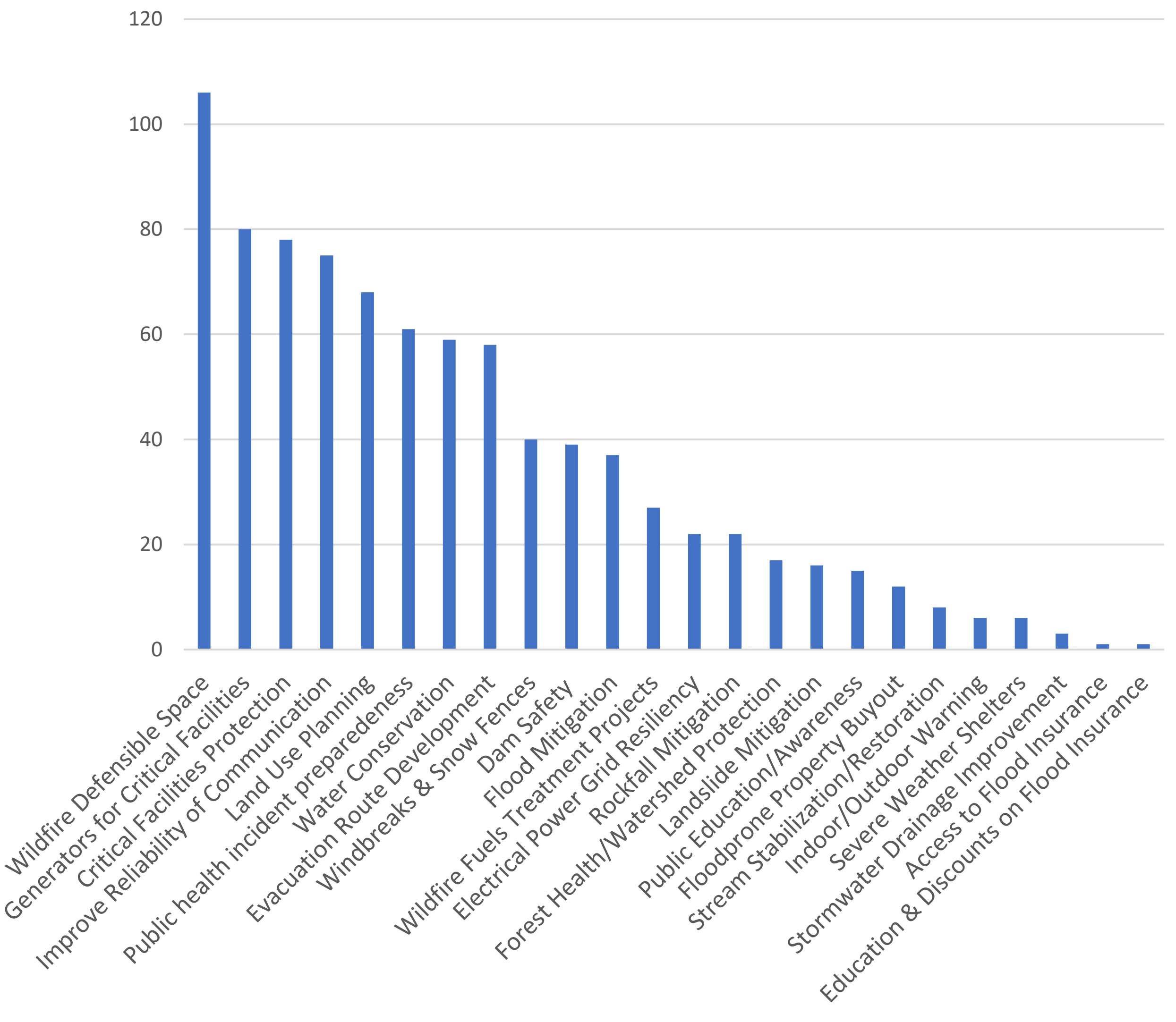
The 2022-2024 planning process was an open one, with the public informed and involved throughout the process. In some cases, the HMPC meetings included members of the public and/or local media. Public outreach included social media notices, a public survey, and a public comment form to allow the public the opportunity to share comments on the draft plan.

2022 Public Survey

Early in the planning process, a public survey was developed as a tool to gather public input. The survey was for the public to provide feedback to the county and tribal 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 what hazards concern them and solicited input on strategies to reduce their impacts. The survey was released as an online tool in early May 2022 and closed in October 2022. The counties and tribes provided links to the public survey by distributing it using social media, email, and posting the link on websites. In total, 174 survey responses were received and shared with the county and tribal planning committees to inform the process.

The public survey included a question on ranking hazard significance. The results generally track with the significance levels noted in Chapter 4 of this plan, with severe winter weather and wildland fires being rated the most significant, and drought and severe summer weather being rated medium significance. The following graph is a display of the results from Question 17, which asked what types of mitigation actions should have the highest priority in the Western Region Hazard Mitigation Plan. The results indicate that wildfire defensible space, generators for critical facilities, improving reliability of communication, and land use planning were popular mitigation topics with the public (Figure 3-3). Full results of the survey are included in Appendix D.

Figure 3-3 Western Montana Public Survey Results



Prior to finalizing, a draft of the regional plan was made available to the public for review and comment in late September through early October of 2023. The plan was placed on the MTDES website as well as an online public engagement space, shown in Figure 3-4. The counties and tribes used social media and email blasts to announce the public comment period. An online feedback form was provided to collect specific comments.

Seven comments from the public were received through the form, which can be found in Appendix D. These comments were discussed with the HMP, resulting in minor edits and changes in a few sections of the plan to improve accuracy of information.

Figure 3-4 Regional Hazard Mitigation Plan Virtual Public Engagement Space

Central Montana Regional Hazard Mitigation Plan

The State of Montana Disaster and Emergency Services (MT DES) is coordinating the creation of new Regional Hazard Mitigation Plans that will encompass all counties, municipalities, and tribal nations in Montana. This will support consistency across the state, lighten the administrative burden on local and tribal governments, be cost effective, and ensure comprehensive eligibility for FEMA mitigation grant funding.

The Central Region Plan is now available for public review and comment. Please share your feedback with us.

Hazard Identification

The Central Region plan profiles these natural and human-caused hazards:

- Communicable Disease
- Cyber Attack
- Dam Failure
- Drought
- Earthquake
- Flooding
- Hazardous Material Incidents
- Landslide
- Severe Summer Weather
- Severe Winter Weather
- Human Conflict (Terrorism, Civil Unrest, etc.)
- Tornadoes & Windstorms
- Transportation Accidents
- Volcanic Ash
- Wildfire

Review the Draft Plan

Click on the link above to download the draft 2023 Central Montana Regional Hazard Mitigation Plan. Please review it and let us know what you think.

Comment Form

We Want Your Feedback!

Please use the comment form above this panel to provide feedback on this project and the draft plan. All comments will be reviewed with the planning team for possible incorporation into the final plan.

Thank you for your time!

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 other organizations to participate in the process. A wide variety of stakeholders were invited by email to attend planning meetings, provide information, and review the draft plan, to include:

- Neighboring communities such as surrounding counties;
- Agencies involved in hazard mitigation activities, such as the U.S. Army Corps of Engineers and Montana Rural Water System;
- Agencies with the authority to regulate development, such as various planning boards and the Snowy Mountain Development Corporation;
- Businesses and include infrastructure owners, such as Northwestern Energy and BSNF Railway, and high hazard dam owners/operators;
- Academia and schools, such as local school districts and MSU Extension Offices;
- Nonprofits and community organizations that represent socially vulnerable populations, such as the American Red Cross, Salvation Army, and the Harlem Ministerial Association.

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, provided data and information for the Plan update, or provided feedback on the Plan include:

- Montana Department of Natural Resources & Conservation (DNRC)
- Montana Department of Transportation
- Montana Bureau of Mines & Geology
- Montana Fish, Wildlife, & Parks

- FEMA Region VIII
- US EPA
- US Forest Service
- US Air Force
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- NOAA/NWS
- US Army Corps of Engineers

Appendix A lists the individuals and agencies that participated in the regional planning process, as well as those that were invited but did not participate.

Coordination with certain agencies occurred on a regular basis during the planning process, including a bi-weekly (and weekly in initial months of the project) coordination call with WSP, MT DES and other stakeholders. The Montana DNRC including the Dam Safety Office participated in many of these calls and provided data to inform the dam failure hazard risk assessment. Other federal stakeholders that participated in these meetings included FEMA Region VIII, the Environmental Protection Agency, and the US Army Corps of Engineers (USACE). Other stakeholders included private non-profit organizations (Headwaters Economics), and a consulting firm involved in the update of the Montana Hazard Mitigation Plan. USACE representatives participated in regional mitigation strategy workshops, including providing information on funding programs and suggestions for partnerships on mitigation actions. The public survey previously described included distribution lists and social media connections with members of local businesses and schools (as well as the public) to provide input during the planning process.

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, the tribes, 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 this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions. Examples of this include.

- County comprehensive plans
- Community Wildfire Protection Plans
- Montana State Hazard Mitigation Plan (2018 & 2023)
- Existing Local and Tribal HMPs
- Montana Forest Action Plan (2020)
- Montana Climate Solutions Plan (2020)

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, are noted in Appendix E References.

3.3.2 Phase 2: Assess Risks

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

WSP led the HMPC and CPT/TPTs to identify and document all the hazards that have, or could, impact the planning area. The existing county and tribal hazard mitigation plans, and the Montana State Hazard Mitigation Plan provided a knowledge 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 dam inundation, flood, liquefaction, 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 4.2.8.

Also included in the regional plan is a capability assessment to review and document the planning area's current capabilities to mitigate risk and vulnerability from 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 the updated capability assessment are captured in each annex.

During this phase, the tribes and participating jurisdictions reviewed hazard significance levels, as described in Chapter 4, to determine if any changes in priorities were needed. Additional feedback on priority levels were solicited during Workshop #2, using an online polling tool.

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 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 for each jurisdiction and tribe, 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 and reservation annex; the process used to identify and prioritize mitigation actions is described in greater detail in Chapter 5 Mitigation Strategy.

During this phase the tribes and participating jurisdictions reviewed mitigation action priority levels, as described in Chapter 5, to determine if any changes in priorities were needed using a mitigation action status tool.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, WSP produced a complete first draft of the Regional Plan. This complete draft was shared for HMPC and CPT/LPT review and comment by email from the consultant and posted on the project website and cloud-based share drive. Comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. Other agencies and neighboring county emergency managers were invited to comment on this draft as well. WSP integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for MT DES and FEMA Region VIII to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

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 follows the FEMA plan review and approval, copies of the adoption resolution will be included electronically in Appendix D.

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 a discussion and the mitigation action plan summary table in Chapter 5 Mitigation Strategy. An overall implementation strategy is described in Chapter 6 Plan Adoption, Implementation and Maintenance.

Finally, there are numerous organizations within the Western Region 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 Western Montana 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, and specifics are also in the annexes for the participating counties and tribes.

3.4 Tribal Mitigation Planning Process

The Western Montana Regional Hazard Mitigation Plan meets the requirements for Tribal Mitigation Plans described in Title 44 of the Code of Federal Regulations, Section 201.7 (44 CFR § 201.7). Under the Sandy Recovery Improvement Act of 2013, federally recognized Tribal governments could obtain their own major disaster declaration for the first time, enabling them to apply to FEMA for disaster assistance independent of the state obtaining a declaration. The Tribal Mitigation Planning Handbook outlines a 7-step planning process for the development of mitigation plans which meet the needs of tribal governments. These 7-steps are summarized in Table 3-3.

Table 3-3 Tribal Mitigation Planning 7-Step Process

Planning Step	Title	Description
1	Describe your community	Describe the planning area, Tribal assets, and any unique characteristics of your Tribe.
2	Identify your hazards	Figure out what natural hazards could occur in your planning area
3	Explain impacts that hazards can have on the community	Describe what the natural hazards could do to your people, property, and land and determine the Tribe's biggest hazard concerns
4	Review your current capability to mitigate the impacts	Inventory your Tribe's plans, policies, and programs that could be used to protect your community.
5	Develop the strategy	Keeping in mind your risks and your capabilities, identify your Tribe's mitigation goals and actions.
6	Develop an action plan	Prioritize your actions and develop the details to assist with implementation
7	Keep track of progress	Observe and record progress in implementing your mitigation program using a defined method and schedule.

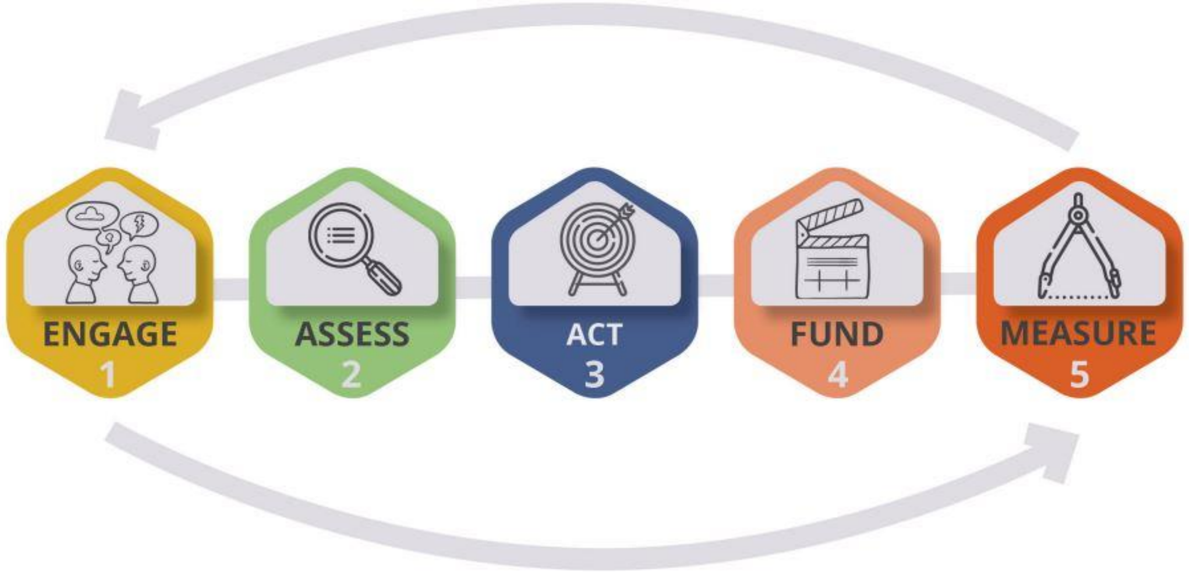
3.5 EPA Regional Resilience Toolkit

The Environmental Protection Agency (EPA), in partnership with FEMA, has developed the Regional Resilience Toolkit to focus the development of resilient communities on the regional scale at which disasters happen. As stated in the toolkit, with more and more communities facing the effects of disasters, decision-makers and community members need tools and guidance to help them take action that can both protect them from natural disasters while also creating great places to live, work, and play. This Regional Resilience Toolkit provides:

- A coordinated process for meeting many different state and federal planning requirements.
- Communication and outreach guidance and resources for engaging a broad coalition of stakeholders across a region.
- Guidance for project teams who are conducting vulnerability assessments, writing required plans, and implementing projects.
- Clear information and tools that can be used with an advisory group and to bring in decision-makers and community leaders to guide the overall action plan and ensure its successful implementation.
- Detailed appendices with worksheets to help inform and guide work, as well as additional information and resources for each step.

The toolkit includes five steps designed so that users can jump in at any point of the process depending on their progress with community resilience planning. These five steps are shown in Figure 3-5 below:

Figure 3-5 EPA Regional Resilience Toolkit Planning Steps



Source: EPA Regional Resilience Toolkit, https://www.epa.gov/smartgrowth/regional-resilience-toolkit

The toolkit also relies in part on engaging state and federal partners who have funding, policies, and programs intended to support local efforts to create sustainable and resilient communities, helping to supplement the mitigation strategy of this regional HMP. Like the FEMA mitigation planning process, the steps of the resilience toolkit are intended to ideally work in a continuous loop improving planning and community resilience over time. This is a valuable tool for the development of the Western Montana Regional HMP, due to the large scale of the planning area and the history of hazards which have had regional impacts.

4 Hazard Analysis and Risk Assessment

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 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. The risk assessment shall include:

(i) A description of the type, 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.

(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;

(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

(ii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

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.

Additional county annexes include a summary 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 detailed maps.

4.1 Hazard Identification

4.1.1 Results and Methodology

Using existing hazards data, plans from participating jurisdictions, and input gained through planning and public meetings, the County and Tribal Planning Teams agreed upon a list of hazards that could affect the Region.

Hazards data from FEMA, Montana Disaster and Emergency Services (DES), the 2018 State of Montana Multi-Hazard Mitigation Plan, approved county and tribal plans from the participating Western Region counties, and many other sources were examined to assess the significance of these hazards to the planning area. The hazards evaluated in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

The final list of hazards identified and investigated for the 2024 Western Region Multi-Hazard Mitigation Plan includes:

- Avalanche
- Communicable Disease
- Cyber-Attack
- Dam Failure
- Drought
- Earthquake
- Flooding
- Hazardous Materials Incidents
- Landslide
- Severe Summer Weather
- Severe Winter Weather
- Human Conflict
- Tornadoes & Windstorms
- Transportation Accidents
- Volcanic Ash
- Wildfire

Hazards identified and added to the Regional Plan during the update process include cyber-attack due to the prevalence of the threat that has emerged worldwide and increasing interconnectedness and reliance on cyber infrastructure. Human conflict was added to include terrorism (previously identified in most of the prior hazard mitigation plans [HMPs]) as well as active shooter and civil unrest due to concerns arising from national trends.

Members of each county's planning team 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 for future occurrences of the event, frequency of past occurrences, geographical area affected, 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. The county and tribal annexes include further details on hazard significance by county and municipality or tribe.

Table 4-1 Western Region Hazard Significance Summary Table

Hazard	Geographic Area	Magnitude/ Severity	Probability	Significance
Avalanche	Limited	Negligible	Highly Likely	Low
Communicable Disease	Extensive	Critical	Occasional	Medium

Hazard	Geographic Area	Magnitude/ Severity	Probability	Significance
Cyber-Attack	Significant	Critical	Occasional	Medium
Dam Failure	Limited	Critical	Unlikely	Medium
Drought	Extensive	Moderate	Likely	Medium
Earthquake	Significant	Critical	Likely	Medium
Flooding	Significant	Critical	Likely	High
Hazardous Material Incidents	Limited	Negligible	Likely	Low
Landslide	Limited	Negligible	Likely	Low
Severe Summer Weather	Extensive	Moderate	Highly Likely	Medium
Severe Winter Weather	Extensive	Moderate	Highly Likely	Medium
Human Conflict	Significant	Critical	Occasional	Medium
Tornadoes & Windstorms	Extensive	Moderate	Highly Likely	Medium
Transportation Accidents	Significant	Negligible	Highly Likely	Low
Volcanic Ash	Extensive	Moderate	Unlikely	Low
Wildfire	Extensive	Critical	Highly Likely	High

Geographic Area	**Frequency/Likelihood of Occurrence**
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	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.
Potential Magnitude/Severity	**Overall Significance**
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.	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

<table>
<tr><th>Hazard</th><th>Geographic Area</th><th>Magnitude/ Severity</th><th>Probability</th><th>Significance</th></tr>
<tr><td colspan="3">Moderate: 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. Overwhelmed for an extended period of time or many deaths occur.
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.</td><td colspan="2">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.</td></tr>
</table>

4.1.1.1 Other Hazards Considered but not Profiled

As part of the hazard identification process, the Regional Steering Committee and County and Tribal Planning Teams also noted other hazards that could impact the Region but are not further profiled as impacts tend to be more isolated or do not result in local, state, or federal disaster declarations. These were noted at the regional kickoff meeting in May 2022 and included mass casualty incidents, widespread power or communications disruptions, resource shortages/supply chain disruptions, and industrial accidents. The group concluded that many of these incidents are often consequences of other hazards and thus were not profiled individually but noted where appropriate in other hazard profiles.

4.1.1.2 Disaster Declaration History

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

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

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

Table 4-2 provides information on federal emergencies and disasters declared in the Western Region counties between 1953 and 2022. State of Montana disaster declarations from 1974 to 2022 are provided in Table 4-3. The hazards that have historically resulted in disaster declarations in the Region include wildfires, flooding, severe storms, drought, and pandemic.

Table 4-2 Federal Disaster Declarations in the Western Region, 1953-2022

Year	Declaration Title	Disaster Number	Area Impacted
1974	Montana Severe Storms, Flooding, Landslides	DR-417-MT	Deer Lodge, Flathead, Lincoln, Mineral, Missoula, Sanders
1975	Montana Rains, Snowmelt, Storms, Flooding	DR-472-MT	Broadwater, Flathead, Jefferson, Lewis and Clark, Meagher, Powell
1977	Montana Drought	EM-3050-MT	Lincoln, Missoula
1981	Montana Severe Storms, Flooding	DR-640-MT	Broadwater, Gallatin, Granite, Jefferson, Lewis and Clark, Meagher, Missoula, Powell, and Silver Bow
1986	Montana Heavy Rains, Flooding, Landslides	DR-761-MT	Deer Lodge, Powell, Sanders
1996	Montana Flooding	DR-1113-MT	Blaine, Flathead, Hill, Lincoln, Phillips, Toole
1997	Montana Severe Storms, Ice Jams, Snowmelt, Flooding, Extreme Soil Saturation	DR-1183-MT	Broadwater, Deer Lodge, Flathead, Madison, Meagher, Missoula, Park, Ravalli, Sanders, Stillwater, Sweetgrass
2000	Montana Wildfires Montana SW Zone 2 Fire Complex Montana South Central Zone 4 Fire Complex Montana Northwest Zone 1 Fire Complex Montana Central Zone 3c Fire Complex Montana Central Zone 3b Fire Complex	DR-1340-MT FSA-2317-MT FSA-2321-MT FSA-2320-MT FSA-2318-MT FSA-2314-MT	Beaverhead, Broadwater, Deer Lodge, Flathead, Gallatin, Granite, Jefferson, Lake, Lewis & Clark, Lincoln, Madison, Meagher, Mineral, Missoula, Park, Powell, Ravalli, Sanders, Silver Bow, Sweet Grass Deer Lodge, Granite, Mineral, Missoula, Powell, Ravalli, Silver Bow Gallatin, Park Flathead, Lincoln, Lake, Sanders Beaverhead, Madison Broadwater, Jefferson, Lewis and Clark, Meagher
2001	Montana Severe Storms	DR-1385-MT	Gallatin, Missoula, Powell
2003	Montana Wedge Canyon Fire Montana Robert Fire Montana Missoula/Mineral Fire Zone Montana Lincoln Fire Complex Montana Hobble Fire Montana Flathead Fire Zone Montana Cherry Creek Fire	FM-2485-MT FM-2484-MT FM-2490-MT FM-2492-MT FM-2488-MT FM-2494-MT FM-2489-MT	Flathead Flathead Mineral, Missoula Lewis and Clark, Powell Sweet Grass Flathead Sanders
2005	Montana Hurricane Katrina Evacuation	EM-3253-MT	Statewide
2006	Montana Derby Fire	FM-2671-MT	Stillwater, Sweet Grass
2007	Montana Jocko Lakes Fire Montana Country Club Fire Montana Black Cat Fire	FM-2718-MT FM-2730-MT FM-2721-MT	Missoula Lewis and Clark Missoula
2011	Montana Nineteen Mile Fire Montana Corral Fire Montana Severe Storms and Flooding	FM-5008-MT FM-2987-MT DR-1996-MT	Jefferson Lewis and Clark

Year	Declaration Title	Disaster Number	Area Impacted
			Broadwater, Flathead, Missoula, Powell, Lewis and Clark, Ravalli, Granite, Deer Lodge, Silver Bow, Madison, Jefferson, Park, Meagher
2012	Montana Sawtooth Fire	FM-5016-MT	Ravalli
2013	Montana West Mullan Fire	FM-5035-MT	Mineral
	Montana Lolo Creek Fire Complex	FM-5047-MT	Missoula
2014	Montana Ice Jams and Flooding	DR-4172-MT	Broadwater, Jefferson, Lake, Park, Ravalli, Sanders
2016	Montana Roaring Lion Fire	FM-5143-MT	Ravalli
2017	Montana West Fork Fire	FM-5209-MT	Lincoln
	Montana Rice Ridge Fire	FM-5207-MT	Missoula, Powell
	Montana Moose Peak Fire	FM-5211-MT	Lincoln
	Montana Lolo Peak Fire	FM-5197-MT	Missoula, Ravalli
	Montana Highway 200 Fire Complex	FM-5210-MT	Sanders
	Montana Alice Creek Fire	FM-5208-MT	Lewis and Clark
2018	Montana Flooding	DR-4405-MT	Lewis and Clark, Missoula, Park, Powell
2019	Montana North Hills Fire	FM-5286-MT	Lewis and Clark
	Montana Flooding	DR-4437-MT	Lake, Park
2020	Covid-19 Pandemic	DR-4508-MT	Statewide
	Covid-19	EM-3476-MT	Statewide
	Montana Bridger Foothills Fire	FM-5346-MT	Gallatin
2022	Severe Storm and Flooding	DR-4655-MT	Carbon, Park, Stillwater, Yellowstone

Source: FEMA

Table 4-3 State-Declared Emergencies and Disasters, 1976-2022

Year	Hazard	State Declaration		County (Town)
1980	Volcanic Ash	E0-4-80	PA-ST-80-1	Lake County
1984	Flood	PA ST-84-2		Beaverhead County
1984	Flood	PA ST-84-1		Madison County
1995	Flood	EO-1-95	MT-1-95	Beaverhead County (Lima)
1996	Flood	EO-12-96	MT-1-96	Sweet Grass County
1996	Flood	EO-12-96	MT-2-96	Park County
1996	Flood	EO-12-96	MT-3-96	Park County (Livingston)
1997	Wind	EO-14-97	MT-3-97	Lincoln County (Libby)
1998	Flood	EO-10-98	MT-3-98	Jefferson County
2005	Flood	EO-09-05	MT-1-05	Sweet Grass County
2005	Flood	EO-11-2005	MT-4-05	Lake County (Ronan)
2006	Flood	EO-39-06	MT-2-06	Ravalli County
2008	Flood	EO-34-2008	MT-2-08	Park County (Livingston)
2011	Flood	EO-3-2011	MT-1-11	Lincoln County (Libby)
2018	Flood	EO-20-2018		Cascade County, Lewis and Clark County,
2019	Flood	EO-5-2019		Crow Indian Reservation, Daniels County, Lake County, McCone County, Park County, Powder River County, Powder River County (Town of Broadus), Stillwater County, Treasure County, Valley County
2022	Flood	EO-4-2022		Carbon County, Park County, Stillwater County

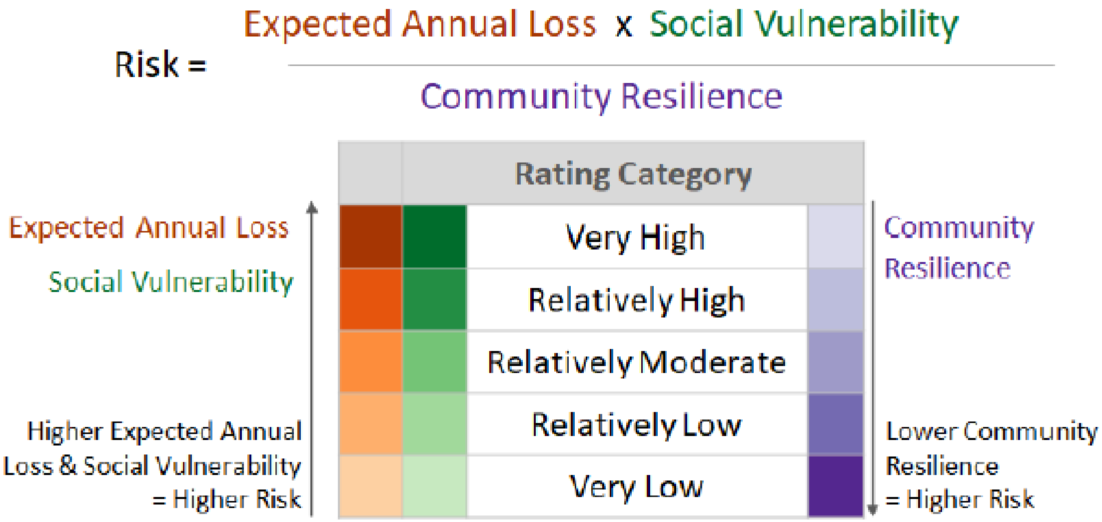
Source: 2023 Montana State Hazard Mitigation Plan

4.1.1.3 National Risk Index Overview

During the 2022/2023 planning process a relatively new online risk assessment tool became available from FEMA. The National Risk Index (NRI) is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards. It was designed and built by FEMA in close collaboration with various stakeholders and partners in academia; local, state, and federal government; and private industry. The Risk Index leverages available source data for natural hazard and community risk factors to develop a baseline relative risk measurement for each United States county and census tract. The NRI's interactive mapping and data-based interface enables users to visually explore individual datasets to better understand what is driving a community's natural hazard risk. Users may also create reports to capture risk details on a community or conduct community-based risk comparisons, as well as export data for analysis using other software. Intended users of the NRI include planners and emergency managers at the local, regional, state, and federal levels, as well as other decision makers and interested members of the general public.

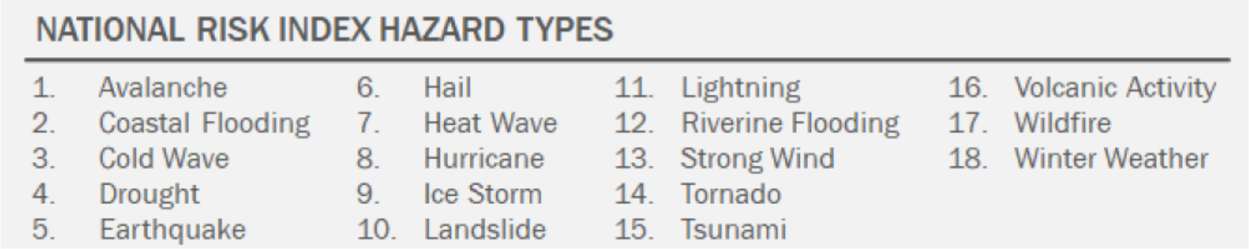
The NRI provides relative Risk Index scores and ratings based on data for Expected Annual Loss (EAL) due to natural hazards, social vulnerability, and community resilience. Separate scores and ratings are also provided for each component: EAL, Social Vulnerability, and Community Resilience.

Figure 4-1 Generalized National Risk Index Risk Equation and Components



Source: FEMA NRI Technical Documentation 2021

For the Risk Index and EAL, scores and ratings can be viewed as a composite score for all hazards or individually for each of the 18 hazard types.


NATIONAL RISK INDEX HAZARD TYPES

1. Avalanche
2. Coastal Flooding
3. Cold Wave
4. Drought
5. Earthquake
6. Hail
7. Heat Wave
8. Hurricane
9. Ice Storm
10. Landslide
11. Lightning
12. Riverine Flooding
13. Strong Wind
14. Tornado
15. Tsunami
16. Volcanic Activity
17. Wildfire
18. Winter Weather

The NRI was evaluated by the Regional Steering Committee and Montana DES's planning consultant to determine its applicability to the Western Region Hazard Identification and Risk Assessment (HIRA). An added benefit of leveraging NRI data for the Regional Plan included standardized methods for assessing risk on a county-by-county scale for most of the natural hazards in the HIRA. This included composite risk indicators for hazards previously lacking necessary data, including subsets of summer and winter storms such as cold wave, lightning, wind, and ice storms. The other benefit is that moving forward, FEMA will be periodically updating and improving the NRI, which should provide a valuable and standardized resource for future HIRA updates.

The HIRA sections for Avalanche, Drought, Flooding, Landslides, Severe Summer Weather, Severe Winter Weather, Tornadoes & Windstorms, and Wildfire contain the following aggregate risk products, mapped by WSP using NRI data:

- Annualized Frequency
- Composite Risk Index Rating
- EAL

Sources of hazards and exposure data includes SHELDUS, National Oceanic Atmospheric Administration (NOAA), United States Geological Survey (USGS), National Weather Service (NWS), United States Department of Agriculture (USDA). Consequences of hazard occurrences are categorized into three different types: buildings, population, and agriculture. Additional details can be referenced in the FEMA NRI Technical documentation 2021, available at https://hazards.fema.gov/nri/.

4.1.1.4 Assets Summary

Building and Critical Facility Assets

Assets inventoried for the purpose of determining vulnerability include people, buildings, critical facilities, and natural, historic, or cultural resources. For the regional planning process two standard databases were utilized for the basis of building and critical facility data. An April 2022 Montana Spatial Data Infrastructure (MSDI) Cadastral Parcel layer was used for improved parcel and building inventory throughout the Region. This information provided the basis for building exposure and property types. Data current as of 2022 was downloaded for all the counties within the Region, which was then analyzed using GIS to create a centroid, or point, representing the center of each parcel polygon, for vulnerability analysis using GIS. 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). Other critical facility databases were also used, such as the National Bridge Inventory (NBI) and data from Montana DES. Where applicable, this information was used in an overlay analysis for hazards such as flood and wildfire. More detail on assets potentially exposed to hazards can be found in the county and tribal annexes.

FEMA organizes critical facilities into seven lifeline categories as shown in Figure 4-2.

Figure 4-2 FEMA Lifeline Categories

Note: FEMA adopted a revised version of the Lifelines following the lifeline analysis conducted for this update.

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.

A summary of the critical facilities inventory for the Region can be found in Table 4-4 below.

Table 4-4 Summary of Critical Facilities Exposure Summarized by FEMA Lifelines

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Beaverhead	43	19	23	1	5	27	237	**355**
Broadwater	37	12	4	3	0	13	41	**110**
Butte-Silver Bow	88	36	26	8	2	53	67	**280**
Flathead	187	59	65	6	21	133	235	**706**
Granite	36	13	10	0	2	13	78	**152**
Jefferson	92	15	5	4	3	37	134	**290**
Lake	46	26	9	1	7	61	125	**275**
Lewis and Clark	184	32	48	12	5	113	225	**619**
Lincoln	41	16	16	2	7	49	198	**329**
Madison	41	20	8	0	5	27	100	**201**
Meagher	6	6	3	0	1	11	56	**83**
Mineral	23	10	7	1	1	18	152	**212**
Missoula – CSKT Flathead Nation	4	0	0	0	0	0	10	**14**
Park	109	29	30	0	6	37	128	**339**
Powell	37	19	9	1	2	23	117	**208**
Ravalli	126	22	19	3	12	66	168	**416**
Sanders	45	21	10	3	8	37	131	**255**
Sweet Grass	31	16	9	1	2	9	92	**160**
Total	**1,176**	**371**	**301**	**46**	**89**	**727**	**2,294**	**5,004**

Source: HIFLD 2022, Montana DES, NBI

Natural Resource Assets

In addition to building and critical facility assets, natural resource assets such as wetlands, forests, animals, and protected areas, are important to include in benefit-cost analyses for future hazard mitigation projects. Natural resources are valuable to communities due to their benefits to water quality, wildlife protection, recreation, and education. Additionally, awareness of these resources may be used to leverage additional funding for projects and contribute to a community's goal in protecting sensitive resources.

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. The U.S. Fish and Wildlife Service Montana Ecological Services Field Office maintains a database which documents a list of threatened and endangered species in the State of Montana. Table 4-5 summarizes these species and their status. A list of other natural resource assets by county and tribe can be found in the corresponding annexes.

Table 4-5 State of Montana Threatened and Endangered Species

Common Name	Scientific Name	Status	Range-Montana
Black-footed Ferret	*Mustela nigripes*	E/XN	Prairie dog complexes; eastern Montana
Whooping Crane	*Grus americana*	E	Wetlands; migrant eastern Montana
Pallid Sturgeon	*Scaphirhynchus albus*	E	Bottom dwelling; Missouri, Yellowstone, Marias, Milk, Poplar, Powder, Tongue Rivers
White Sturgeon (Kootenai River population)	*Acipenser transmontanus*	E	Bottom dwelling; Kootenai River
Grizzly Bear	*Ursus arctos horribilis*	T	Alpine/subalpine coniferous forest; Western Montana
Piping Plover	*Charadrius melodus*	T/CH	Missouri and Yellowstone River sandbars, alkali beaches; northeastern Montana. Alkali lakes in Sheridan County; riverine and reservoir shoreline in Garfield, McCone, Phillips, Richland, Roosevelt and Valley counties
Ute Ladies'-tresses	*Spiranthes diluvialis*	T	River meander wetlands; Jefferson, Madison, Beaverhead, Gallatin, Broadwater counties
Bull trout (Columbia River basin and St. Mary - Belly River populations)	*Salvelinus confluentus*	T/CH	Clark Fork, Flathead, Kootenai, St. Mary and Belly River basins; cold water rivers & lakes. Portions of rivers, streams, lakes and reservoirs within Deer Lodge, Flathead, Glacier, Granite, Lake, Lewis and Clark, Lincoln, Mineral, Missoula, Powell, Ravalli, Sanders counties
Canada Lynx (contiguous U.S. population)	*Lynx canadensis*	T/CH	Western Montana Resident – core lynx habitat, montane spruce/fir forests; Transient – secondary/peripheral lynx habitat. Western Montana - montane spruce/fir forest
Spalding's Catchfly	*Silene spaldingii*	T	Upper Flathead River and Fisher River drainages; Tobacco Valley - open grasslands with rough fescue
Yellow-billed cuckoo (western population)	*Coccyzus americanus*	T	Population west of the Continental Divide; riparian areas with cottonwoods and willows
Red Knot	*Calidris canutus rufa*	T	Migrant; eastern Montana plains along shorelines
Northern Long-eared Bat	*Myotis septentrionalis*	T	Eastern Montana; caves, abandoned mines; roosts in live trees and snags
Meltwater Lednian Stonefly	*Lednia tumana*	T	High elevation meltwater streams; Glacier, Flathead, and Lake Counties
Western Glacier Stonefly	*Zapada glacier*	T	Typically found in clean, cold running waters that have high oxygen content. Glacier and Carbon Counties
Whitebark Pine	*Pinus albicaulis*	T	Western, central, and southwestern Montana, in forests at upper subalpine elevations and near treeline
ENDANGERED (E) - Any species that is in danger of extinction throughout all or a significant portion of its range.			
THREATENED (T) - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.			
NON-ESSENTIAL EXPERIMENTAL POPULATION (XN) - A population of a listed species reintroduced into a specific area that receives more flexible management under the Act.			
CRITICAL HABITAT, PROPOSED CRITICAL HABITAT (CH, PCH) - The specific areas (i) within the geographic area occupied by a species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species.			

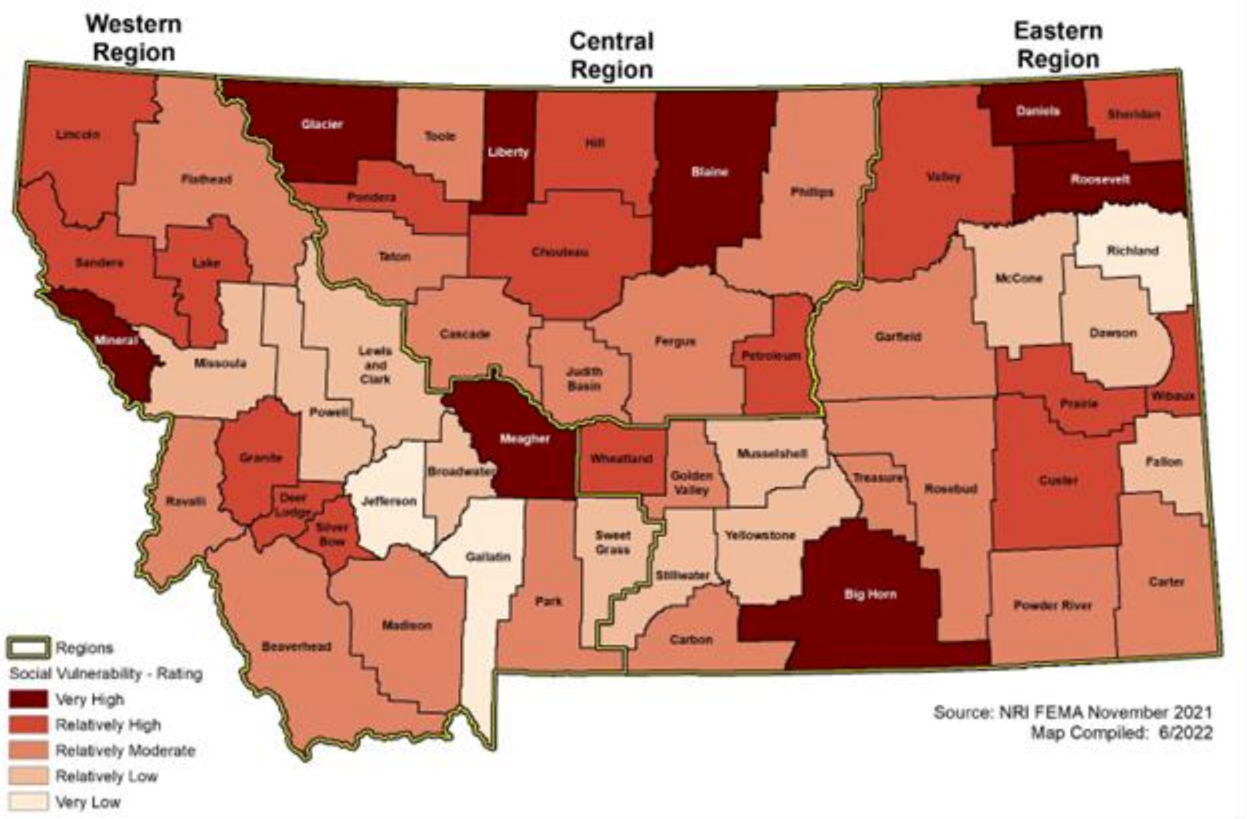
Source: Montana Ecological Services Field Office, https://www.fws.gov/office/montana-ecological-services/species

4.1.1.5 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.

The NRI has incorporated a social vulnerability index (SoVI) rating as a "consequence enhancing risk component" using the SoVI compiled by the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina. This SoVI is a location-specific assessment and measures the social vulnerability of U.S. counties to environmental hazards utilizing 29 socioeconomic variables which have been deemed to influence a community's vulnerability. The comparison of SoVI values between counties within the State allows for a more detailed depiction of variances in risk and vulnerability. Figure 4-3 shows this social vulnerability rating by county in Montana, with those counties shaded in darker red having the highest levels of social vulnerability.

Figure 4-3 Social Vulnerability Rating by County in Montana



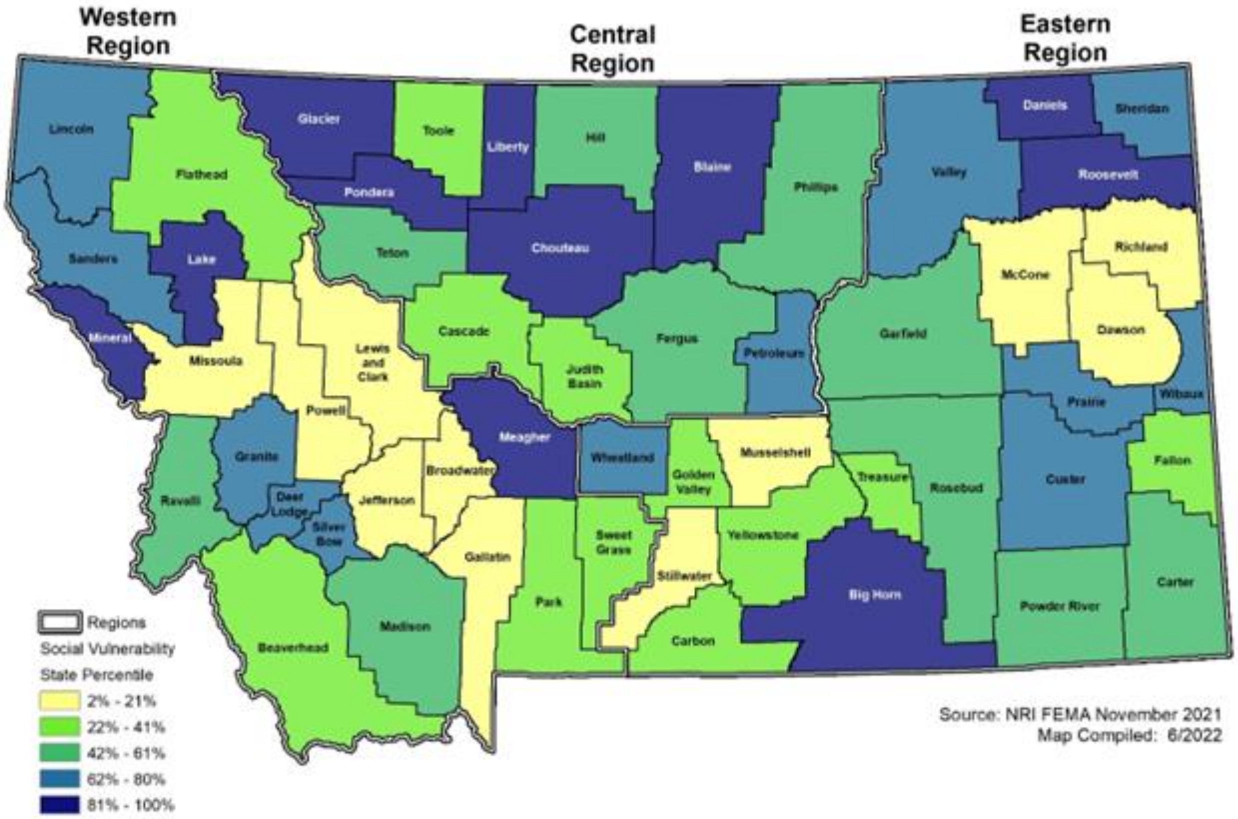
Source: NRI FEMA November 2021
Map Compiled: 6/2022

The index can be used by the State to help determine where social vulnerability and exposure to hazards overlaps and how and where mitigation resources might best be used. The SoVI provides a score between 0.01 and 100, with higher scores indicative of higher levels of social vulnerability. According to the index, the following, listed in order, are Western Montana's three most socially vulnerable counties as follows. Mineral County is in the Western Region.

1. Meagher County (Score 63.0)
2. Mineral County (Score 59.0)
3. Lake County (Score 55.8)

Each of the above counties are also in the top 20 percent in the nation in terms of social vulnerability. The average national social vulnerability score is 38.35 and the average for Montana is 43.46. Glacier County for instance has a higher social vulnerability score than 99.2% of U.S. counties. In addition to the ten counties listed above, Wheatland, Valley, Sanders, Granite, Sheridan, and Lincoln also rank in the top 20% most socially vulnerable counties nationwide. Figure 4-4 below shows the percentile of each county's social vulnerability ranking on a national scale.

Figure 4-4 Social Vulnerability State Percentile



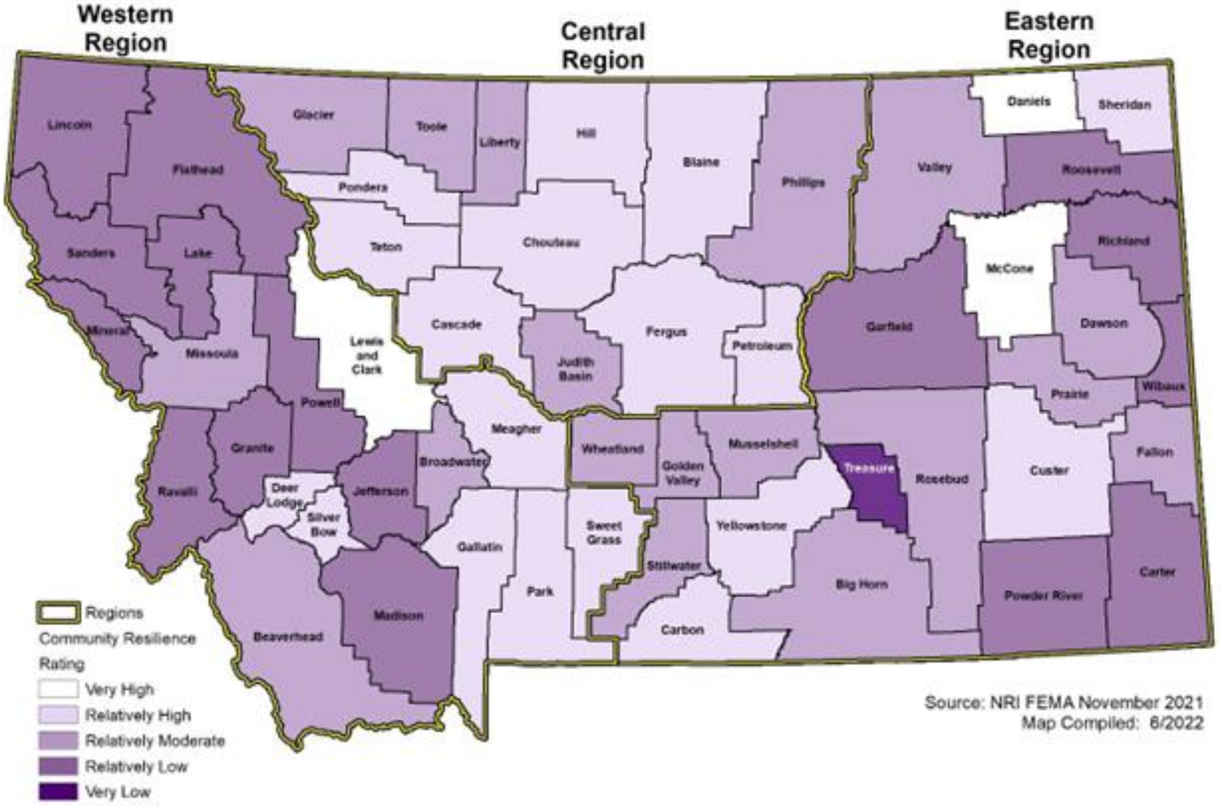
Source: NRI FEMA November 2021
Map Compiled: 6/2022

Community Resilience

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 4-5 below shows the community resilience rating for each county in Montana.

Figure 4-5 Community Resilience Rating by County in Montana



Source: NRI FEMA November 2021
Map Compiled: 6/2022

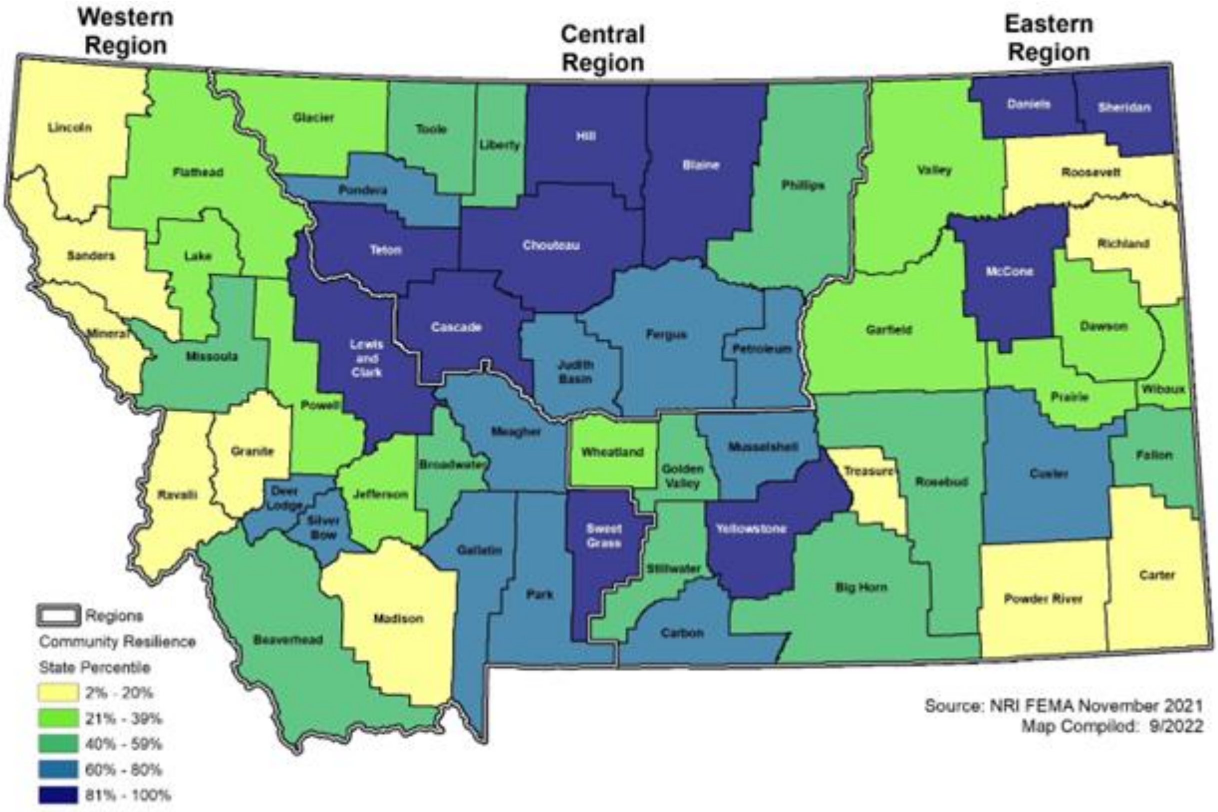
The community resilience rating can be useful in determining counties which have higher levels of ability to cope with hazards and identify success stories for building resilience. According to the index, the following, listed in order, are Montana's ten most resilient counties:

1. Daniels County (58.16)
2. Lewis and Clark County (57.80)
3. Liberty County (57.72)
4. Sheridan County (57.49)
5. Yellowstone County (56.92)
6. Hill County (56.90)
7. Chouteau County (56.79)
8. Teton County (56.71)
9. Sweet Grass County (56.63)
10. Blaine County (56.17

In general, the Western and Central Regions rate poorly for community resilience relative to the Central Region of Montana.

Only a select few of the above counties are in the top 20 percent in the nation in terms of community resilience with those being limited to Daniels, Lewis and Clark, and McCone counties. The average community resilience score for the State of Montana is 54.43, which is slightly lower than the national average score of 54.59. Only 11.1% of counties in the country have a higher level of community resilience than Montana's highest rated county, Daniel County. In addition to the ten counties listed above, Petroleum, Silver Bow, Custer, Pondera, Carbon, Meagher, Gallatin, and Fergus Counties each are identified as having relatively high levels of community resilience. Figure 4-6 below shows the percentile of each county's community resilience ranking on a national scale.

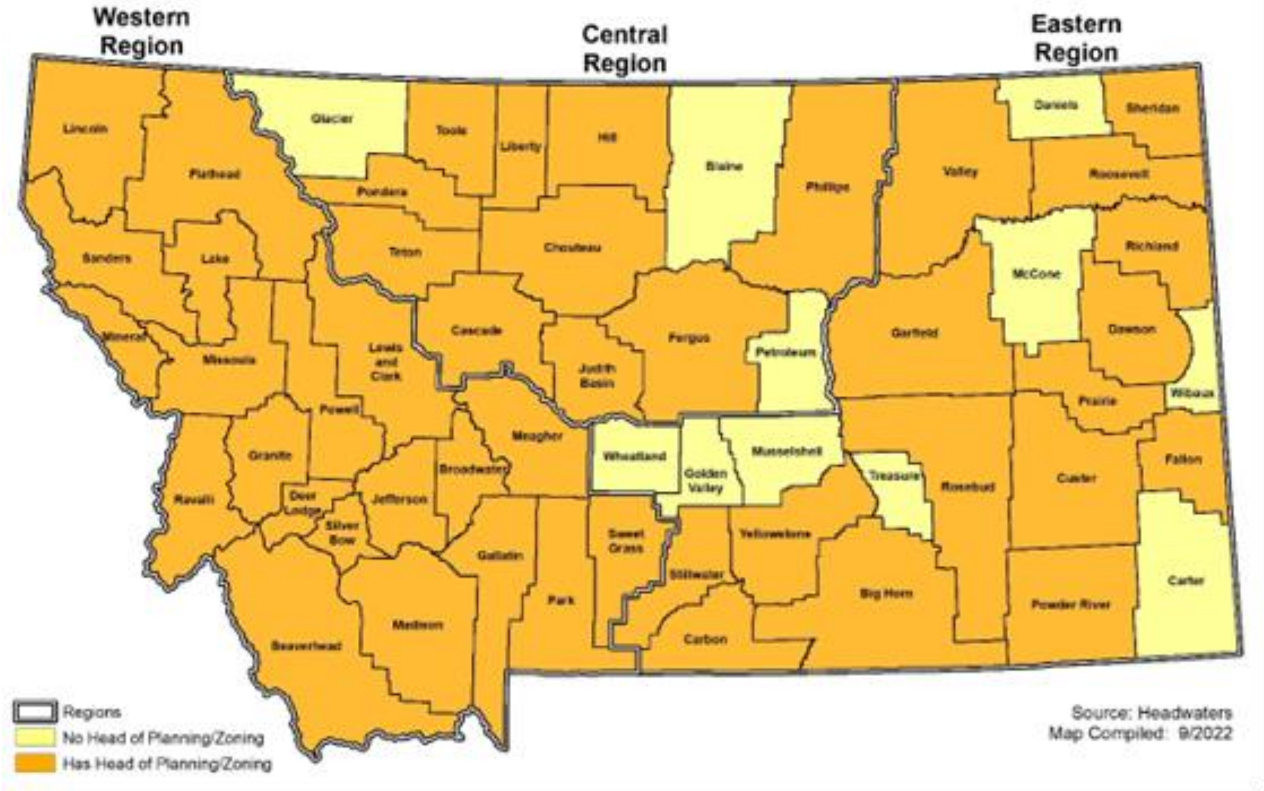
Figure 4-6 Community Resilience State Percentile



Source: NRI FEMA November 2021
Map Compiled: 9/2022

Adaptive capacity is the potential for a system to adjust to change and to potential damage and take advantage of opportunities, and cope with consequences. As such, other indicators of community resilience include whether local municipalities have planning departments and administrative and technical staff capabilities to address community needs during hazard events through effective planning processes, community engagement, and planning projects related to resiliency. Data from Headwater Economics was reviewed to map those counties that lack a Planning Department and/or a Zoning Ordinance. Figure 4-7 shows the counties in Montana that do not have a Planning Department. In other words, these are the counties in the State that lack formal planning resources and have less capability for land use and hazard mitigation planning. These include the counties of Glacier, Blaine, Wheatland, Golden Valley, Musselshell, Treasure, Carter, McCone, and Daniels.

Figure 4-7 Counties in Montana that Lack a Planning Department

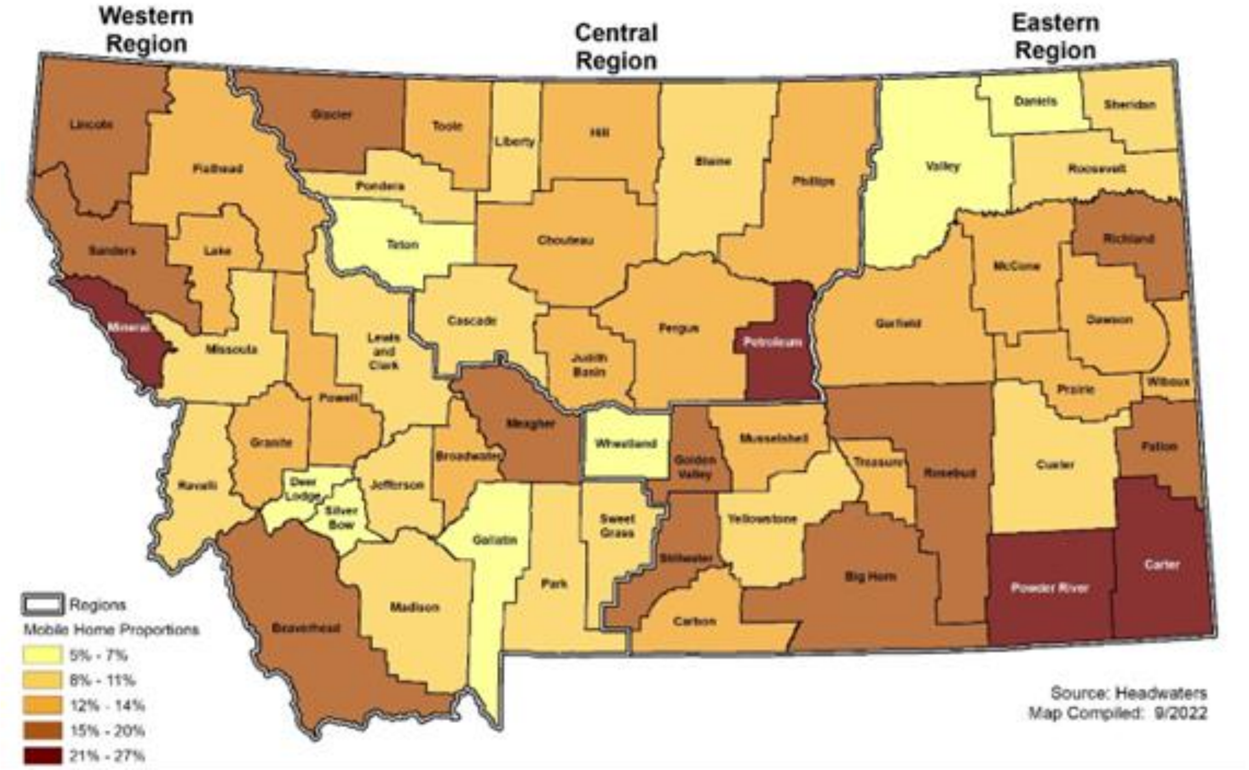


Source: Headwaters
Map Compiled: 9/2022

Mobile Homes

Mobile and manufactured homes are the most common unsubsidized, affordable housing in the United States. Research shows that these structures face a disproportionately higher risk of flooding and also damage from wind events. Approximately 9.2% of the housing types in Montana are mobile homes compared to approximately 5.6% mobile homes in the United States (U.S. Census 2020). Compared to those who live in other types of housing, mobile home residents have higher exposure to natural hazards such as wind, tornadoes, hurricanes, extreme heat, wildfire, and particularly flooding. For example, according to analysis by Headwater Economics, one in seven mobile homes is located in an area with high flood risk, compared to one in ten for all other housing types (Headwater Economics 2022). Figure 4-8 shows the number of mobile homes as a proportion to the number of households within the county.

Figure 4-8 Mobile Homes in Montana



Source: Headwaters
Map Compiled: 9/2022

As shown above, Mineral, Petroleum, Powder River, and Carter Counties have the highest number of mobile homes as a proportion to the number of households in that county. Other counties with 15% to 20% mobile home proportions include Lincoln, Sanders, Beaverhead, Glacier, Meagher, Stillwater, Golden Valley, Big Horn, Rosebud, Richland, and Fallon counties.

4.2 Hazard Profiles

Requirement §201.6I(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 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 separate sections of 4.2 and contain subsections described as follows.

4.2.1.1 Hazard/Problem Description

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

4.2.1.2 Geographical Area Affected

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

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.

4.2.1.3 Past Occurrences

This subsection contains information on historic incidents, including impacts where known. Information provided by the Regional Steering Committee is included here along with information from other data sources, including NOAA's National Centers for Environmental Information (NCEI) Storm Events Database and other data sources. When available, tables showing county-specific data from the NCEI database may be found in each hazard profile.

4.2.1.4 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—90 to 100 percent chance of occurrence in next year or happens every year.

Likely—Between 10 and 90 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.

Occasional—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.

Unlikely—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

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

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

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 percent chance of that hazard occurring any given year.

4.2.1.5 Climate Change Considerations

This describes the potential for climate change to affect the future frequency and intensity, exposure, vulnerability, and risk of impact of each hazard.

4.2.1.6 Potential Magnitude and Severity

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

- **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. Overwhelmed for an extended period of time or many deaths occur.
- **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.

4.2.1.7 Vulnerability Assessment

The primary function of the Vulnerability Assessment section for each hazard is to identify which assets are both likely to be exposed to a hazard and susceptible to damage from that exposure. In this context, assets are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. Exposure is defined here as interacting with a hazard, and likely to be exposed indicates a presence in areas deemed to be especially likely to experience a hazard. Susceptible is meant to indicate assets that are easily damaged from exposure to a hazard. Finally, vulnerability under future conditions is considered as it relates to both climate change and development.

Susceptible is a peculiar term in the context of hazard mitigation plans. FEMA avoids defining the term and apparently yields to the common definition of “easily harmed by something” (Cambridge Dictionary). In practice, estimating susceptibility of assets or lifelines to each hazard is a remarkably complex task. Even defining which assets are, or are not, susceptible is subject to an implicit judgment of how easily harmed is easily enough to be deemed susceptible? FEMA also avoids this issue of how easily harmed qualifies for susceptible in its guidance documents for developing hazard mitigation plans. However, FEMA’s Local Mitigation Planning Policy Guide provides a statement that plan participants may identify which specific assets are most susceptible to damage or loss from hazards (Local Mitigation Policy Guide, p. 23). In this plan, an attempt is made to at least describe which assets are susceptible to a given hazard. When this fails, input from plan participants serves as a guide to defining what is susceptible and what is not.

Another limitation of the vulnerability assessment is the inconsistent ability to define which specific assets are vulnerable. The reasons for this are many, but the most common problem is that GIS datasets may not contain consistent information about the characteristics of specific assets. Information about the characteristics of each asset could allow a judgment of which assets are susceptible to damage. For example, if a dataset only contains the location of houses, it is easy to identify which houses exist within a high-hazard area. However, not all houses are equally susceptible to damage. Some were built with older housing codes, some may not be well maintained, some may be oriented in ways or located on sites that cause subtle differences in exposure to a hazard such as wind. In the absence of reliable data on key characteristics, judging which assets are susceptible to harm becomes a 'best estimate' rather than a determination. Another example is if one dataset has the location of assets in a different format than is used to define a hazard area. In this case it is not possible to determine which assets are within a hazard area without additional analysis.

4.2.1.8 Development Trends Related to Hazards and Risk

Analysis of the effect of recent and future development on vulnerability is provided on a hazard-by-hazard basis. These discussions are provided within the *Development Trends Related to Hazards and Risk* subsection of each hazard profile. Specific trends and impacts can also be found in each county or tribal annex as applicable.

4.2.1.9 Risk Summary

The primary function of the Risk Summary section for each hazard is to summarize the potential severity of loss to vulnerable assets and the impact of that loss on jurisdictions. This section summarizes risk by county according to the area affected, likelihood, and magnitude of impacts. Overall Hazard Significance is summarized for the Region and by county and tribe. If the hazard has impacts on specific towns or cities in the Region that differ from the county, they are noted here, where applicable.

4.2.2 Avalanche

4.2.2.1 Hazard/Problem Description

An avalanche is a release or slide of a mass of snow that moves rapidly down a slope, often as a result of severe weather and when they occur, they can cause damage to or threaten the safety of people. While most avalanches in Montana occur on mountains above the timberline and in sheltered regions where snow is most prone to accumulate, they can also occur on slight slopes well below the timberline, such as gullies and road cuts. For an avalanche to occur, four factors must be present: a slope, a snow cover, a weak layer in the snow cover, and a trigger.

They occur when weak layers in the snowpack fail to support the weight of the snow above and collapse. The weak layer causes the overlying snow to break free and flow downhill.

Snow avalanches can release loose snow or slabs of snow and can be classified as wet or dry events, depending on the moisture content of the snowpack. Loose avalanches involve snow near the surface and release when cohesion is lost between the snow grains. Slab avalanches extend into deeper snow and release cohesiveness at a deeper and weaker layer of snow. Both types can flow downhill for long distances on gentle terrain and often damage or destroy buildings, cabins, and electrical transmission lines.

Avalanches are triggered by human activity or environmental factors, such as wind loading, precipitation, or warm weather. Human-caused avalanches mostly occur in the backcountry and involve backcountry skiers, hikers, or other recreationists. Once triggered, an avalanche path consists of a starting zone where they begin, a track where they develop speed and velocity, and a runout zone at lower gradient slopes where the slides slow down and the debris zone forms.

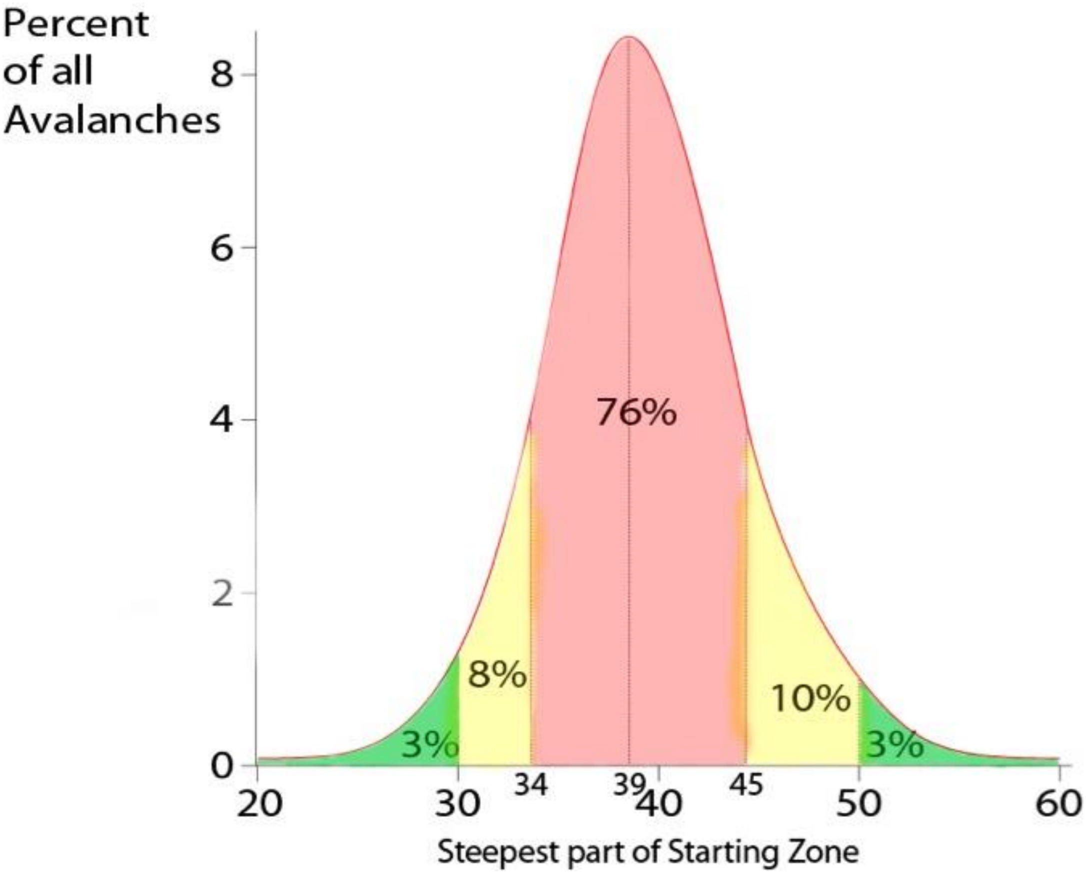
Although most avalanches do not result in damage, risk occurs when people or property cross their paths. The greatest risk is to communication and transportation networks, as well as to winter recreationists. Increases in encroachment into mountainous areas, as well as gains in the popularity of winter sports, has increased the risk posed by avalanches. Bridger Bowl and Big Sky ski areas, both located in Western Montana, are the second and fourth most avalanche prone ski resorts in the United States (Montana Emergency Response Framework, 2017) and regularly perform avalanche mitigation.

4.2.2.2 Geographical Area Affected

Avalanches begin in specific areas with both a snowpack and steep terrain (Figure 4-9) and can extend to adjacent flatter areas. Due to the largely immutable nature of the landscape, avalanches are likely to occur in areas where they have previously occurred. The paths avalanches have historically taken down mountains are known as avalanche chutes and can often be identified by the convergence of areas with snowpack, steep terrain, and vegetation changes from surrounding terrain such as the abrupt absence of trees. Very often, avalanche chutes in Western Montana are well-known, even if they are not formally cataloged in GIS databases. Avalanches also commonly occur above 7,000 feet where snow is more likely to accumulate throughout the winter snowfall season. Current analyses of avalanche hazard zones is relatively coarse and generally does not extend to defining specific starting or runout areas.

Extensive – Due to the mountainous terrain of Western Montana, much of the Region is at risk of avalanche. Nearly every county in the Region has areas especially prone to avalanche hazards, though the majority of these areas are in remote or wilderness areas.

Figure 4-9 Avalanche Occurrence by Slope Steepness



4.2.2.3 Past Occurrences

Avalanches occur frequently in Western Montana. However, avalanche events that don't cause damage are rarely recorded. Still, avalanches have the capability to incur major damages when people are involved, and Western Montana is especially susceptible due to its mountainous terrain and popularity among winter recreationists.

According to the 2017 Montana Emergency Response Framework, 70 people were killed by avalanches in Montana between 1998 and 2012, representing more than 15% of nationwide avalanche fatalities (Montana Emergency Response Framework, 2017). Approximately 26 additional avalanche-related fatalities occurred between 2013 and 2021. According to nationwide data tracked by the Colorado Avalanche Information Center, at least two recreationists were killed after being partially buried in avalanches during the first two months of 2022 in Western Montana.

Table 4-6 Avalanche Fatalities in Montana 2017-2022

Date	Location/Name	Activity	Number Caught/Buried/Killed
2022-02-19	Miller Mountain Avalanche Fatality	Snowbiking	One caught, partially buried, and killed
2022-02-06	Ski Hill Avalanche Fatality	Snowmobiling	One caught, partially buried, and killed
2021-12-27	Double Avalanche Fatality, Cooke City	Snowmobiling	Two caught, buried, and killed

Date	Location/Name	Activity	Number Caught/Buried/Killed
2021-02-14	Beehive Basin Avalanche Fatality	Splitboarding	Two caught, one partially buried and killed
2021-02-06	Wounded Buck Lake	Snowmobiling	Five caught, one partially buried and killed
2020-01-01	Lake Dinah Accident	Snowmobiling	Three snowmobilers caught and buried, two killed
2019-02-26	Avalanche Fatality, Truman Gulch	Skiing	One caught, partially buried, and killed
2019-01-25	Bell Lake Avalanche Fatality	Skiing	Four caught, two partially buried, one killed
2019-01-05	South Waldron Creek	Snowmobiling	Two caught, one buried and killed
2018-04-15	Saddle Peak Avalanche Fatality	Skiing	One caught, partially buried, and killed
2018-02-17	Canyon Creek, Whitefish Range	Skiing	One caught, buried, and killed
2018-01-02	Cabin Creek, SE Madison Range	Snowmobiling	One caught, buried, killed
2017-10-07	Imperial Peak, S Madison Range	Skiing	Two caught and buried, one killed
2017-01-05	Mt. Stanton, North of W. Glacier	Skiing	One caught, buried, and killed

Source: Colorado Avalanche Information Center, https://avalanche.state.co.us/accidents/us/; Gallatin National Forest Avalanche Center, https://www.mtavalanche.com/accidents

While substantial property damage due to an avalanche is rare, it does occur. On January 28, 2004, following heavy snowfall in the area, two separate avalanches hit a freight train near Glacier National Park in Western Montana. The first avalanche knocked seven cars off the track and while the train was stopped a second avalanche hit and knocked an additional eight cars off the track. Fortunately, there were no reported injuries (Associated Press, 2004).

An "urban avalanche" occurred in Missoula on February 28, 2014. Triggered by a snowboarder on Mount Jumbo, the avalanche swept up available snow and picked up speed as it advanced across the terrain. The snow captured two children, ages 8 and 10, and carried them several feet before partially burying one and completely burying the other. The avalanche slammed into a two-story home, knocking it down completely, with its two residents inside. Three other homes, several vehicles, and an apartment building were also reported to be damaged. Rescue operations began swiftly. However, they were complicated by live power lines, broken natural gas lines, and the possibility of a subsequent avalanche. Both the two children and two home residents were rescued, although one resident died in the following days from traumatic injuries.

Figure 4-10 The Path of the Urban Avalanche in Missoula

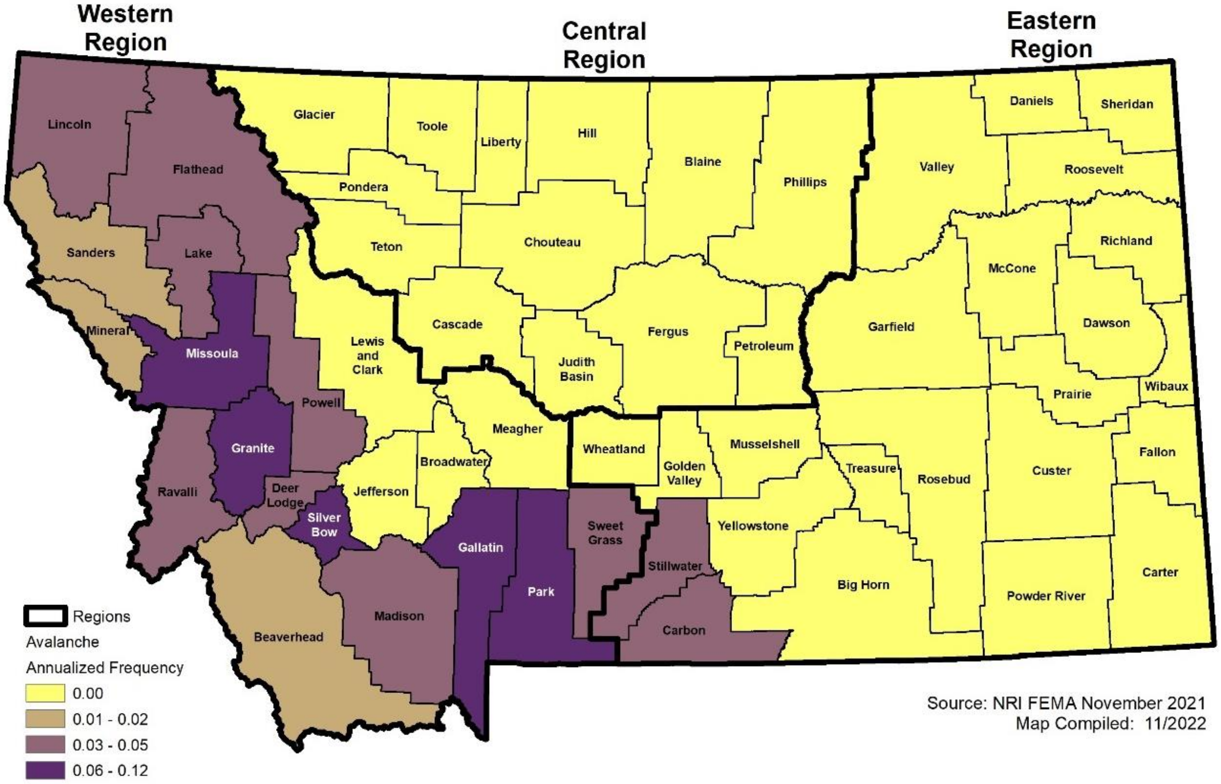
Source: The West Central Montana Avalanche Foundation, missoulaavalanche.org

4.2.2.4 Frequency/Likelihood of Occurrence

Highly Likely – According to the Gallatin National Forest Avalanche Center, in the Gallatin Forest alone over 100 avalanches occurred in 2021. This makes the probability of future avalanches in the Region a certainty. However, during that same time frame only four avalanches involving people were reported in Western Montana. Using the formula described in Section 4.2.1.4, it is highly likely that an avalanche that results in injury or death will occur each year.

Figure 4-11 depicts the annualized frequency of avalanche events at a county level based on NRI data. The greatest probability is in Missoula, Granite, Butte-Silver Bow, Gallatin, and Park counties.

Figure 4-11 Annualized Frequency of Avalanche Events by County



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

4.2.2.5 Climate Change Considerations

Climate change will have an effect on avalanche risk. Particularly at moderate elevations, temperature is the main constraint on snow accumulation. In Montana, research indicates temperature is especially important at elevations below ~5,100 feet.[1] Projections of warmer temperatures suggest snowpack will decline, especially below this elevation threshold. As snow cover declines, the spatial extent of avalanche will decline.

As the spatial extent of avalanche hazards declines with a diminishing snowpack, exposure and risk of impacts to *stationary assets* such as roads and infrastructure will decline. However, it is arguable wintertime backcountry enthusiasts will simply follow the snowpack to pursue recreation and exposure to people may persist. The relationship between changing snowpack and deaths and injuries from avalanche is likely complex.

Drought, which is worsened by climate change (Section 4.2.6), may have complex effects on avalanche hazards. As is the case with the temperature-driven shift in snowlines, as drought reduces the depth and spatial extent of snowpack exposure of stationary assets to avalanche hazards will be reduced. However, early and mid-winter drought can weaken the cohesion within snowpack, which increases avalanche danger after the next snowfall.

---

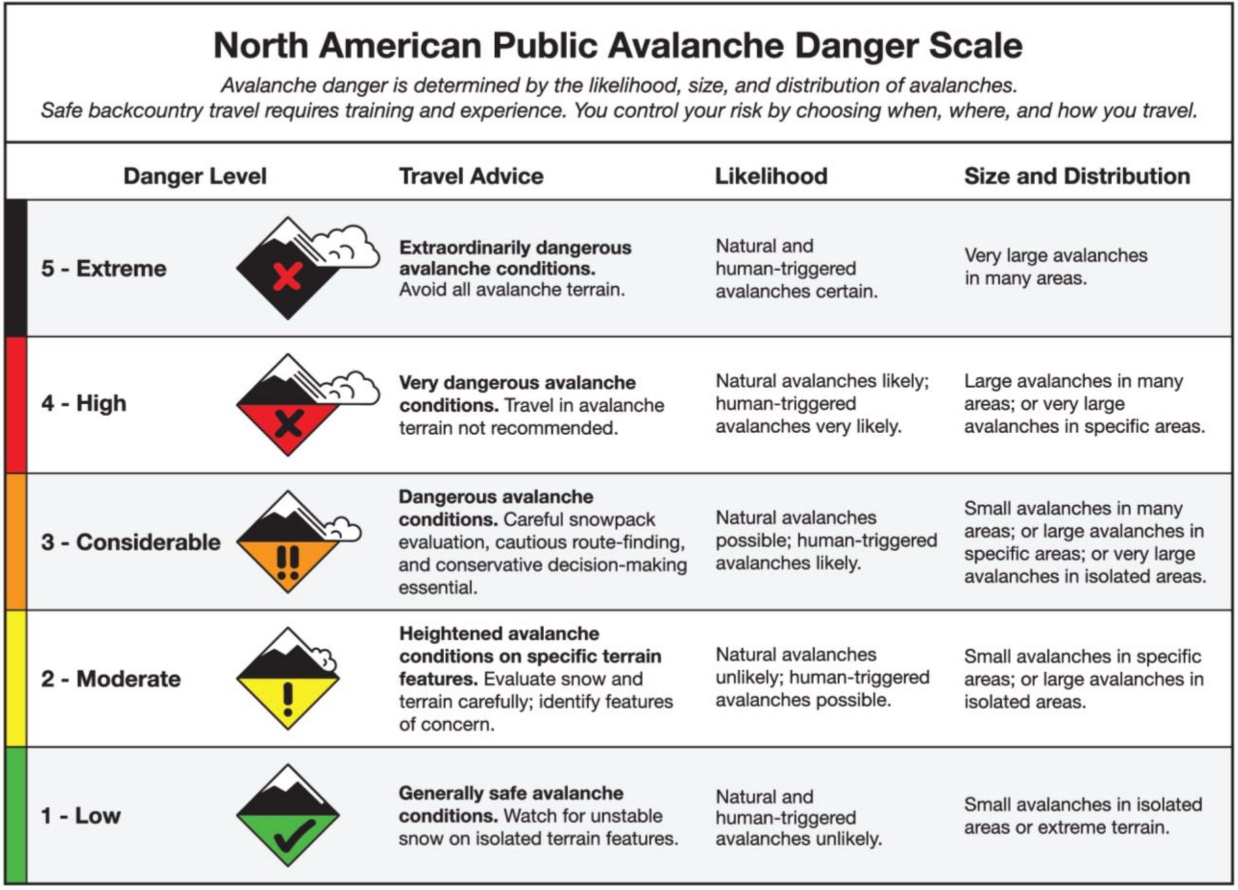
[1] Sospedra-Alfonso, R., Melton, J. R., and Merryfield, W. J. (2015). *Effects of temperature and precipitation on snowpack variability in the Central Rocky Mountains as a function of elevation*. Geophys. Res. Lett. 42, 4429–4438.

With regard to the impact of climate change on avalanche risk to people, recent research[2] suggests that climate change may make avalanches more lethal than in the past. With a wetter and warmer snow climate, snow becomes denser, and the consequences of burial may become more severe. A thinner snowpack may also increase exposure of humans caught in avalanche to debris and stationary ground cover. Asphyxiation of buried victims and blunt trauma and secondary injuries may all become more frequent as snow cover becomes denser and thinner. All of this is countered by an overall reduction in the length and quality of the winter recreation season that seems likely to reduce the amount of time outdoors enthusiasts spend in avalanche-prone areas. No research has yet evaluated how these factors may play out in the Western Montana region.

4.2.2.6 Potential Magnitude and Severity

The North American Public Avalanche Danger Scale (NAPADS) shown below in Table 4-7 is a system that rates avalanche danger and provides general travel advice based on the likelihood, size, and distribution of expected avalanches. It consists of five levels, from least to highest amount of danger: 1 – Low, 2 – Moderate, 3 – Considerable, 4 – High, 5 – Extreme. Danger ratings are typically provided for three distinct elevation bands. The scale ratings are assigned numerical levels, increases exponentially between levels. In other words, the hazard rises more dramatically as it ascends toward the numerically higher levels on the scale.

Table 4-7 North American Public Avalanche Danger Scale



North American Public Avalanche Danger Scale

Avalanche danger is determined by the likelihood, size, and distribution of avalanches.
Safe backcountry travel requires training and experience. You control your risk by choosing when, where, and how you travel.

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

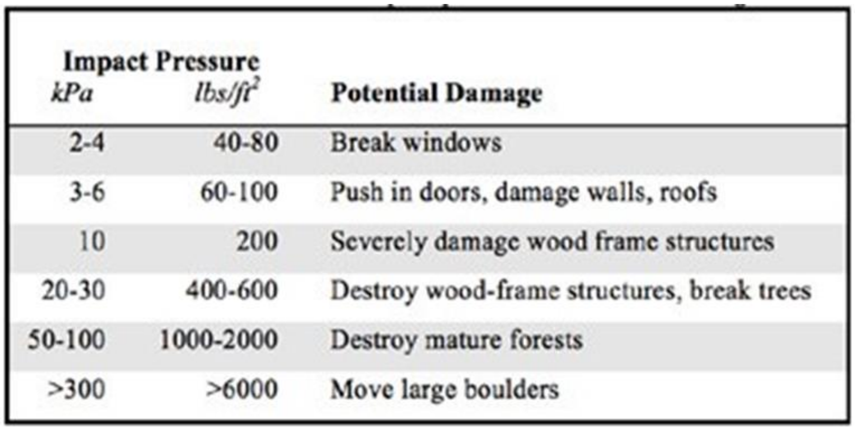
Source: Avalanche.Org

---

[2] Strapazzon, G., Schweizer, J., Chiambretti, I., Brodmann Maeder, M., Brugger, H., & Zafren, K. (2021) *Effects of climate change on avalanche accidents and survival*. Frontiers in physiology, 12, 639433.

The impact pressure of an avalanche ranges from relatively harmless blasts of powder snow clouds to a dense and highly destructive mix of snow and debris capable of destroying reinforced concrete structures. Engineers determine what type of mitigation method should be utilized based on possible impact pressure calculations in the runout zone, which is shown in Table 4-8.

Table 4-8 Avalanche Impact Pressure Related to Damage



Impact Pressure		
kPa	*lbs/ft^2*	**Potential Damage**
2-4	40-80	Break windows
3-6	60-100	Push in doors, damage walls, roofs
10	200	Severely damage wood frame structures
20-30	400-600	Destroy wood-frame structures, break trees
50-100	1000-2000	Destroy mature forests
>300	>6000	Move large boulders

Source: FEMA

An engineering analysis of the magnitude of avalanche hazards in the Western Region has not been conducted. Qualitatively, the magnitude of the hazard is quite severe. Avalanches kill multiple people each year and can be especially disruptive to the transportation lifeline.

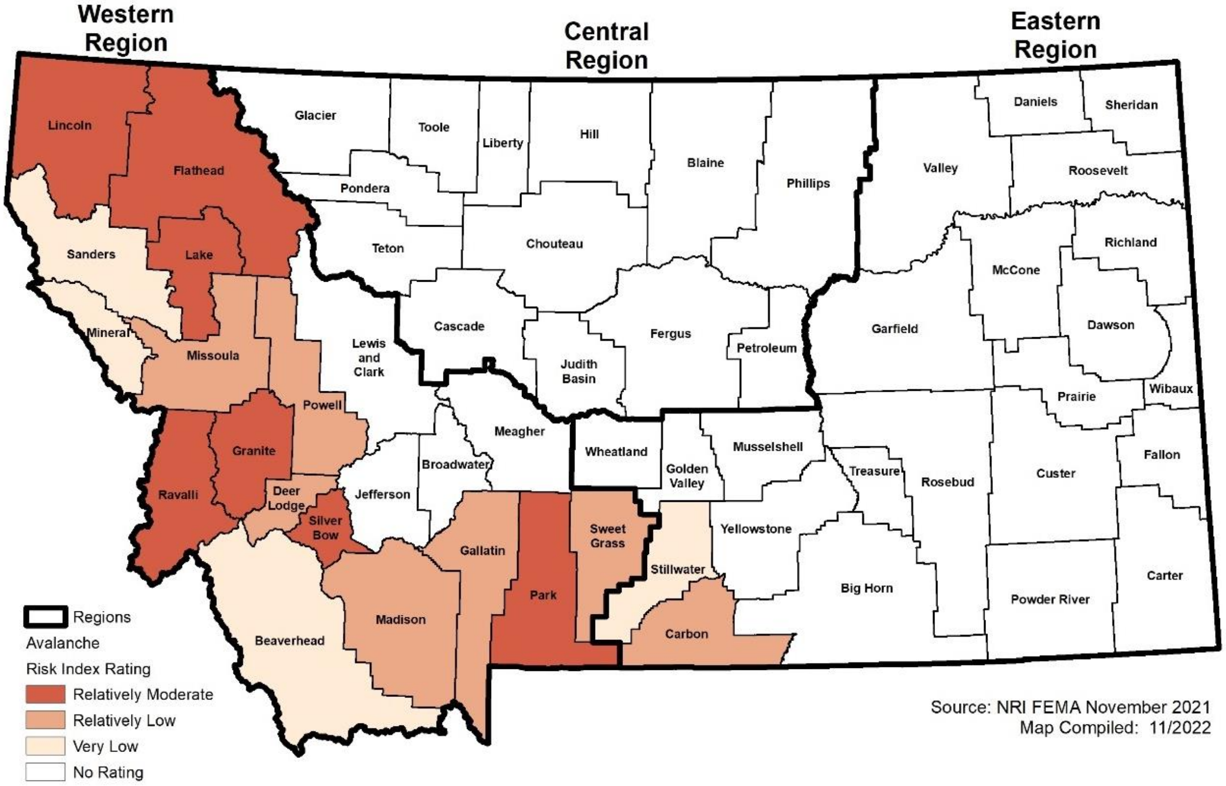
4.2.2.7 Vulnerability Assessment

The avalanche *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to avalanche hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with avalanche hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience avalanche hazards. *Susceptible* indicates a strong likelihood of damage from exposure to avalanche hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is not a particular concern for avalanche hazards in the Western Region, though this assessment will be revisited in future plan updates (see section titled *Climate Change Considerations*, above). Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

The overall potential magnitude of impacts from avalanches in the Western Montana Region is limited in extent, avalanches affect a very small number of people each year, but severe when they do occur. In the past, avalanche damage in the Western Region causes fatalities nearly every year and causes modest property destruction.

The NRI risk index rating for avalanche in the Western Region is shown in Figure 4-12. The risk index rating considers impacts to many types of assets and provides insight to the overall significance of avalanche hazards in jurisdictions throughout the Western Region. A deeper analysis of the vulnerability of each asset type to avalanche hazards in Western Region jurisdictions is provided below.

Figure 4-12 Risk Index Rating for Avalanche by County



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

People

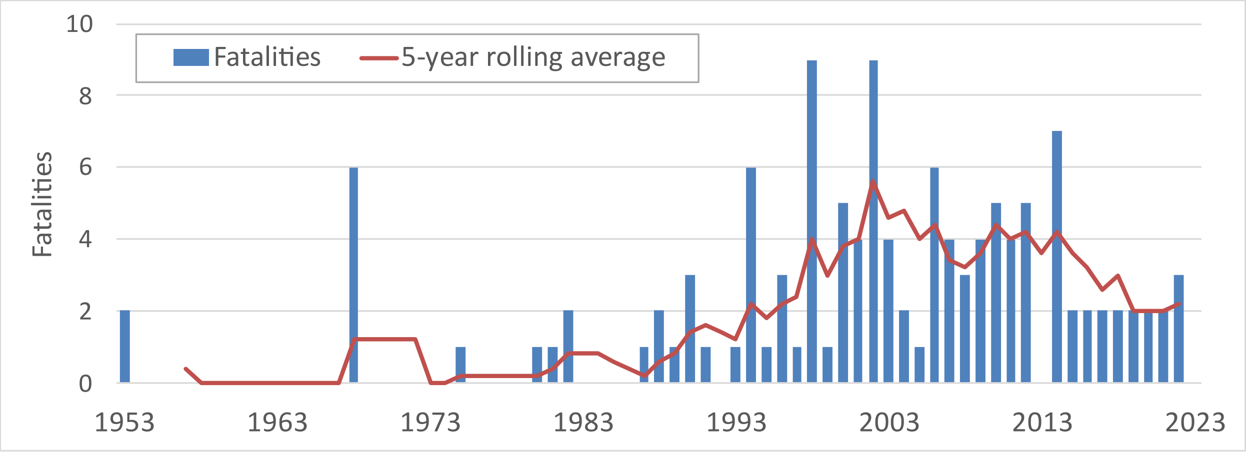
Avalanches kill people nearly every year in the Western Region (Figure 4-13). Fatalities grew from near zero to four to five per year near the turn of the century, before gradually declining to approximately two per year at present. Fatalities typically occur in the months of December, January, and February (Figure 4-14). Well over half of avalanche fatalities are to snowmobilers and cumulatively 88% of fatalities occur to either snowmobilers or skiers/snowboarders and outside of ski area boundaries.

These statistics confirm that humans are quite susceptible to harm from avalanche hazards. Exposure to avalanche hazards often results in serious injury and death. However, exposure is typically limited to undeveloped areas. Only 3% of avalanche fatalities in Montana have occurred to people not engaged in outdoor recreation. Three-fourths of these non-recreation fatalities occurred to people on or near roadways, possibly in remote areas prone to avalanche hazards.

Clearly, outdoor recreationists who travel into backcountry areas are most at risk. Additionally, avalanche incidents involving search and rescue teams can put these personnel at risk. The key actions to limiting impacts to individuals recreating in avalanche prone areas include spreading knowledge and awareness of the hazard and being knowledgeable and properly equipped to avoid avalanche hazards or for self-rescue if necessary. These actions are likely responsible for the levelling out and gradual decline in fatalities in Montana observed over the past 20 years (Figure 4-13).

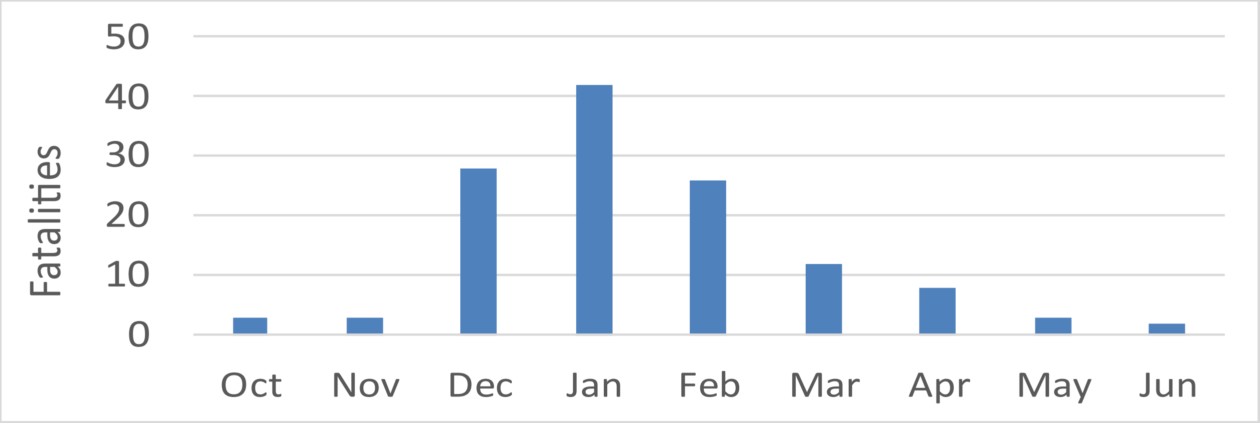
The best data available on avalanche fatalities include place names for fatality location, sometimes include map coordinates, and do not specify the county. In this HMP update jurisdictional differences in avalanche impacts to people are assumed to follow the pattern in NRI avalanche risk rating shown in Figure 4-12.

Figure 4-13 Avalanche Fatalities in Montana, 1956-May 2023



Source: Colorado Avalanche Information Center, 2024

Figure 4-14 Month of Avalanche Fatalities in Montana, 1956-May 2023



Source: Colorado Avalanche Information Center, 2024

Table 4-9 Activities Leading to Avalanche Fatalities in Montana, 1956-May 2023

Activity	Killed	Percent of Total
Snowmobiler	79	61
Ski/Snowboard/Similar	35	27
Climber	7	5
Hiker/Hunter	4	3
Highway Personnel	2	2
Motorist	1	1
Resident on foot	1	1

Source: Colorado Avalanche Information Center, 2024

Property

Property damage from avalanche hazards is rare in the Western Region but has occurred in the past. Structures such as houses and buildings are somewhat susceptible to damage and occasionally can be destroyed by avalanches, but typically avoid exposure by not being located in high hazard areas prone to avalanches. One exception to this is the 2014 avalanche incident in Missoula (Section 4.2.2.3, Figure 4-10). Automobiles are particularly likely to be present in high hazard areas and are sometimes buried while parked or in rare cases pushed off of roads while in motion.

According to NRI data for expected annual loss to buildings, risk to property in the Western Region is slight (Table 4-10). In fact, only 0.1% of the total expected loss for the Western Region is attributable to structure damage. Damage to people is responsible for the remaining 99.9% of losses due to avalanche in the NRI data.

Table 4-10 Buildings Expected Annual Loss due to Avalanche Hazards

County	Avalanche Buildings Expected Annual Loss
Missoula	$832
Ravalli	$624
Gallatin	$554
Park	$317
Flathead	$237
Lincoln	$237
Silver Bow	$201
Lake	$158
Deer Lodge	$158
Madison	$158
Powell	$158
Sweet Grass	$158
Beaverhead	$79
Sanders	$79
Mineral	$47
Granite	$3
Broadwater	-
Jefferson	-
Lewis and Clark	-
Meagher	-

Source: National Risk Index

Critical Facilities and Lifelines

Highways and railway lines are particularly vulnerable to avalanche hazards. The linear nature of this infrastructure virtually guarantees crossing high-hazard zones. When avalanches do occur, automobiles or trains can be vulnerable to damage, including being swept off of roads or derailed. Typically, however, the biggest impact of avalanche slides on transportation systems is to block the path of automobiles or trains.

In the Western Region, I-90 on the Montana side of Lookout Pass in Missoula County has been blocked by avalanches in the past, most recently in January 2022. The HMPC noted that BNSF and Amtrak Rail Lines in the John Stevens Canyon/Hwy 2 Corridor in Flathead County is vulnerable to avalanche.

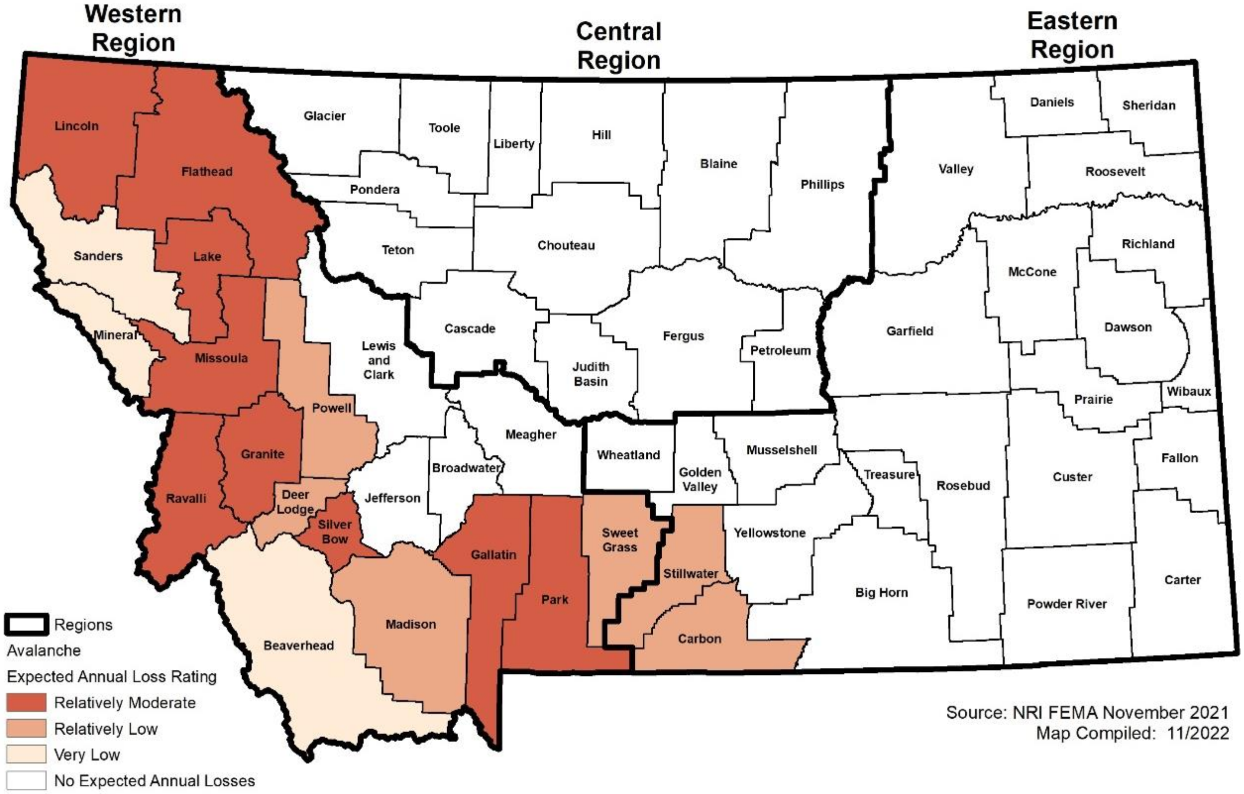
Avalanche-related blockage of roads and rail lines requires urgent and costly effort to restore use. Disruption of traffic and rail services can further disrupt other lifelines, especially health and safety and perhaps access to health and medical.

Power distribution and communications lines are also linear in nature, but are not commonly impacted in the Western Region. This is apparently due to being elevated above grade or being routed to avoid high-hazard areas.

Economy

The impact of avalanche hazards on the economy of Western Montana has not been quantified. The NRI reports an expected annual loss for each county Figure 4-15. As described above, the EAL of avalanches for Montana is dominated by human impacts such as loss-of-life. This is not a true measure of economic impacts such as reducing tourism. Nevertheless, this is perhaps the best indicator available to describe variability in the magnitude of economic impacts of avalanche between counties in the Western Region.

Figure 4-15 Expected Annual Loss Rating for Avalanche by County



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Historic and Cultural Resources

The impact of avalanche hazards on historic and cultural resources in the Region is not known to exist.

Natural Resources

Avalanches are a natural process in landscapes where they occur and affect a relatively small area. Most typically, avalanche chutes maintain open areas in otherwise steep forested terrain. This is arguably better characterized as a feature of the landscape than an impact on natural resources.

Variation in the magnitude of impacts to natural resources between counties has not been quantified. NRI data for avalanche frequency (Figure 4-11) or risk index (Figure 4-12) provide some insight to the likely variability of impacts to natural resources due to avalanche hazards.

Development Trends Related to Hazards and Risk

A potential concern related to development is population growth and an associated increase of people pursuing winter recreation in high hazard zones. With the exception of Lincoln and Powell, all counties in Western Montana have experienced rapid population growth from 2010 to 2022. The average rate of increase was 6.57%, well above the national average, with Gallatin County experiencing a staggering 39.5% rate of increase (World Population Review, 2022). However, the actual impact of population growth on avalanche impacts is has not been documented and is complex. First, avalanche fatalities are on a 20-year decline, despite growth in population and tourism (Figure 4-13). Second, population growth in one county may lead to avalanche-related injuries or fatalities in other counties where winter outdoor recreation is more popular. In the absence of reliable information describing if or how populations trends impact avalanche hazard risk, it is possibly best to presume that population growth will simply amplify the impact trends identified in the *People* subsection, above.

New development is not anticipated to increase avalanche vulnerability of property in the Region. Building typically occurs on relatively flat sites, where slope angles are much lower than what is associated with avalanche terrain. Development typically avoids avalanche runout zones that are either easy to identify, or simply not present. The very slight significance of property damage due to avalanche is described above, in the *Property* subsection. Constructing new homes or buildings in a location prone to avalanche hazards remains a theoretical possibility, particularly where planning and zoning is not practiced.

4.2.2.8 Risk Summary

In general, the avalanche hazard is considered to be overall low significance for jurisdictions in the Western Region. Variations in risk rating do exist between jurisdictions and these differences are in Table 4-11.

Key aspects of the vulnerability assessment that affect risk from avalanche hazards are as follows.

- Overall, avalanches are rated as a low significance risk in the planning area.
- Avalanche risk is highest in steep, remote mountain terrain.
- The vast majority of impacts occur to outdoor recreation enthusiasts that use high hazard areas, although rarely avalanches have affected urban areas.
- On average, avalanches currently kill 2 people each year in Montana. Nearly all Montana fatalities occur in the Western Region planning area, making the likelihood of future occurrence **Highly Likely**.
- The economic impacts from avalanche hazards are poorly understood but the risk is considered to be negligible due to the small number of people affected.
- Related hazards: Severe Winter Weather.

Table 4-11 Risk Summary Table: Avalanche

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Low	See below	See below
Beaverhead	Low	City of Dillon Town of Lima	Almost no avalanche danger in county
Broadwater	Low	City of Townsend	none
Butte-Silver Bow County	Low	City of Butte Town of Walkerville	none
Confederated Salish and Kootenai Tribes of the Flathead Reservation	Low		none
Flathead	Medium	City of Columbia Falls City of Kalispell Town of Whitefish	Flathead County has one of the largest populations in Western Montana and is home to multiple popular ski resorts. Incorporated areas are low
Granite County	Low	Town of Drummond Town of Philipsburg	none
Jefferson	Low	City of Boulder Town of Whitehall	none
Lake	Medium	City of Polson City of Ronan Town of St. Ignatius	Incorporated areas have low rating
Lewis and Clark	Low	City of Helena City of East Helena	none
Lincoln	Low	City of Libby City of Troy Town of Eureka Town of Rexford	none
Madison	Medium	Town of Ennis Town of Sheridan Town of Twin Bridges Virginia City	Incorporated areas have low rating. The Big Sky Ski Resort in Madison and Gallatin Counties is the fourth most avalanche prone ski resort in the U.S. but regularly controlled.
Meagher	Low	City of White Sulphur Springs	none
Mineral	Low	Town of Superior Town of Alberton	none
Park	Medium	City of Livingston Town of Clyde Park	Park County has the highest avalanche fatality rate in Montana. Rating is low for Livingston and Clyde Park.
Powell	Low	City of Deer Lodge	none
Ravalli	Low	City of Hamilton Town of Darby Town of Stevensville Town of Pinesdale	none
Sanders	Low	City of Thompson Fall Town of Plains Town of Hot Springs	none
Sweet Grass	Low	City of Big Timber	none

4.2.3 Communicable Disease

4.2.3.1 Hazard/Problem Description

A communicable disease spreads from one person to another through a variety of ways that include: contact with blood and bodily fluids; breathing in an airborne virus; or being bitten by an insect. ("Communicable Disease" 2022).

The scale of a communicable disease outbreak or biological incident is described by the extent of the spread of disease in the community. An outbreak can be classified as an endemic, an epidemic, or a pandemic depending on the prevalence of the disease locally and around the world.

- An endemic is defined as something natural to or characteristic of a particular place, population, or climate. For example, threadworm infections are endemic in the tropics.
- An epidemic is also defined as a disease that spreads rapidly through a demographic segment of the human population, such as everyone in a given geographic area, a similar population unit, or everyone of a certain age or sex, such as the children or women of a region.
- A pandemic is defined as a widespread epidemic with effects felt worldwide.

Many potentially devastating diseases are spread through physical contact, ingestion, insects, and inhalation. Airborne diseases and those spread through physical contact pose higher risks to the community because they are difficult to control. Diseases such as influenza, Pertussis, Tuberculosis, and meningitis are all spread through these methods and pose a threat to all communities. Health agencies closely monitor for diseases with the potential to cause an epidemic and seek to develop and promote immunizations.

A pandemic is a global disease outbreak. Pandemic flu is a human flu that causes a global outbreak, or pandemic, of serious illness. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease could spread easily person-to-person, causing serious illness, and can sweep across the country and around the world in a very short time. The Centers for Disease Control and Prevention (CDC) has been working closely with other countries and the World Health Organization to strengthen systems to detect outbreaks of influenza that might cause a pandemic and to assist with pandemic planning and preparation.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Pandemics are generally thought to be the result of novel strains of viruses. Because of the process utilized to prepare vaccines, it is impossible to have vaccines pre-prepared to combat pandemics. Additionally, for novel viruses, identification of symptoms, mode of transmission, and testing/identification may require development, causing significant delays in response actions. A portion of the human and financial cost of a pandemic is related to the lag time to prepare a vaccine to prevent the future spread of the novel virus. In some cases, current vaccines may have limited activity against novel strains. Even when there is a strong healthcare system in place, disease outbreaks can strain and overwhelm community resources if there is a significant outbreak. The Western Region's vulnerable populations, young children, the elderly, under-resourced households, and those with underlying health conditions, will be the hardest hit during any disease outbreak.

Ongoing COVID-19 Pandemic

Since March 2020 and during the update of this plan, the State of Montana, the nation, and the world were dealing with the COVID-19 pandemic, confirming that the pandemic is a key public health hazard in the State. The COVID-19 virus has a much higher rate of transmission than the seasonal flu, primarily by airborne transmission of droplets/bodily fluids. Common symptoms include fever, cough, fatigue, shortness of breath or breathing difficulties, and loss of smell and taste. While most people have mild symptoms, some people develop acute respiratory distress syndrome with roughly one in five requiring hospitalization and a fatality rate of approximately 1%. Recent studies, however, have shown the average country/territory-specific COVID-19 case fatality rate to be 2% - 3% worldwide and higher than previously reported estimates (Cao, Hiyoshi and Montgomery 2020). Case fatality rate, also called case fatality risk or case fatality ratio, in epidemiology, is the proportion of people who die from a specified disease among all individuals diagnosed with the disease over a certain period of time (Harrington 2022). The key challenge in containing the spread has been the fact that it can be transmitted by asymptomatic people.

2022 U.S. Monkeypox Outbreak

During the summer of 2022 an outbreak of Monkeypox occurred in the U.S. According to CDC, monkeypox is a rare disease caused by infection with the monkeypox virus. Monkeypox virus is part of the same family of viruses as smallpox. Monkeypox symptoms are similar to smallpox symptoms but milder, and monkeypox is rarely fatal. Symptoms of monkeypox can include fever, headache, muscle aches and backache, swollen lymph nodes, chills, and exhaustion; moreover, a rash that can look like pimples or blisters that appear on the face, inside the mouth, and on other parts of the body, like the hands, feet, chest, genitals, or anus. The rash goes through different stages before healing completely. The illness typically lasts 2-4 weeks. Sometimes, people get a rash first, followed by other symptoms, while others only experience a rash. While only 7 cases were reported in Montana, a negligible percentage of the national total, this is an example scenario for communicable disease spread that is possible nationally and in Montana.

Monkeypox spreads in different ways. The virus can spread from person-to-person through:

- Direct contact with the infectious rash, scabs, or body fluids
- Respiratory secretions during prolonged, face-to-face contact, or intimate physical contact, such as kissing, cuddling, or sex
- Touching items (such as clothing or linens) that previously touched the infectious rash or body fluids
- Pregnant people can spread the virus to their fetus through the placenta

It is also possible for people to get monkeypox from infected animals, either by being scratched or bitten by the animal or by preparing or eating meat or using products from an infected animal.

Moreover, monkeypox can spread from the time symptoms start until the rash has fully healed and a fresh layer of skin has formed. The illness typically lasts 2-4 weeks. People who do not have monkeypox symptoms cannot spread the virus to others. At this time, it is not known if monkeypox can spread through semen or vaginal fluids.

Monkeypox was discovered in 1958 when two outbreaks of a pox-like disease occurred in colonies of monkeys kept for research. Despite being named “monkeypox,” the source of the disease remains unknown. However, African rodents and non-human primates (like monkeys) might harbor the virus and infect people. The first human case of monkeypox was recorded in 1970. Before the 2022 outbreak, monkeypox had been reported in people in several Western and Western African countries. Previously, almost all monkeypox cases in people outside of Africa were linked to international travel to countries where the disease commonly occurs or through imported animals. These cases occurred on multiple continents.

As of October 2, 2022, there are 68,428 cases all over the world. There are 25,851 cases in the U.S. The State of Montana has reported six monkeypox cases. The World Health Organization (WHO) declared Monkeypox Spread a Global Health Emergency on July 23, 2022.

Hantavirus Pulmonary Syndrome (HPS)

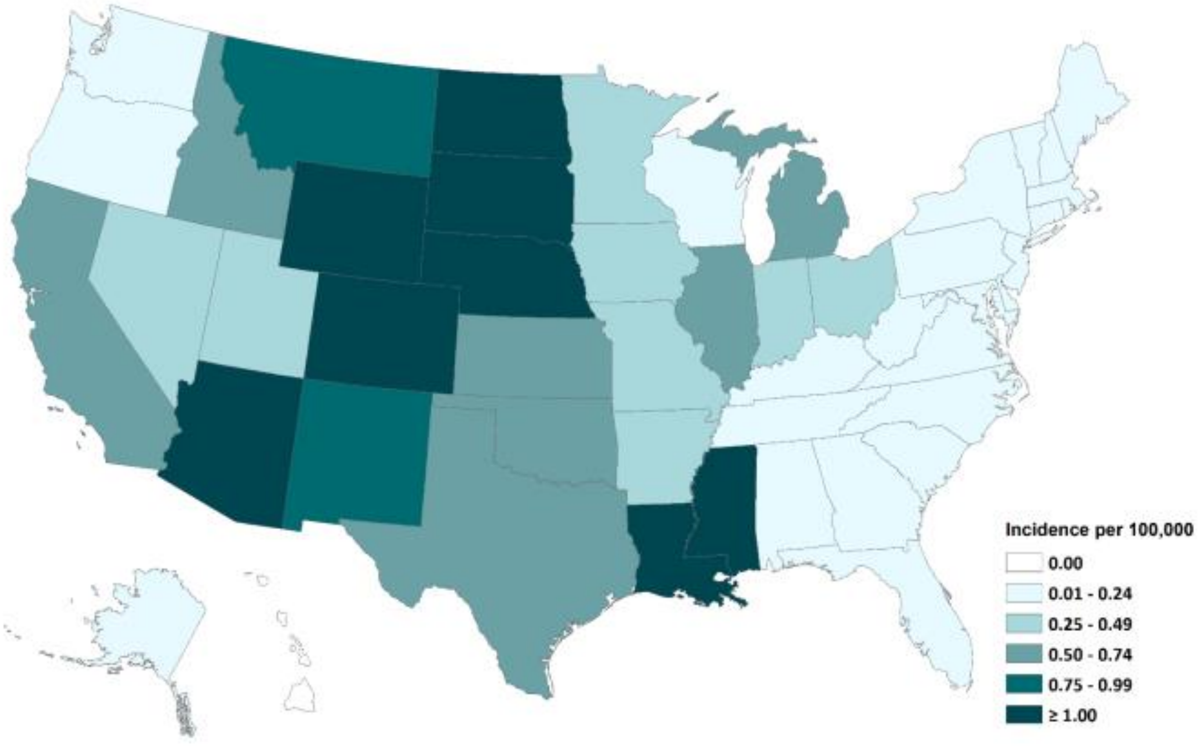
Moreover, according to the State of Montana’s Department of Public Health and Human Services (DPHHS), HPS is another communicable disease of concern to the State of Montana. HPS is an illness caused by a family of viruses called hantaviruses. HPS is a rare but often serious illness of the lungs. In Montana, the deer mouse is the reservoir for the hantavirus. The virus is found in the droppings, urine, and saliva of infected mice. The most common way that a person can get HPS is by breathing in the virus when it is aerosolized (stirred up into the air). People can also become infected after touching mouse droppings or nesting materials that contain the virus and then touching their eyes, nose, or mouth.

West Nile Virus

West Nile virus (WNV) is the leading cause of mosquito-borne disease in the continental United States. It is most commonly spread to people by the bite of an infected mosquito. Cases of WNV occur during mosquito season, which starts in the summer and continues through fall. There are no vaccines to prevent or medications to treat WNV in people. Fortunately, most people infected with WNV do not feel sick. About 1 in 5 people who are infected develop a fever and other symptoms. About 1 out of 150 infected people develop a serious, sometimes fatal, illness.

The following map from CDC shows the average annual incidence of West Nile virus neuroinvasive disease reported to CDC by state from 1999 to 2021. The state of Montana has a relatively higher average annual incidence when compared to other states in the US.

Figure 4-16 Average Annual Incidence of West Nile Virus by State 1999-2021



Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

4.2.3.2 Geographical Area Affected

The entire geographic area of the Montana Western Region is susceptible to the spread of infectious diseases. Disease spread usually occurs in areas where vulnerable populations are, and also in areas where people live and work in close quarters. Depending on the specifics of the illness and its spread, these areas include shelters, senior homes, schools, and places of business.

The Montana DPHHS has reported 311,000 cases of COVID-19 and 3,520 deaths as of October 2, 2022. The current COVID-19 pandemic has affected all the counties in the Western Region. Table 4-12 below shows the total cases and deaths specific to the Western Region. Data specific to tribes are included in the nearest Counties. Western Region comprises approximately 16% of the statewide total of cases and 20% of the statewide total of deaths. In general, it is likely that the more-populated areas municipal areas may be affected sooner and may experience higher infection rates. Some indirect consequences may be the diversion of health and medical resources that may be otherwise available.

Table 4-12 COVID-19 Cases and Deaths by County (as of July 22, 2022)

County	Cases	Cases Per Total Pop*.	Deaths
Beaverhead	2,365	25%	30
Broadwater	1,463	24%	23
Butte-Silver Bow	9,340	27%	135
Flathead	32,460	32%	295
Granite	628	19%	10
Jefferson	2,960	25%	25
Lake	7,709	25%	104
Lewis and Clark	20,707	30%	194
Lincoln	5,344	27%	91
Madison	2,251	26%	22
Meagher	547	30%	10
Mineral	1,261	29%	17
Park	4,910	30%	36
Powell	2,130	31%	30
Ravalli	7,935	18%	166
Sanders	2,357	20%	52
Sweet Grass	862	23%	13

Source: The New York Times *Population total is based on U.S. Census Bureau American Community Survey (ACS) 5-Year Estimates 2016-2020.

4.2.3.3 Past Occurrences

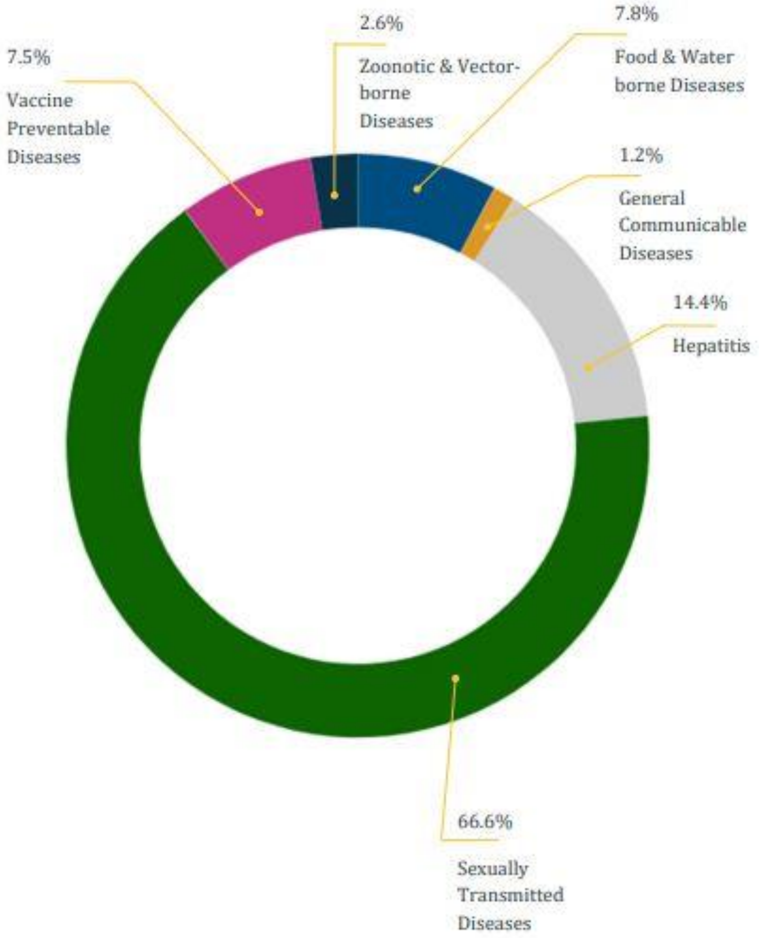
Since the early 1900s, five lethal pandemics have swept the globe:

- **1918-1919 Spanish Flu:** The Spanish Flu was the most severe pandemic in recent history. The number of deaths was estimated to be 50-100 million worldwide and 675,000 in the United States. Its primary victims were mostly young, healthy adults. At one point, more than 10% of the American workforce was bedridden.
- **1957-1958 Asian Flu:** The 1957 Asian Flu pandemic killed 1.1 million people worldwide, including about 70,000 people in the United States, mostly the elderly and chronically ill. Fortunately, the virus was quickly identified, and vaccine production began in May 1957.
- **1968-1969 H3N2 Hong Kong Flu:** The 1968 Hong Kong Flu pandemic killed one million people worldwide and approximately 100,000 people in the United States. Again, the elderly were more severely affected. This pandemic peaked during school holidays in December, limiting student-related infections, which may have kept the number of infections down. Also, people infected by the Asian Flu ten years earlier may have gained some resistance to the new virus.

- **2009-2010 H1N1 Swine Flu:** This influenza pandemic emerged from Mexico in early 2009 and was declared a public health emergency in the U.S. on April 26. By June, approximately 18,000 cases had been reported in the U.S. and the virus had spread to 74 countries. Most cases were fairly mild, with symptoms similar to the seasonal flu, but there were cases of severe disease requiring hospitalization and some deaths. On May 11, 2009, the Montana DPHHS reported the State's first confirmed case of swine flu. As of July 26, there were 122 reported cases. As of January 21, there were 801 confirmed cases of A/H1N1, and 18 confirmed deaths due to H1N1 flu.
- **2020-Ongoing COVID-19:** The COVID-19 or novel coronavirus was detected in December 2019 and was declared a pandemic in March 2020. As of October 2, 2022, over 614 million cases have been reported around the world with 6.5 million deaths, including almost 95 million cases and 1.05 million deaths in the U.S. Worldwide there have been more than 12.7 billion vaccine doses administered. The Montana DPHHS has reported 310,731 cases of COVID-19 and 3,520 deaths as of October 2, 2022. The response to the COVID-19 pandemic included numerous public health orders, including stay-home orders; massive testing and vaccination efforts; the establishment of alternate care sites to support the hospital system; and an unprecedented community-wide vaccination push. Moreover, Montana's news leader KTVQ noted on December 2021 that COVID-19 was the leading cause of death among Montana's Native Americans in 2020. A report released by the State's DPHHS points out that COVID-19 was responsible for 251 of the 1,022 total deaths among Montana's Native Americans in 2020. While Native Americans only make up around 7 percent of the State's population, they accounted for 32 percent of the deaths and 19 percent of cases in the State from March to October of 2020 (Schubert 2021).

Additionally, as shown in the 2019 Montana DPHHS Communicable Disease in Montana Annual Report 2019, sexually transmitted diseases rank the highest among all the reported communicable diseases, followed by Hepatitis, Food & Water Borne Diseases and Vaccine-Preventable Diseases, as shown in Figure 4-17 below:

Figure 4-17 Reported Communicable Diseases by Category, Montana, 2019



Source: Montana Department of Public Health and Human Services

The report also noted a sudden increase in the incidence of Hepatitis A, which has been linked to person-to-person outbreaks reported in more than 30 states, predominantly due to injection drug use and outbreaks among people experiencing homelessness. Moreover, the report also mentioned a continued increase in the incidence of gonorrhea. It is believed that the increase in reported cases is partially due to an increase in screening tests being performed all across the State, which suggests that gonorrhea has been underreported for many years.

In addition, the report shows that in the year 2019, the top five communicable diseases that have the highest case numbers are: Chlamydia (4,752), Gonorrhea (1,571), Hepatitis C, chronic (1,335), Pertussis (494), Campylobacteriosis (374). Influenza was not included in the stats.

4.2.3.4 Frequency/Likelihood of Occurrence

Although it is impossible to predict the next disease outbreak, there is recent history that shows these outbreaks are not uncommon and are likely to reoccur. Based on the five pandemics that have affected the United States in roughly the last 100 years, a pandemic occurs on average roughly every 20 years. In other words, there is a 5% probability that a pandemic that affects the entire United States will occur in any given year.

For the current COVID-19 pandemic, due to the virus's ability to mutate and infect potential hosts, the pandemic may extend for several years, and booster vaccines may be necessary to mitigate future outbreaks. In just the last couple of decades, the world has drastically increased points of transmissions through global travel and trade to levels unseen in human history – this may have an impact on the frequency of pandemics and the speed with which they spread in coming years.

4.2.3.5 Climate Change Considerations

As the earth's climate continues to warm, researchers predict wild animals will be forced to relocate their habitats — likely to regions with large human populations — dramatically increasing the risk of a viral jump to humans that could lead to the next pandemic. This link between climate change and viral transmission is described by an international research team led by scientists at Georgetown University and is published on April 28, 2022, in *Nature*. The scholars noted that the geographic range shifts due to climate change could cause species that carry viruses to encounter other mammals to share thousands of viruses. The viruses can then further be spread to humans. In addition, rising temperatures caused by climate change will impact bats, which account for the majority of novel viral sharing. Bats' ability to fly will allow them to travel long distances and share the most viruses. Altogether, the study suggests that climate change will become the biggest upstream risk factor for disease emergence — exceeding higher-profile issues like deforestation, wildlife trade and industrial agriculture. The authors say the solution is to pair wildlife disease surveillance with real-time studies of environmental change. ("New Study Finds Climate Change Could Spark The Next Pandemic – Georgetown University Medical Center" 2022)

4.2.3.6 Potential Magnitude and Severity

The magnitude of a disease outbreak or public health emergency will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. Pandemic influenza is more easily transmitted from person to person but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time.

Today, a much larger percentage of the world's population is clustered in cities, making them ideal breeding grounds for epidemics. Additionally, the explosive growth in air travel means a virus could spread around the globe within hours, quickly creating a pandemic. Under such conditions, there may be very little warning time. Most experts believe we will have just one to six months between the time that a dangerous new influenza strain is identified and the time that outbreaks begin to occur in the United States. Outbreaks are expected to occur simultaneously throughout much of the nation, preventing shifts in human and material resources that normally occur with other natural disasters. These and many other aspects make influenza pandemic unlike most other public health emergencies or community disasters. Pandemics typically last for several months to 1-2 years.

As seen with the ongoing COVID-19 pandemic, the rapid spread of the virus combined with the need for increased hospital and coroner resources, testing centers, first responders, and vaccination administration sites caused significant strain on the medical system and public health departments. Additionally, other public health-related triggers or commingled public health hazards (such as an outbreak of another pathogen) or even more contagious strains of COVID such as the recent Omicron, BA.5 and Delta B.1.617.2 variant can quickly lead to even more outbreaks.

The Pandemic Intervals Framework (PIF) is a six-phased approach to defining the progression of an influenza pandemic. This framework is used to guide influenza pandemic planning and provides recommendations for risk assessment, decision-making, and action. These intervals provide a common method to describe pandemic activities that can inform public health actions. The duration of each pandemic interval might vary depending on the characteristics of the virus and the public health response.

The six-phase approach was designed for the easy incorporation of recommendations into existing national and local preparedness and response plans. Phases 1 through 3 correlates with preparedness in the pre-pandemic interval, including capacity development and response planning activities, while Phases 4 through 6 signal the need for response and mitigation efforts during the pandemic interval.

Pre-Pandemic Interval

Phase 1 is the natural state in which influenza viruses circulate continuously among animals (primarily birds) but do not affect humans.

In **Phase 2** an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is thus considered a potential pandemic threat. Phase 2 involves cases of animal influenza that have circulated among domesticated or wild animals and have caused specific cases of infection among humans.

In **Phase 3** an animal or human-animal influenza virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. Limited transmission under these circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic. Phase 3 represents the mutation of the animal influenza virus in humans so that it can be transmitted to other humans under certain circumstances (usually very close contact between individuals). At this point, small clusters of infection have occurred.

Phase 4 is characterized by verified human-to-human transmission of the virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upward shift in the risk for a pandemic. Phase 4 involves community-wide outbreaks as the virus continues to mutate and become more easily transmitted between people (for example, transmission through the air)

Phase 5 is characterized by verified human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short. Phase 5 represents human-to-human transmission of the virus in at least two countries.

Phase 6, the pandemic phase, is characterized by community-level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. The designation of this phase will indicate that a global pandemic is underway. Phase 6 is the pandemic phase, characterized by community-level influenza outbreaks.

4.2.3.7 Vulnerability Assessment

People

Pandemics can affect large segments of the population for long periods. The number of hospitalizations and deaths will depend on the virulence of the virus. Risk groups cannot be predicted with certainty; the elderly, people with underlying medical conditions, and young children are usually at higher risk, but as discussed above this is not always true for all influenza strains. People without health coverage or access to good medical care are also likely to be more adversely affected. According to data collected from the ACS five-year estimates for 2016-2020, in the Western Region, the elderly (those over 65 years of age) make up 20.1% of the population; the young (those under five years of age) make up 5.2% of the population, and 14% of the Western Region's population had income in the past 12 months below poverty level. On the other hand, within the State of Montana, the elderly (those over 65 years of age) make up 18.7% of the population; the young (those under five years of age) make up 5.8% of the population, and 12.8% of the State's population had income in the past 12 months below poverty level. There is no significant difference in these vulnerable populations between the Western Region and the State. These populations are the most vulnerable to communicable diseases. Nevertheless, impacts, mortality rates, speed and type of spread are disease-specific, though certain illnesses could cause high infectivity and mortality rates.

As seen with the current COVID-19 pandemic statewide, according to the State's DPHHS, the most positive cases occurred in the 20-39 age group. Hospitalizations and deaths, however, happened more within the 60+ age groups.

Property

Communicable diseases would not have specific impacts on infrastructure or the built environment. Should infrastructure require human intervention to fulfill vital functions, these functions could be impaired by absenteeism, sick days and isolation, quarantine, and disease prophylaxis measures. As concerns about contamination increase, property may be quarantined or destroyed as a precaution against spreading illness. Additionally, traditional sheltering facilities including shelters for persons experiencing homelessness or facilities stood up to support displaced persons due to an evacuation or other reasons due to a simultaneous disaster occurring cannot be done in a congregate setting. This requires additional planning considerations or the use of facilities that allow for non-congregate shelter settings which may require approval of request to FEMA for non-congregate sheltering and may have an increased cost (such as the use of individual hotel rooms) as opposed to traditional congregate sheltering facilities.

Critical Facilities and Lifelines

The impacts of a communicable disease on critical infrastructure and lifelines would center on service disruption due to staff missing work; shortages in essential resources and supplies to perform services as seen with personal protective equipment (PPE) during the COVID-19 pandemic within Health and Medical Sector. While automated systems and services that allow for the physical distancing of staff from other persons may fare better through a communicable disease incident, due to the globalization of supply chains, services, and interdependency of most communities on robust staffing, all critical infrastructure sectors and lifelines would likely be affected in various ways.

Economy

A widespread communicable disease outbreak could have devastating impacts on Western Region's economy. The economic impacts fall under two categories – economic losses as a result of the disease, and economic losses to fight the disease. Economic impacts as a result of a disease include those costs associated with lost work and business interruption. Depending on the disease and the type and rate of spread, businesses could see a loss of consumer base as people self-isolate or avoid travel to the Western Region. This could last for a protracted amount of time, compounding economic loss. Economic costs are also associated with incident response. Two of the biggest areas of cost are public information efforts and mass prophylaxis.

According to an article published on November 15, 2018, by GlobeNewswire with the source from Integrated Benefits Institute, in a normal year, lost productivity due to illness costs U.S. employers an estimated $530 billion. During a pandemic, that figure would likely be considerably high and could trigger a recession or even a depression. According to an October 2020 report by the Journal of American Medical Association (JAMA) Network, the estimated cumulative financial costs of the COVID-19 pandemic related to the COVID-19 economic recession and compromised health (premature death, mental health, long-term health impairment) in the U.S. population was almost $16 trillion. As of July 29, 2021, the Montana Coronavirus Relief Fund has awarded over $819 million to businesses and nonprofits across the State to support economic recovery efforts.

Historic and Cultural Resources

As mentioned previously, communicable diseases would not have specific impacts on the built environment, which then include historic and cultural resources. However, historic, and cultural resources oftentimes are related to the tourism industry, while reduced tourism could lead to additional economic impacts.

Natural Resources

Impacts on natural resources are typically minimal. However, zoonotic diseases can spread from animals to humans, wreaking havoc on both populations. Examples of zoonotic diseases include avian flu, swine flu, tuberculosis, plague, and rabies.

Development Trends Related to Hazards and Risk

Population growth and development contribute to pandemic exposure. Future development in the Western Region has the potential to change how infectious diseases spread through the community and impact human health in both the short and long term. New development may increase the number of people and facilities exposed to public health hazards and greater population concentrations (often found in special needs facilities and businesses) put more people at risk. During a disease outbreak, those in the immediate isolation area would have little to no warning, whereas the population further away in the dispersion path may have some time to prepare and mitigate against disease depending on the hazard, its transmission, and public notification.

4.2.3.8 Risk Summary

In summary, the communicable disease hazard is considered to be overall **Medium** significance for the Region. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

- Pandemics affecting the U.S. occur roughly once every 20 years but cannot be reliably predicted.
- Effects on people will vary, while the elderly, people with underlying medical conditions, and young children are usually at higher risk.
- Effects on property are typically minimal, although quarantines could result in short-term closures.
- Effects on economy: lost productivity due to illness and potential business closures could potentially have severe economic impacts. Social distancing requirements and fear of public gatherings could significantly reduce in-person commerce.
- Effects on critical facilities and infrastructure: community lifelines, such as healthcare facilities, like hospitals will be impacted and may be overwhelmed and have difficulty maintaining operations due to bed availability, medical staffing shortages, and lack of PPE and other supplies.
- The hazard is considered **Medium** significance across the Western Region.
- Unique jurisdictional vulnerability: As mentioned above, COVID-19 was the leading cause of death in Montana’s Native American tribes; it could be inferred that tribes are more vulnerable to communicable diseases.
- Ongoing mitigation activities should focus on disease prevention, especially during flu season. This includes, but is not limited to, pre-season community outreach campaigns to educate the public about risks and available support; establishing convenient vaccination centers; reaching out to vulnerable populations and caregivers; and issuing advisories and warnings.
- Related Hazards: Human Conflict.

Table 4-13 Risk Summary Table: Communicable Disease

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	NA	None
Beaverhead	Medium	Dillon, Lima	None
Broadwater	Medium	Townsend	None
Butte-Silver Bow	Medium	NA	None
CSKT	Medium	NA	None
Flathead	Medium	Columbia Falls, Kalispell, Whitefish	None
Granite	Medium	Drummond, Philipsburg	None
Jefferson	Medium	Boulder, Whitehall	None
Lake	Medium	Polson, Ronan, St. Ignatius	None
Lewis and Clark	Medium	East Helena, Helena	None
Lincoln	Medium	Eureka, Libby, Rexford, Troy	None
Madison	Medium	Ennis, Sheridan, Twin Bridges, Virginia City	None
Meagher	Medium	White Sulphur Springs	None
Mineral	Medium	Alberton, Superior	None
Park	Medium	Clyde Park, Livingston	None
Powell	Medium	Deer Lodge	None
Ravalli	Medium	Darby, Hamilton, Pinesdale, Stevensville	None
Sanders	Medium	Hot Springs, Plains, Thompson Falls	None
Sweet Grass	Medium	Big Timber	None

4.2.4 Cyber-Attack

4.2.4.1 Hazard/Problem Description

The Merriam-Webster dictionary defines cyber-attacks as "an attempt to gain illegal access to a computer or computer system to cause damage or harm." Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks. Cyber threats can take many forms, including:

- **Phishing attacks:** Phishing attacks are fraudulent communications that appear to come from legitimate sources. Phishing attacks typically come through email but may come through text messages as well. Phishing may also be considered a type of social engineering meant to exploit employees into paying fake invoices, providing passwords, or sending sensitive information.
- **Malware attacks:** Malware is malicious code that may infect a computer system. Malware typically gains a foothold when a user visits an unsafe site, downloads untrusted software, or may be downloaded in conjunction with a phishing attack. Malware can remain undetected for years and spread across an entire network.
- **Ransomware:** Ransomware typically blocks access to a jurisdiction's/agency's/ business' data by encrypting it. Perpetrators will ask for a ransom to provide the security key and decrypt the data, although many ransomware victims never get their data back even after paying the ransom.
- **Distributed Denial of Service (DdoS) attack**: Perhaps the most common type of cyber-attack, a DdoS attack seeks to overwhelm a network and causes it to either be inaccessible or shut down. A DdoS typically uses other infected systems and internet-connected devices to "request" information from a specific network or server that is not configured or powerful enough to handle the traffic.
- **Data breach**: Hackers gaining access to large amounts of personal, sensitive, or confidential information has become increasingly common in recent years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.
- **Critical Infrastructure/SCADA System attack:** There have been recent critical infrastructure Supervisory Control and Data Acquisition (SCADA) system attacks aimed at taking down lifelines such as power plants and wastewater facilities. These attacks typically combine a form of phishing, malware, or other social engineering mechanisms to gain access to the system.

Cyber-attacks are rapidly increasing in the United States. The FBI Internet Crime Complaint Center (IC3) was developed to provide the public with a direct way to report cybercrimes to the FBI. In 2021, the FBI Internet Crime Report reported a record number of cyber-attacks, with a 7% increase from 2020. The events reported to the FBI are used to track the trends and threats from cyber criminals to combat cyber threats and protect U.S. citizens, businesses, and government from future attacks.

4.2.4.2 Geographical Area Affected

Cyber-attacks can and have occurred in every location regardless of geography, demographics, and security posture. Anyone with information online is vulnerable to a cyber-attack. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the State can still impact people, businesses, and institutions within Western Region. All servers in the Western Region are potentially vulnerable to cyber-attacks. Businesses, industry, and even individuals are also susceptible to cyber-attacks. Therefore, the geographic extent of cyber-attack is **Significant**.

4.2.4.3 Past Occurrences

According to the FBI's 2021 Internet Crime Report, the FBI received 2.76 million complaints with $18.7 billion in losses over the last five years due to cyber-attacks. The Crime Report also noted a trend of increasing cyber-crime complaints and losses each year. Nationwide losses in 2021 alone exceeded $6.9 billion, a 392% increase since 2017. According to the 2021 Report, Montana ranked 48/57 among U.S. territories in the total number of victims, with 1,188 victims of cyber-crime, and 49th in total victim losses, with $10,107,283 in total losses,

Data on past cyber-attacks impacting Montana was gathered from the Privacy Rights Clearinghouse. The Privacy Rights Clearinghouse, a non-profit organization based in San Diego, maintains a timeline of 9,741 data breaches resulting from computer hacking incidents in the United States from 2005-2021. The database lists 35 data breaches against systems located in Montana totaling almost 1.5 million impacted records; it is difficult to know how many of those affected residents in the Montana Western Region. Attacks happening outside of the State can also impact local businesses, personal identifiable information, and credit card information. Table 4-14 shows several of the most significant cyber-attacks in Montana in recent years. The data aims to provide a general understanding of the impacts of cyber-attacks by compiling an up-to-date list of incidents but is limited by the availability of data: "This is an incomplete look at the true scope of the problem due in part to varying state laws."

Table 4-14 Major Cyber-Attacks Impacting Montana (10,000+ Records), 2005-2021

Date Reported	Target	City	Organization Type	Total Records	Type of Attack
7/7/2014	Montana Department of Public Health & Human Services	-	Healthcare	1,062,509	Hacked by an Outside Party or Infected by Malware
1/30/2008	Davidson Companies	Great Falls	Business	226,000	Hacked by an Outside Party or Infected by Malware
3/11/2011	OrthoMontana	Billings	Healthcare	37,000	Portable Device (lost, discarded or stolen laptop, PDA, smartphone, memory stick, CDs, hard drive, data tape, etc.)
1/15/2016	New West Health Services dba New West Medicare	Kalispell	Healthcare	28,209	Portable Device (lost, discarded or stolen laptop, PDA, smartphone, memory stick, CDs, hard drive, data tape, etc.)
4/14/2017	Western Health Screening	-	Healthcare	15,326	PHYS

Source: The Privacy Rights Clearinghouse

In total, the Privacy Rights Clearinghouse has reported 35 attacks in Montana since 2005 with a total of 1,471,889 records. Of these records lost in Montana, a majority were from healthcare organizations. It is difficult to know how many of these incidents affected residents in the Montana Western Region.

The Montana Department of Agriculture temporarily took the USAHERDS web-based software offline in the year 2021 to allow the application's developer to beef up security following a suspected Chinese state-sponsored cyber-attack. USAHERDS is used to track livestock by at least 18 US states. The suspected attacker, APT41, had carried out a hacking campaign that comprised the networks of at least six US state governments (Power 2022).

Logan Health Medical Center in Kalispell, Montana suffered a hacking incident that impacted 213,543 individuals, according to the Maine Attorney General's Office. Logan Health discovered suspicious network activity on November 22, 2021, and later found evidence of unauthorized access to one file server containing information about patients, employees, and business associates (McKeon 2022).

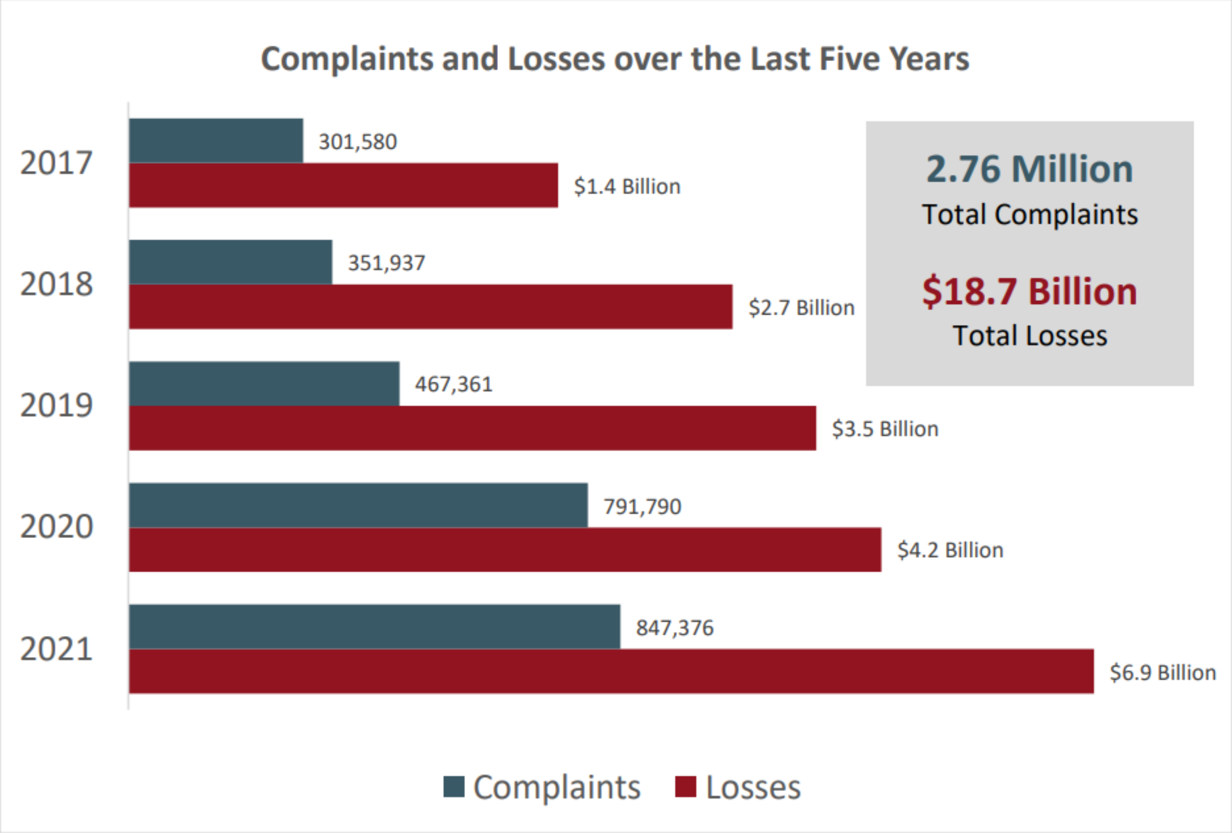
In February 2020, it is reported that Ryuk ransomware hacked the computer system of the Havre Public Schools. Despite the major scare, it was eventually concluded that the hackers did not gain access to student and employee information (Dragu 2020).

On April 3, 2015, Western Montana Clinic notified almost 7,000 patients of a payment data hack. The hacker bypassed the Clinic website's security measures and obtained access to the demographic and credit card information of 6,994 patients who paid their bill(s) via the link on the Clinic's website. The information available to the hacker included patient names, addresses, telephone numbers, email addresses, date(s), and amount(s) of credit card transaction(s), and the last four (4) digits of patients' credit card numbers. In addition, approximately 44 patients' full credit card information was compromised. The Clinic took steps to mitigate any further harm to patients from this security incident ("Western Montana Clinic Notifies Almost 7,000 Patients of Payment Data Hack" 2015).

4.2.4.4 Frequency/Likelihood of Occurrence

Small-scale cyber-attacks such as DdoS attacks occur daily, but most have negligible impacts at the local or regional level. Data breaches are also extremely common, but again most have only minor impacts on government services. Additionally, the FBI Internet Crime Report 2021 found that there is a trend of increasing cyber-attacks over the past 5 years. These trends are shown in Figure 4-18.

Figure 4-18 Trends of the Frequency of Cyber-Attacks, 2017-2021



Source: The FBI Internet Crime Report 2021

Perhaps of greatest concern to the Western Region are ransomware attacks, which are becoming increasingly common. It is difficult to calculate the odds of the Western Region or one of its jurisdictions being hit with a successful ransomware attack in any given year, but it is likely to be attacked in the coming years.

The possibility of a larger disruption affecting systems within the Region is a constant threat, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Major attacks specifically targeting systems or infrastructure in the Western Region cannot be ruled out. Therefore, the probability of future cyber-attack is **Occasional**.

4.2.4.5 Climate Change Considerations

Climate change is not projected to have an impact on the threat, vulnerability, and consequences of a cyber-attack.

4.2.4.6 Potential Magnitude and Severity

There is no universally accepted scale to explain the severity of cyber-attacks. The strength of a DdoS attack is often explained in terms of a data transmission rate. One of the largest DdoS disruptions ever, known as the Dyn Attack which occurred on October 21, 2016, peaked at 1.2 terabytes per second and impacted some of the internet's most popular sites, including Amazon, Netflix, PayPal, Twitter, and several news organizations.

Data breaches are often described in terms of the number of records or identities exposed. The largest data breach ever reported occurred in August 2013, when hackers gained access to all three billion Yahoo accounts. The hacking incidents associated with Montana in the Privacy Rights Clearinghouse database are of a smaller scale, ranging from 201 records to approximately 1.06 million, along with several cases in which an indeterminate number of records may have been stolen.

Ransomware attacks are typically described in terms of the amount of ransom requested, or the amount of time and money spent to recover from the attack. One report from cybersecurity firm Emsisoft estimates the average successful ransomware attack costs $81 million and can take 287 days to recover from. Therefore, the potential magnitude and severity of cyber-attack is **Critical**.

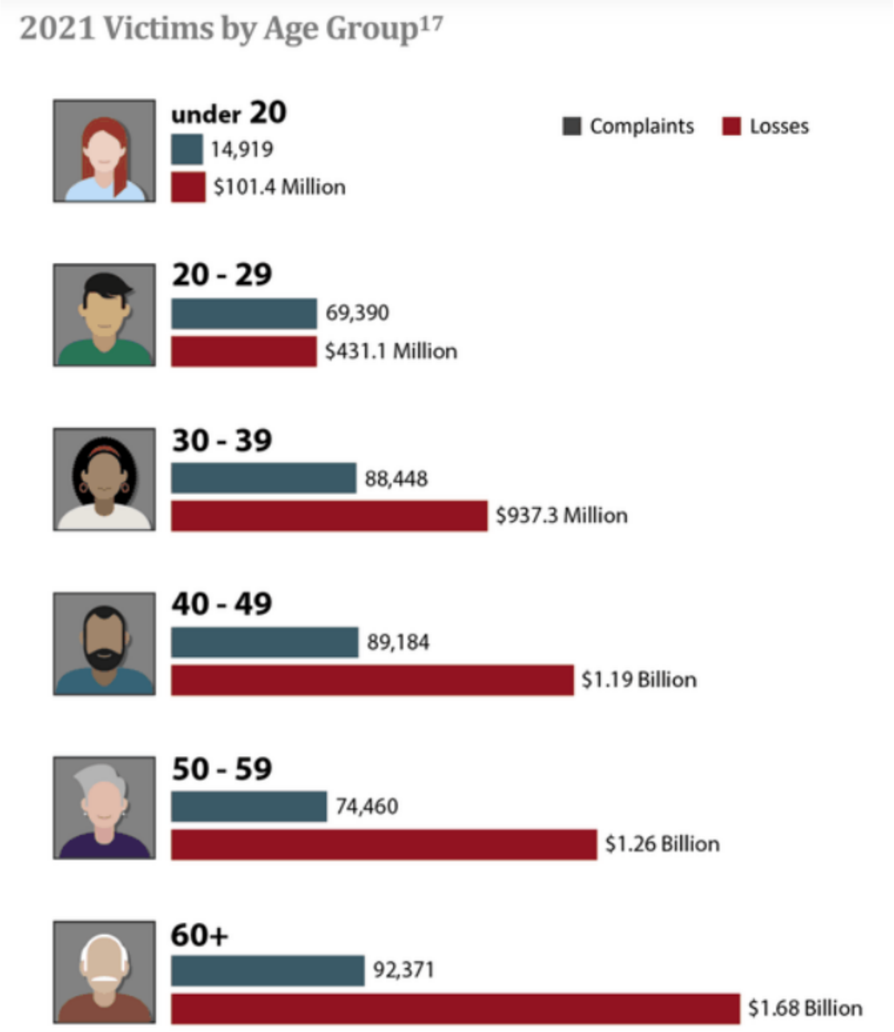
4.2.4.7 Vulnerability Assessment

People

Injuries or fatalities from cyber-attacks would generally only be possible from a major cyber-terrorist attack against critical infrastructure. More likely impacts on the public are financial losses and an inability to access systems such as public websites and permitting sites. Indirect impacts could include interruptions to traffic control systems or other infrastructure.

The FBI Internet Crime Reports on the victims of cyber-attack by age group. While the number of cyber-attack complaints is comparable across age groups, the losses increase significantly as age group increases, with individuals 60 years and older experiencing the greatest losses. This is likely due to seniors being less aware of cyberthreats, lack of the tools to identify cyberthreats, and "Grandparent Scams", which is a cyber-attack where criminals impersonate a loved one in need, such as a grandchild, and ask for money. In the Western Region, 37.6% of the population was reported to be 60+ in 2020, according to the U.S. Census. Figure 4-19 displays the breakdown of victims by age group in 2021.

Figure 4-19 Victims by Age Group in 2021



Source: The FBI Internet Crime Report 2021

Property

Most cyber-attacks affect only data and computer systems and have minimal impact on the general property. However, sophisticated attacks have occurred against the SCADA systems of critical infrastructure, which could potentially result in system failures on a scale equal to natural disasters. Facilities and infrastructure such as the electrical grid could become unusable. A cyber-attack took down the power grid in Ukraine in 2015, leaving over 230,000 people without power. A ransomware attack on the Colonia Pipeline in 2021 caused temporary gas shortages on the East Coast. The 2003 Northeast Blackout, while not the result of a cyber-attack, caused 11 deaths and an estimated $6 billion in economic loss.

Critical Facilities and Lifelines

An article posted on July 31, 2022, by government technology mentions that despite the lack of major headline-grabbing cyber-attacks against U.S. critical infrastructure so far in 2022, our global cyber battles continue to increase. Worldwide cyber actions are becoming less covert. Besides, according to IBM's 2022 annual Cost of a Data Breach Report, almost 80 percent of critical infrastructure organizations studied do not adopt zero-trust strategies, seeing average breach costs rise to $5.4 million – a $1.17 million increase compared to those that do. All while 28 percent of breaches amongst these organizations were ransomware or destructive attacks (Lohrmann 2022).

Cyber-attacks can interfere with emergency response communications, access to mobile data terminals, and access to critical pre-plans and response documents. According to the Cyber & Infrastructure Security Agency (CISA), cyber risks to 9-1-1 systems can have "severe impacts, including loss of life or property; job disruption for affected network users; and financial costs for the misuse of data and subsequent resolution." CISA also compiled a recent list of attacks on 9-1-1 systems including a DdoS in Arizona, unauthorized access with stolen credentials in Canada, a network outage in New York, and a ransomware attack in Baltimore.

Moreover, the delivery of services can be impacted since governments rely to a great extent on the electronic delivery of services. Most agencies rely on server backups, electronic backups, and remote options for Continuity of Operations/Continuity of Government. Access to documents on the network, OneDrive access, and other operations that require collaboration across the Western Region will be significantly impacted.

In addition, public confidence in the government will likely suffer if systems such as permitting, DMV, voting, or public websites are down for a prolonged amount of time. An attack could raise questions regarding the security of using electronic systems for government services.

Economy

Data breaches and subsequent identity thefts can have huge impacts on the public. The FBI Internet Crime Report 2021 reported losses in Montana due to cyber-attacks totaled $10,107,283 in 2021 alone.

Economic impacts from a cyber-attack can be debilitating. The cyber-attack in 2018 that took down the City of Atlanta cost at least $2.5 million in contractor costs and an estimated $9.5 million additional funds to bring everything back online. The attack in Atlanta took more than a third of the 424 software programs offline and recovery lasted more than 6 months. The 2018 cyber-attack on the Colorado Department of Transportation (CDOT) cost an estimated $1.5 million. None of these statistics consider the economic losses to businesses and ongoing IT configuration to mitigate from a future cyber-attack.

Additionally, a 2016 study by Kaspersky Lab found that roughly one in five ransomware victims who pay their attackers never recover their data. A 2017 study found ransomware payments over a two-year period totaled more than $16 million. Even if a victim is perfectly prepared with full offline data backups, recovery from a sophisticated ransomware attack typically costs far more than the demanded ransom.

Historic and Cultural Resources

Most cyber incidents have little to no impact on historic, cultural, or natural resources. A major cyber terrorism attack could potentially impact the environment by triggering a release of hazardous materials, or by causing an accident involving hazardous materials by disrupting traffic control devices.

Natural Resources

Most cyber-attacks would have a limited impact on natural resources. There are cases, such as a cyber-attack on a hydroelectric dam, that could result in catastrophic consequences to natural and human-built environments in the case of a flood. If a cyber-attack occurred on several upstream dams and released significant amounts of water downstream, the additional pressure put on downstream dams could fail, resulting in massive flood events. This would not only jeopardize the energy system that relies on these dams but also cause significant damage to the natural environment.

Development Trends Related to Hazards and Risk

Changes in development have no impact on the threat, vulnerability, and consequences of a cyber-attack. Cyber-attacks can and have targeted small and large jurisdictions, multi-billion-dollar companies, small mom-and-pop shops, and individual citizens. The decentralized nature of the internet and data centers means that the cyber threat is shared by all, regardless of new construction and changes in development.

4.2.4.8 Risk Summary

In summary, the cyber-attack hazard is considered to be overall **Medium** significance for the Region. Variations in risk by jurisdiction are summarized in the table below, as well as key issues from the vulnerability assessment.

- Overall, cyber-attacks are rated as a **Medium** significance in the planning area
- Cyber-attacks can occur anywhere and on any computer network, therefore, this hazard is rated as **Significant** location
- There is an increasing trend in the number of cyber-attacks in the U.S. each year, therefore, the frequency of cyber-attack is rated as **Likely**
- Cyber-attacks can result in significant economic losses, interruptions of critical facilities and services, and confidential data leaks; therefore, magnitude is ranked as **Critical**
- People ages 60+ are the most likely age group to experience the greatest monetary losses, although anyone of any age can be a victim to a cyber-attack
- Small businesses worth less than $10 million and local governments are increasingly becoming targets for cyber-attack, with criminals assuming these smaller organizations will lack the resources to prevent an attack
- Critical infrastructure, such as the energy grid and first responder communication, is vulnerable to cyber-attack and disruption
- Significant economic losses can result from cyber-attacks if the attackers ask for ransom
- Jurisdictions with a significantly large population and advanced infrastructure, such as Butte or Helena, are most likely to experience cyber-attacks, but rural areas can also be targets.

Table 4-15 Risk Summary Table: Cyber-Attack

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	NA	None
Beaverhead	Medium	Dillon, Lima	None
Broadwater	Medium	Townsend	None
Butte-Silver Bow	Medium	NA	None
CSKT	Medium	NA	None
Flathead	Medium	Columbia Falls, Kalispell, Whitefish	None
Granite	Medium	Drummond, Philipsburg	None
Jefferson	Medium	Boulder, Whitehall	None
Lake	Medium	Polson, Ronan, St. Ignatius	None
Lewis and Clark	Medium	East Helena, Helena	None
Lincoln	Medium	Eureka, Libby, Rexford, Troy	None
Madison	Medium	Ennis, Sheridan, Twin Bridges, Virginia City	None
Meagher	Medium	White Sulphur Springs	None
Mineral	Medium	Alberton, Superior	None
Park	Medium	Clyde Park, Livingston	None
Powell	Medium	Deer Lodge	None
Ravalli	Medium	Darby, Hamilton, Pinesdale, Stevensville	None
Sanders	Medium	Hot Springs, Plains, Thompson Falls	None
Sweet Grass	Medium	Big Timber	None

4.2.5 Dam Failure

4.2.5.1 Hazard/Problem Description

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are constructed for a variety of uses, including flood protection, power, agriculture/irrigation, water supply, and recreation. 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. Depending on local topography, even a small dam may have a reservoir containing many acre-feet of water. Dams serve many purposes, including irrigation control, providing recreation areas, electrical power generation, maintaining water levels, and flood control.

Dam failures and releases from dams during heavy rain events can result in downstream flooding. Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. Two factors that influence the potential severity of a full or partial dam failure are the amount of water impounded and the density, type, and value of downstream development and infrastructure. Dams can fail at any time of year, but the results are typically most catastrophic when the dams fill or overtop during winter or spring rain/snowmelt events.

A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety depend on the warning time and the resources available to notify and evacuate the public and could include major loss of life and potentially catastrophic damage to roads, bridges, and homes. Associated water quality and health concerns could also be an issue.

Dam failures are often the result of prolonged rainfall and overtopping, but can happen in any conditions due to erosion, piping, structural deficiencies, lack of maintenance and repair, or the gradual weakening of the dam over time. Other factors that may contribute to dam failure include earthquakes, landslides, improper operation, rodent activity, vandalism, or terrorism.

According to FEMA, dams are classified in three categories that identify the potential hazard to life and property:

- **High hazard** – Dams where failure/mis-operation will probably cause loss of human life.
- **Significant hazard** – Dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- **Low hazard** – Dams where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property.

Dam inundation can also occur from non-failure events or incidents such as when outlet releases increase during periods of heavy rains or high inflows. Controlled releases to allow water to escape when a reservoir is overfilling can help prevent future overtopping or failure. When outlet releases are not enough, spillways are designed to allow excess water to exit the reservoir and prevent overtopping. This can protect the dam but result in flooding downstream. Dam safety incidents are defined as situations at dams that require an immediate response by dam safety engineers.

High, significant, and low hazard dams located throughout Montana’s Western Region are summarized by county in Table 4-16 based on information provided by the Montana Department of Natural Resources and Conservation (DNRC) Dam Safety Program. Lewis and Clark, Madison, Powell, Ravalli, and Lake Counties have the highest numbers of high hazard potential dams.

Table 4-16 Western Region Dam Summary Table

County	High Hazard Dams	Significant Hazard Dams	Low Hazard Dams	Total	Percentage of High Hazard Dams with Emergency Action Plans
Beaverhead	7	4	32	43	43%
Broadwater	1	0	4	5	100%
Butte-Silver Bow	3	2	5	10	100%
Flathead	8	1	3	12	88%
Gallatin	4	0	5	9	50%
Granite	2	1	8	11	100%
Jefferson	7	0	4	11	71%
Lake	9	3	5	17	100%
Lewis and Clark	16	2	17	35	94%
Lincoln	6	4	9	19	100%
Madison	11	6	13	30	64%
Meagher	8	5	36	49	100%
Missoula	5	9	7	21	100%
Park	3	4	16	23	100%
Powell	9	3	25	37	89%
Ravalli	9	1	11	21	56%
Sanders	3	0	8	11	100%
Sweet Grass	4	3	11	18	100%
Total	**115**	**48**	**219**	**382**	**86%**

Source: Montana Department of Natural Resources and Conservation (DNRC) Dam Safety Program, Montana State Library, NID, HIFLD 2022, Montana DES, NBI

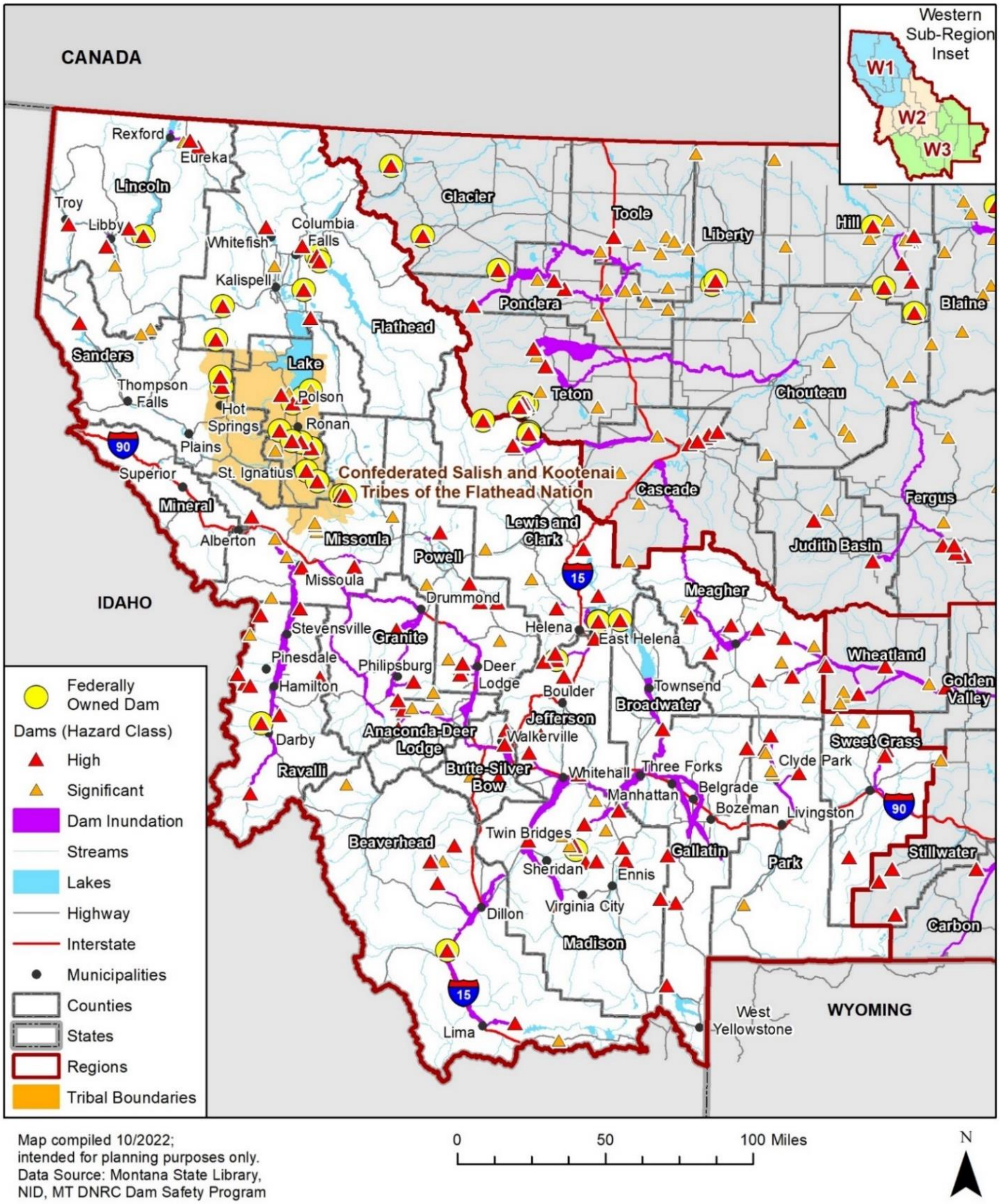
NOTE: There is one low hazard dam which is directly on the Madison/Silver Bow County line, and it is counted in the totals of both counties here

4.2.5.2 Geographical Area Affected

The geographical area affected by dam failure is potentially **significant**. According to the National Inventory of Dams, there are a total of 393 dams throughout the counties of the Western Region. 118 of these dams are high hazard, and 51 are significant hazard dams, with the remainder being low hazard dams. 102 of the high hazard dams in the Western Region have Emergency Action Plans (EAP) on file. High and significant hazard dams located in and adjacent to the Region are shown on the map below. In some cases, there is inundation mapping, commonly limited to privately owned high hazard dams, based on data from the MT Department of Natural Resources and Conservation (DNRC). Additionally, there are inundation zones for dams owned by the Bureau of Indian Affairs, used with permission. Other federally owned dams are highlighted in yellow and do not have publicly available inundation mapping. A lack of mapped inundation areas prevents identifying assets likely to be affected by dam failure but does not indicate the absence of risk.

At least two opportunities exist to address the limitation of missing dam inundation area delineations. First, future plans will renew requests for these delineations. This approach can be effective and resulted in BIA providing dam inundation areas for this HMP update. Second, dam inundation areas that were not provided for this HMP update typically exist in hard-copy form within EAPs for HHPDs. The opportunity is for local managers to access the EAP, evaluate hard copies of the missing inundation areas, and adjust mitigation accordingly.

Figure 4-20 Western Region Dams



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Montana State Library,
NID, MT DNRC Dam Safety Program

Dam inundation maps are frequently treated as sensitive documents due to concerns about causing public alarm, particularly in regions prone to flooding. There is also potential that these maps may be misused by individuals representing realty or insurance interests. Potential exists for maps to be exploited for malicious purposes, such as terror attacks. Therefore, the availability of these maps to the public remains limited due to a combination of security concerns, legal considerations, and the potential for misuse or misinterpretation.

4.2.5.3 Past Occurrences

Dam failure floods in Montana have primarily been associated with riverine and flash flooding. According to the 2023 Montana State Hazard Mitigation Plan and the Montana Department of Natural Resources and Conservation, aging infrastructure is largely to blame for a number of failed dams in Montana. There have been numerous small failures primarily related to deterioration of corrugated metal pipe outlet works, which causes slow release of reservoir contents along the outside of the outlet pipe, with minimal downstream property damage but serious damage to the structure. Dams with potential for loss of life downstream are subject to stringent permitting, inspection, operation, and maintenance requirements. Deficiencies and problems are identified in advance and actions taken to mitigate the chance of the deficiency leading to failure. If a deficiency cannot be immediately addressed due to lack of data or lack of dam owner resources, risk reduction measures are put in place.

There have been two instances of dam failure flooding in the Western Region, both in Lewis and Clark County. The Hauser Dam failed on 04/14/1908 and the Mike Horse Dam failed on 01/01/1975. The 1908 failure of the Hauser Dam was a result of the dam not being anchored to bedrock. The 70-foot-high steel dam collapsed at 2:45 pm of that day and had only been operational for a year at that point. A new concrete anchored dam was built at the site in 1911.

The Mike Horse Dam failure in 1975 occurred when heavy rains caused high creek waters and a partial failure of the dam. This failure caused erosion and contaminated wastewater to be deposited into Beartrap Creek and Upper Blackfoot River. Today Mike Horse Dam is one of Montana’s most prominent environmental cleanup sites.

4.2.5.4 Frequency/Likelihood of Occurrence

Dam failures in the United States typically occur in one of four ways:

- Dam overtopping occurs when the water level behind the dam exceeds the top of the dam. Overtopping accounts for 34% of all dam failures, and can occur due to inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors.
- Foundation defects due to differential settlement, slides, slope instability, uplift pressures, and foundation seepage can also cause dam failure. These account for 30% of all dam failures.
- Internal erosion of piping of an earth dam takes place when water that seeps through the dam carries soil particles away from the embankment, filters, drains, foundation, or abutments of the dam. Failure due to piping and seepage accounts for 20% of all failures.
- Failure due to problems with conduits and valves, typically caused by the piping of embankment material into conduits through joints or cracks, constitutes 10% of all failures.

The remaining 6% of U.S. dam failures are due to miscellaneous causes. Many dam failures in the United States have been secondary results of other hazard events, notably floods and other dam failures upstream, earthquakes, landslides, equipment malfunction, structural damage, foundation failures, and sabotage.

Failure due to poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable through a program of regular inspections. According to the 2023 State of Montana Multi-Hazard Mitigation Plan and the 2023 National Inventory of Dams, there are 18 high hazard potential dams in the Western Region currently rated as being in poor condition (Table 4-17). County-specific annexes contain additional information on these dams. MTDES and the participating jurisdictions will continue to monitor dam conditions and may amend this plan if additional high hazard potential dams are assessed as being in poor condition.

Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

Table 4-17 Poor Condition HHPDs in the Western Region

NID_ID	County	Dam Name	Nearest city - miles	Purpose	Built	EAP last revised
MT03716	Gallatin	Kistner Hardy Dam	Willsall - 9	Fire Protection, Stock or Small Fish Pond	1945	Unlisted
MT01155	Granite	Lower Willow Creek Dam	Hall - 6	Irrigation, Recreation, Flood Risk Reduction	1962	4/5/2022
MT00865	Lewis and Clark	Three Mile Reservoir (L.&C.)	Helena Valley - 7	Irrigation	1926	10/18/2018
MT03756	Lincoln	Glen Lake	Eureka - 8	Irrigation	1950	8/1/2019
MT01470	Lincoln	Kootenai Devel. Impoundment Dam	Libby - 6	Other	1980	10/8/2020
MT01273	Madison	Jackson (Madison)	Norris - 5	Irrigation	1959	None
MT00022	Madison	Willow Creek Dam	Willow Creek - 6	Irrigation	1938	1/3/2022
MT00005	Madison	Cataract Creek Dam	Pony - 2	Irrigation	1959	6/14/2021
MT01596	Meagher	Newlan Creek Dam	Ulm - 70	Irrigation	1977	9/1/2021
MT00334	Park	Jordan Dam	Wilsall - 7	Irrigation	1961	Unlisted
MT00043	Powell	Powell	Deer Lodge - 9	Irrigation	1981	1/4/2022
MT03858	Ravalli	Little Sleeping Child Creek Dam	Hamilton - 0	Irrigation, Recreation	1927	1/4/2022
MT00019	Ravalli	West Fork Bitterroot (Painted Rocks)	Darby - 30	Irrigation	1940	1/3/2022
MT01467	Silver Bow	Moulton Creek Dam #1	Butte - 7	Water Supply	1907	9/21/2021
MT00374	Silver Bow	Basin Creek Dam #1	Butte - 10	Water Supply	1897	1/16/2020
MT03267	Sweet Grass	Upper Glasston North Dam	Greycliff - 29	Irrigation	1912	11/30/2020
MT00380	Sweet Grass	Upper Glasston West Dam	Greycliff - 29	Irrigation	1912	11/30/2020
MT00378	Sweet Grass	Lower Glasston Dam	Greycliff - 26	Irrigation	1912	11/30/2020

Source: NID

The probability of a catastrophic dam failure is **unlikely** but still possible, especially in the case of poor condition dams. All areas within inundation zones of dams are at risk to dam failures. Damages and the chances for causing cascading failures in other dams downstream increase proportionally to the dam hazard rating of low, significant, or high.

4.2.5.5 Climate Change Considerations

Changes in rainfall, runoff, and snowpack conditions may each have significant impacts on water resources, including dams. As of this HMP update it is not clear if climate change will affect dam hazards negatively, but some level of caution is warranted. Dam safety is a high priority in Montana and the state has made a considerable investment developing laws and rules for the design, construction, and maintenance of dams to ensure dam safety. The state has a staffed dam safety program that conducts a sophisticated inspection program. However, dam failures have happened when events occurred that were unforeseen when the structures were designed and built.

With regard to climate change, a fundamental concern is that future conditions will be different from past conditions used to develop design parameters for existing dams. Extreme weather events have occurred throughout history, a pattern that seems to be accelerating as climate change progresses. Further complicating matters, many climate change impacts are indirect and difficult or impossible to predict. The 2021 Montana Climate Change and Human Health report considers climate "surprises" to be the third greatest concern with climate change impacts to human health.

Cascading effects of wildfire are one potential source of climate change "surprise" that is especially relevant to dam safety. Wildfire scars can alter watershed hydrology, causing extreme, unprecedented runoff that causes flash flooding and often causes debris flows that can impact nearby dam facilities. The concern in this case is that a future wildfire regime could leave unprecedented fire scars. If an extreme precipitation event occurred on such a fire scar, unprecedented runoff could result that exceeds the design parameters of a nearby dam and is sufficient to cause a dam failure. In a worst case, a failure would cause a reservoir to release floodwaters, but debris flows are also capable of filling reservoirs with sediment and necessitate costly dredging to restore reservoir function. Predicting these scenarios is difficult.

To be clear, none of the climate reports reviewed for this HMP update specified climate change as a particular concern for dam safety. The issue is not mentioned in 2021 Climate Change and Human Health report, the Fifth National Climate Assessment (Chapter 25 on the Northern Great Plains region), or the NOAA Climate Summaries for Montana. Nor is the issue explicitly addressed on the Montana Dam Safety Program landing page (https://dnrc.mt.gov/Water-Resources/Dam-Safety/).

Despite the lack of study to document specific impacts of climate change on dam safety, it is prudent to continue to monitor changing science-based studies in future HMP updates.

4.2.5.6 Potential Magnitude and Severity

As noted above, dams are classified as High Hazard Potential if failure is likely to result in loss of life, or Significant Hazard Potential if failure is likely to cause property damage, economic loss, environmental damage, or disruption of lifeline facilities.

Based on the frequency and severity of past events in the region and especially on the presence of 18 HHPDs in poor condition within the planning area, dam failure impacts could be **critical** in the Western Region.

The potential magnitude of a dam failure in the planning area could change in the future. For example, the hazard significance of certain dams could decrease if rehabilitated or could increase if development occurs in inundation areas.

4.2.5.7 Vulnerability Assessment

The dam failure *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to dam failure hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with dam failure hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience dam failure hazards. *Susceptible* indicates a strong likelihood of damage from exposure to dam failure hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is not a concern for dam safety in the Western Region, though this assessment will be revisited in future plan updates (see 4.2.5.5). Development in the Western Region is considered in the subsection titled *Development Trends Related to Hazard and Risk*.

Exposure is typically considered to be limited to dam inundation zones, areas determined to be inundated by water released in a dam failure scenario. A key limitation of hazard mitigation planning is that flood inundation areas for most federally owned dams are not available. This prevents identification of many assets that are vulnerable to dam-failure hazards. A solution to this limitation is to reference the hard-copy maps that are available within Emergency Action Plans associated with these dams and on file with the local emergency management offices. Another solution was to reach out to the BIA, who was able to provide inundation mapping for their dams.

People

Flooding caused by dam failure is among the most violent and destructive of hazard events. People are certainly susceptible to injury or death when exposed to dam inundation hazards. From a planning perspective, all populations exposed to dam failure hazards are considered vulnerable, but the elderly, people with disabilities, young children, and individuals that face challenges evacuating the inundation zone are a special concern.

Fortunately, the population exposed to dam failure hazards is variable. The presence of people within dam inundation areas can be reduced in many ways, such as limiting development in high hazard areas. Also, providing advance warning of approaching dam failure hazards can be effective when the warning is received and successfully acted upon to evacuate the area. Aiding the evacuation of vulnerable populations deserves special consideration, such as the aged, people with disabilities, young children, and individuals that do not own a vehicle. These issues are considered more thoroughly in Section 5, *Mitigation Strategy*.

Table 4-18 provides results of a GIS analysis of potential dam inundation impacts that was conducted for this vulnerability assessment. An estimated 38,471 people reside in identified dam inundation zones throughout the Western Region. This number does not include people downstream of federally owned dams that do not provide information on dam inundation zones. This estimate was derived by taking the number of residential parcels within the inundation zone and multiplying them by the average household size for each county per the U.S. Census Bureau American Community Survey estimates. The breakdown of these exposed populations per county and jurisdiction are also provided in Table 4-18.

Property

The built environment is generally considered to be susceptible to dam failure hazards. The value of the underlying ground is not typically considered susceptible. Exposure of property to dam failure hazards is considered to be limited to dam inundation zones.

Table 4-18 summarizes the estimated number of improved parcels, building values, and people within available inundation zones (typically excluding federally owned dams) for each county and some individual cities in the Western Region. Counties with the highest exposure of people and property include Butte-Silver Bow, Gallatin, Missoula, and Ravalli Counties.

Some parts of the planning area have clear vulnerability not capture in this analysis. Lake County and the Confederated Salish and Kootenai Tribes of the Flathead Reservation are downstream from BIA-owned dams not represented in this analysis. Other counties with federal owned dams that are not represented in the analysis include Flathead, Lincoln, Lewis and Clark, and Beaverhead Counties.

Table 4-18 Western Region Parcels at Risk to Dam Inundation by County and Jurisdiction

Jurisdiction	Improved Parcels	Improved Value	Content Value	Total Value	Population
Anaconda-Deer Lodge County	180	$25,369,769	$13,640,621	$39,010,390	336
Total	**180**	**$25,369,769**	**$13,640,621**	**$39,010,390**	**336**

Jurisdiction	Improved Parcels	Improved Value	Content Value	Total Value	Population
Dillon	702	$120,078,835	$62,798,201	$182,877,036	1,439
Beaverhead County	425	$89,114,714	$58,749,147	$147,863,861	791
Total	**1,127**	**$209,193,549**	**$121,547,348**	**$330,740,897**	**2,230**
Townsend	822	$114,144,869	$62,826,134	$176,971,003	1,974
Broadwater County	110	$26,757,902	$18,719,876	$45,477,778	186
Total	**932**	**$140,902,771**	**$81,546,010**	**$222,448,781**	**2,160**
Butte-Silver Bow County	3,013	$579,428,201	$310,064,536	$889,492,737	6,603
Total	**3,013**	**$579,428,201**	**$310,064,536**	**$889,492,737**	**6,603**
Flathead County	118	$20,659,865	$11,031,688	$31,691,553	287
Total	**118**	**$20,659,865**	**$11,031,688**	**$31,691,553**	**287**
Gallatin County	3,460	$1,279,159,431	$747,875,409	$2,027,034,840	7,476
Total	**3,460**	**$1,279,159,431**	**$747,875,409**	**$2,027,034,840**	**7,476**
Drummond	37	$2,800,592	$1,401,371	$4,201,963	86
Granite County	446	$79,062,095	$48,660,605	$127,722,700	888
Total	**483**	**$81,862,687**	**$50,061,976**	**$131,924,663**	**974**
Whitehall	308	$42,312,192	$22,926,928	$65,239,120	761
Jefferson County	309	$63,554,988	$41,812,220	$105,367,208	647
Total	**617**	**$105,867,180**	**$64,739,148**	**$170,606,328**	**1,407**
East Helena	184	$21,465,724	$11,279,940	$32,745,664	409
Lewis and Clark County	546	$76,082,310	$44,370,424	$120,452,734	1,163
Total	**730**	**$97,548,034**	**$55,650,363**	**$153,198,397**	**1,572**
Eureka	45	$5,721,710	$3,346,070	$9,067,780	98
Libby	1,070	$148,933,066	$83,372,721	$232,305,787	2,351
Lincoln County	153	$20,577,255	$10,738,149	$31,315,404	337
Total	**1,268**	**$175,232,031**	**$97,456,940**	**$272,688,971**	**2,786**
Twin Bridges	242	$24,923,196	$13,922,081	$38,845,277	495
Madison County	491	$98,534,844	$66,099,852	$164,634,696	857
Total	**733**	**$123,458,040**	**$80,021,933**	**$203,479,973**	**1,353**
White Sulphur Springs	192	$25,051,517	$15,164,639	$40,216,156	435
Meagher County	116	$21,774,701	$18,010,536	$39,785,237	168
Total	**308**	**$46,826,218**	**$33,175,174**	**$80,001,392**	**604**
Missoula County	2,130	$514,884,678	$278,111,120	$792,995,798	4,765

Jurisdiction	Improved Parcels	Improved Value	Content Value	Total Value	Population
Total	**2,129**	**$514,837,938**	**$278,087,750**	**$792,925,688**	**4,763**
Park County	82	$32,849,148	$20,808,199	$53,657,347	126
Total	**82**	**$32,849,148**	**$20,808,199**	**$53,657,347**	**126**
Deer Lodge	293	$24,483,055	$13,484,858	$37,967,913	568
Powell County	91	$17,183,280	$13,121,855	$30,305,135	158
Total	**384**	**$41,666,335**	**$26,606,713**	**$68,273,048**	**726**
Darby	180	$23,815,009	$12,638,546	$36,453,555	407
Hamilton	242	$126,164,530	$106,688,646	$232,853,176	508
Stevensville	1	$289,990	$144,995	$434,985	2
Ravalli County	1,434	$363,270,514	$225,795,056	$589,065,570	2,919
Total	**1,857**	**$513,540,043**	**$345,267,242**	**$858,807,285**	**3,836**
Sanders County (Flathead Reservation)	40	$4,474,815	$3,565,048	$8.039,863	35
Total	**40**	**$4,474,815**	**$3,565,048**	**$8.039,863**	**35**
Sweet Grass County	13	$2,392,251	$1,827,521	$4,219,772	12
Total	**13**	**$2,392,251**	**$1,827,521**	**$4,219,772**	**12**
Grand Total	**18,053**	**$4,092,658,521**	**$2,400,881,299**	**$6,493,539,820**	**38,471**

Source: County Assessor data, NID, MT DNRC, WSP GIS Analysis

Critical Facilities and Lifelines

Above-ground critical infrastructure is typically not designed to withstand or avoid dam failure hazards and is typically susceptible to damage or destruction when exposed to these hazards. This is especially true when infrastructure is in poor condition. Transportation infrastructure, especially bridges, is especially susceptible and can cause great disruption if made unusable, damaged, or destroyed by dam inundation. Areas can become inaccessible or inescapable. Utilities such as overhead power lines, cable and phone lines can also be vulnerable, especially if utility poles are knocked down.

There are 720 critical facilities throughout the Western Region which lie within mapped dam inundation areas. Table 4-19 summarizes these facilities by FEMA Lifeline category (FEMA Community Lifelines, 2019). Tribal data are counted within the county that it coincides with and therefore is counted twice. Refer to the tribal county annexes to get a detailed estimation of tribal critical facilities at risk to dam inundation.

Table 4-19 Western Region Critical Facilities at Risk to Dam Inundation by Jurisdiction and FEMA Lifeline

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Anaconda-Deer Lodge	3	1	3	0	0	3	41	**51**
Beaverhead	4	3	2	0	1	6	60	**76**
Broadwater	5	4	3	0	0	10	8	**30**
Butte-Silver Bow	9	2	2	1	0	6	15	**35**
Flathead	-	-	-	-	-	-	-	**-**
Gallatin	11	6`	4	1	3	23	71	**119**
Granite	1	8	2	0	0	1	40	**52**
Jefferson	2	2	2	1	1	4	23	**35**
Lake	3	3	0	0	0	8	38	**52**
Lewis and Clark	3	1	2	2	1	9	18	**36**
Lincoln	5	0	6	0	1	13	6	**31**
Madison	1	6	1	0	2	10	22	**42**
Meagher	0	0	1	0	0	2	14	**17**
Missoula	0	0	0	0	0	0	1	**1**
Park	0	0	0	0	0	0	18	**18**
Powell	1	2	3	0	0	2	30	**38**
Ravalli	6	1	3	2	4	11	47	**74**
Sanders	0	0	0	0	0	0	11	**11**
Sweet Grass	0	0	0	0	0	0	2	**2**
Total	**54**	**39**	**34**	**7**	**13**	**108**	**465**	**720**

Source: Montana DNRC Dam Safety Program, Montana State Library, NID, HIFLD 2022, Montana DES, NBI

Economy

The economy in the Western Region is both exposed and susceptible to dam failure. For example, a dam failure would likely cause the long-term loss of a reservoir. Reservoirs are often critical water sources for potable or irrigation water needs, support tourism, and provide wildlife habitat. The loss of potable water could directly cause businesses to close, at least temporarily, and the loss of a reservoir could disrupt tourism. Downstream flooding would cause additional economic disruption. There are presently no quantitative analyses of the magnitude of economic disruption caused by dam failure scenarios in the Western Region.

Historic and Cultural Resources

Reservoirs themselves are often significant cultural and economic resources for tourism and recreation. A dam failure and subsequent loss of a reservoir would be potentially catastrophic to these resources. Historic buildings are typically not destroyed by dam failures but are certainly susceptible to damage from inundation. Specific historic resources have not been identified, but the cities and towns of Great Falls, Deer Lodge, Wilsall, White Sulphur Springs, Twin Bridges, Libby, Hamilton, Greycliff, Butte, and the Helena area are directly downstream of at least three HHPDs. Historic resources in these municipalities may be more likely to be exposed than other jurisdictions in the region.

Natural Resources

Many natural resources are susceptible to damage and are potentially exposed to dam failure hazards. Reservoirs held behind dams affect many ecological aspects of a river. Rivers often experience wide fluctuations in key aspects of aquatic habitat such as flow rate, temperature, and suspended sediment. But below dams, rivers often experience relatively stable conditions with very little suspended sediment. These conditions can provide ideal habitat for desirable species such as trout. A dam failure can completely alter this arrangement.

Many dams in the western region are used to supply water for irrigation or potable uses. These uses are susceptible to interruption from dam failure. Reservoirs often provide unique habitat for fish and wildlife species that is lost if the associated dam fails.

Development Trends Related to Hazards and Risk

Dozens, if not hundreds, of towns and cities exist in dam inundation areas, many of which are experiencing growth and development. Development below dams typically increases vulnerability to a dam failure by increasing the value of assets in the dam inundation zone.

Development can also have a financial impact on dam owners. In some cases, development can cause a significant hazard potential dam to be reclassified as a high hazard potential dam. High hazard dams are required to meet more stringent requirements for design, construction, inspection, and maintenance. Bringing a dam up to high hazard design standards can be costly for a dam owner. Even for dams already classified as high hazard, additional downstream development can still have a financial impact. Spillway design standards are based on potential for loss of life downstream. As the population at risk increases, the spillway design standard increases. A dam that is currently in compliance with state design standards can suddenly be out of compliance after a subdivision is built downstream.

4.2.5.8 Risk Summary

Dam failure presents an unlikely chance of occurrence, but major impacts to people, property, infrastructure, the economy, and natural and cultural resources could result should a dam failure occur. Overall, dam failure is rated as having **medium significance** in the Western Region, though this rating varies by county (Table 4-20).

- Dam failures, especially those of high hazard dams, could potentially result in people downstream caught in inundation area flooding with little to no warning.
- Property and buildings located within the inundation area are vulnerable to damage or destruction in the event of a dam failure; counties with the highest exposure of people and property include Butte-Silver Bow and Ravalli Counties.
- Direct economic losses in terms of property damage, as well as indirect losses in terms of impeded tourism and loss of cultural or recreational resources like reservoirs, could result from dam failures.
- Critical facilities and infrastructure, most notably roads and bridges, located in the inundation zones are also vulnerable to damage or complete loss in the event of a dam failure.
- Unique jurisdictional vulnerability: See table below.
- Related hazards: Flooding, landslide, earthquake.

Table 4-20 Risk Summary Table: Dam Failure

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	NA	Has 118 high, 51 significant and 224 low hazard dams within its jurisdiction. Also 38,471 people at risk to Dam Failure. See Table 4-18 and Table 4-19.
Beaverhead	Medium	Dillon, Lima	None
Broadwater	Low	Townsend	N/A
Butte-Silver Bow	Medium	Walkerville	2 high hazard dams located near Walkerville. 6,603 people at risk of dam inundation.
CSKT	Medium	Hot Springs, Polson, Ronan, St. Ignatius	Multiple high hazard dams in proximity to Hot Springs, Polson, Ronan, and St. Ignatius.
Flathead	Medium	City of Columbia Falls City of Kalispell Town of Whitefish	Columbia Falls has several high hazard dams within its vicinity. Whitefish also has a high hazard dam north of its jurisdiction.
Gallatin	High	Belgrade, Bozeman, Three Forks	All three cities at high risk to dam inundation. With a major highway also traversing through the risk area.
Granite	Low	Drummond, Philipsburg	Drummond and Philipsburg are both in proximity to high hazard dams. With three high hazard dams south of Philipsburg.
Jefferson	Low	Boulder, Whitehall	Boulder has several high hazard dams north of the city.
Lake	Medium	Polson, Ronan, St. Ignatius	Multiple high hazard dams in proximity to Hot Springs, Polson, Ronan, and St. Ignatius.
Lewis and Clark	High	East Helena, Helena	East Helena and Helena have multiple high hazard dams and have a high risk of dam inundation.
Lincoln	Medium	Eureka, Libby, Rexford, Troy	Eureka, Libby, Rexford, and Troy all have high hazard dams at risk to dam inundation with Libby being centrally located and have the highest amount of exposure.
Madison	High	Ennis, Sheridan, Twin Bridges, Virginia City	Ennis, Sheridan, Twin Bridges and Virginia City all have dam inundation risk with multiple high and significant hazard dams being centrally located within the county.
Meagher	Medium	N/A	N/A
Mineral	Low	Superior	N/A
Missoula*	High	Missoula	Missoula has a high hazard dam within its jurisdiction.
Park	Low	Clyde Park, Livingston	Clyde Park is located next to multiple high hazard dams with Livingston being located south of these dams and being exposed to downstream exposures.
Powell	Low	Deer Lodge	Deer Lodge has two high hazard and one significant hazard dam to the west and northwest of its city. Putting the jurisdiction at severe dam inundation risk.
Ravalli	High	Darby, Hamilton, Pinesdale, Stevensville	Darby is located downstream from one high hazard dam, the West Fork Bitterroot (Painted Rocks) dam, and is within this dam's inundation zone. Hamilton and Stevensville are both also within the inundation zone of this dam, as well as two additional high hazard dams. Pinesdale has no dam inundation risk.
Sanders	Low	Hot Springs, Plains, Thompson Falls	N/A
Sweet Grass	Low		N/A

4.2.6 Drought

4.2.6.1 Hazard/Problem Description

Drought is a condition of climatic dryness that is severe enough to reduce soil moisture and water below the minimum necessary for sustaining plant, animal, and human life systems. Influencing factors include temperature patterns, precipitation patterns, agricultural and domestic water-supply needs, and growth. Lack of annual precipitation and poor water conservation practices can result in drought conditions.

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or wildland fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and can take years before the consequences are realized. It is often not obvious or easy to quantify when a drought begins and ends. Droughts can be a short-term event over several months or a long-term event that lasts for years or even decades.

Drought is a complex issue involving many factors—it occurs when a normal amount of moisture is not available to satisfy an area’s usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological drought** is usually defined by a period of below average water supply.
- **Agricultural drought** occurs when there is an inadequate water supply to meet the needs of the State’s crops and other agricultural operations such as livestock.
- **Hydrological drought** is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.
- **Socioeconomic drought** occurs when a drought impacts health, well-being, and quality of life or when a drought starts to have an adverse economic impact on a region.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in Montana are those related to water intensive activities such as agriculture, wildland fire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. An ongoing drought may leave an area more prone to beetle kill and associated wildland fires. Previous drought events in Montana have led to grasshopper infestations. Drought conditions can also cause soil to compact, increasing an area’s susceptibility to flooding, and reduce vegetation cover, which exposes soil to wind and erosion. A reduction of electric power generation and water quality deterioration are also potential problems. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

The onset of drought in the Western Region is usually signaled by a lack of significant winter snowfall. Hot and dry conditions that persist into spring, summer, and fall can aggravate drought conditions, making the effects of drought more pronounced as water demands increase during the growing season and summer months.

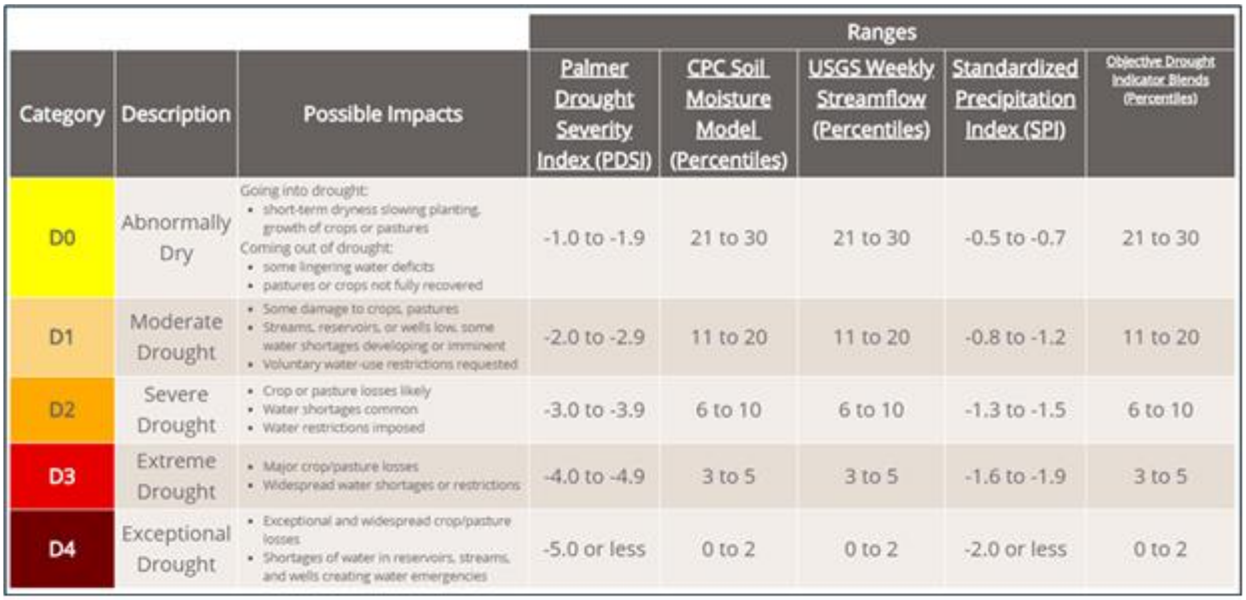
Much of the State of Montana was in a drought during the late 1980’s. In response to this, and to assist with increasing awareness of and planning for drought in the future, the Governor’s Drought Advisory Committee was formed in 1991. This committee, comprised of state and federal water supply and moisture condition experts, meets monthly to evaluate conditions for each county in the State and supports watershed groups and county drought committees by providing planning support and information. Water supply and moisture status maps are produced monthly from February to October by the Committee unless above average moisture conditions are prevalent.

4.2.6.2 Geographical Area Affected

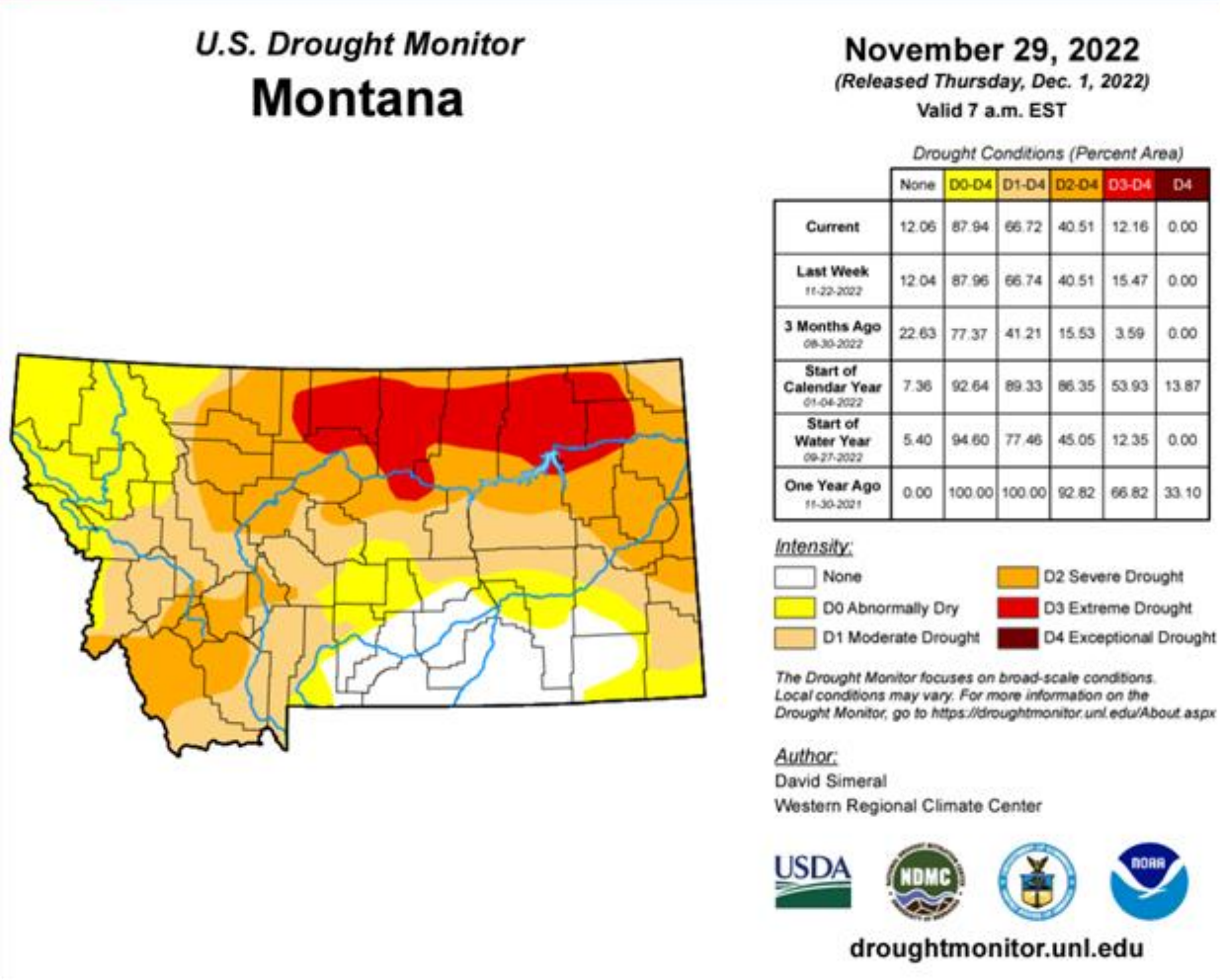
Droughts are often regional events, impacting multiple counties and states simultaneously. Therefore, as the climate of the planning area is contiguous, it is reasonable to assume that a drought will impact the entire planning region. Based on this information, the geographic extent rating for drought is **Extensive**.

Drought in the United States is monitored by the National Integrated Drought Information System (NIDIS). A major component of this portal is the U.S. Drought Monitor. The Drought Monitor concept was developed jointly by the NOAA's Climate Prediction Center, the National Drought Mitigation Center, and the USDA's Joint Agricultural Weather Facility in the late 1990s as a process that synthesizes multiple indices, outlooks, and local impacts into an assessment that best represents current drought conditions. The outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are intimately familiar with the conditions in their respective regions. A snapshot of the most current drought conditions in Montana is provided in Figure 4-21.

Figure 4-21 Drought Status November 2022 in the State of Montana



			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: • short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • some lingering water deficits • pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2



U.S. Drought Monitor

Montana

November 29, 2022

(Released Thursday, Dec. 1, 2022)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	12.06	87.94	66.72	40.51	12.16	0.00
Last Week *11-22-2022*	12.04	87.96	66.74	40.51	15.47	0.00
3 Months Ago *08-30-2022*	22.63	77.37	41.21	15.53	3.59	0.00
Start of Calendar Year *01-04-2022*	7.36	92.64	89.33	86.35	53.93	13.87
Start of Water Year *09-27-2022*	5.40	94.60	77.46	45.05	12.35	0.00
One Year Ago *11-30-2021*	0.00	100.00	100.00	92.82	66.82	33.10

Intensity:

☐ None	🟧 D2 Severe Drought
🟨 D0 Abnormally Dry	🟥 D3 Extreme Drought
🟫 D1 Moderate Drought	🟫 D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
David Simeral
Western Regional Climate Center

droughtmonitor.unl.edu

Source: U.S. Drought Monitor Montana | U.S. Drought Monitor (unl.edu)

4.2.6.3 Past Occurrences

Between 2012 and 2021, there were 58 USDA disaster declarations due to drought that affected counties in the Western Region. Table 4-21 provides a list of these events with details on impacted counties.

Table 4-21 USDA Drought Disaster Declarations (2012-2021)

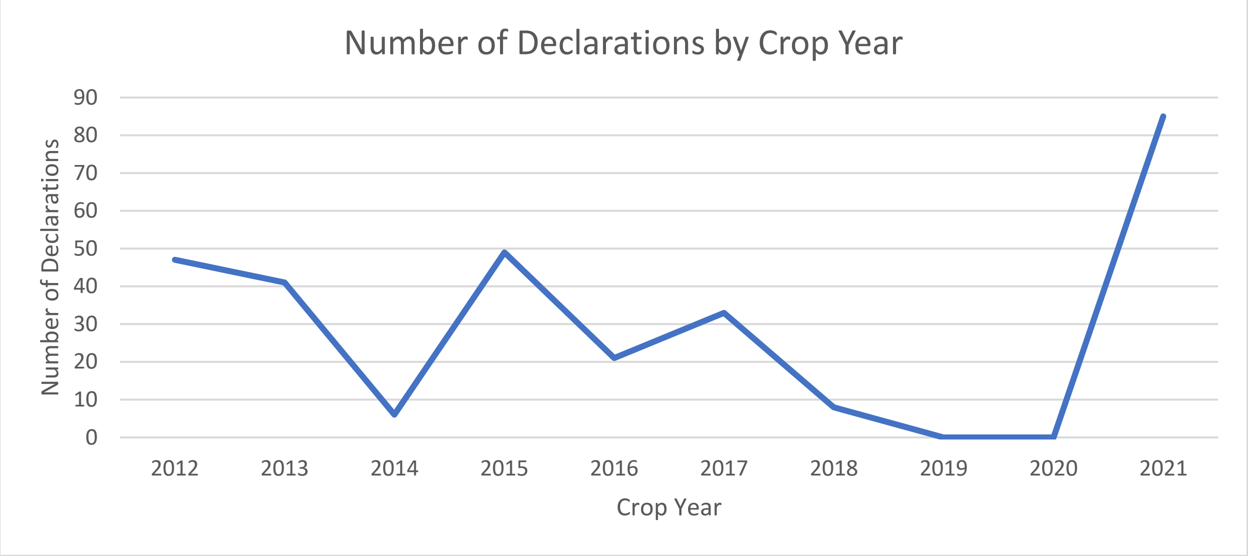
Year	Declaration	Counties Included
2012	S3350	Park
	S3356	Beaverhead, Madison
	S3362	Beaverhead, Ravalli
	S3365	Beaverhead, Granite, Jefferson, Madison, Ravalli, Silver Bow
	S3376	Beaverhead, Broadwater, Jefferson, Lewis and Clark, Madison, Meagher, Park, Powell, Silver Bow
	S3391	Broadwater, Lewis and Clark, Meagher, Park, Sweet Grass
	S3416	Beaverhead, Flathead, Jefferson, Lewis and Clark, Madison, Meagher, Silver Bow
	S3435	Beaverhead
	S3437	Broadwater, Flathead, Jefferson, Lewis and Clark, Meagher, Powell
2013	S3508	Gallatin, Park
	S3521	Park, Sweet Grass
	S3525	Beaverhead, Broadwater, Deer Lodge, Gallatin, Jefferson, Lewis and Clark, Madison, Meagher, Ravalli, Silver Bow
	S3527	Beaverhead, Broadwater, Deer Lodge, Gallatin, Jefferson, Lewis and Clark, Madison, Powell, Silver Bow
	S3535	Broadwater, Gallatin, Jefferson, Madison, Meagher, Park
	S3552	Beaverhead
	S3557	Beaverhead, Deer Lodge, Jefferson, Madison, Silver Bow
	S3559	Beaverhead, Gallatin, Madison, Ravalli
	S3587	Mineral, Missoula
2014	S3701	Beaverhead
	S3716	Beaverhead, Gallatin, Madison
	S3730	Beaverhead, Ravalli
2015	S3838	Beaverhead
	S3843	Beaverhead, Gallatin, Madison
	S3848	Lincoln, Mineral, Missoula, Sanders
	S3849	Beaverhead, Broadwater, Deer Lodge, Flathead, Granite, Jefferson, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Mineral, Missoula, Powell, Ravalli, Sanders, Silver Bow
	S3855	Mineral, Sanders
	S3857	Lincoln, Missoula, Ravalli
	S3861	Beaverhead, Ravalli
	S3877	Beaverhead, Broadwater, Deer Lodge, Flathead, Gallatin, Jefferson, Lewis and Clark, Madison, Powell, Silver Bow
	S3918	Broadwater, Gallatin, Jefferson, Lewis, and Clark. Madison, Meagher, Park
2016	S4061	Meagher, Sweet Grass
	S4066	Broadwater, Deer Lodge, Flathead, Gallatin, Granite, Jefferson, Lake, Lewis and Clark, Lincoln, Meagher, Mineral, Missoula, Park, Powell, Ravalli, Sanders, Sweet Grass
	S4070	Gallatin, Park

Year	Declaration	Counties Included
2017	S4217	Lewis and Clark, Meagher, Sweet Grass
	S4221	Broadwater, Deer Lodge, Flathead, Gallatin, Jefferson, Lewis and Clark, Madison, Meagher, Park, Powell, Silver Bow, Sweet Grass
	S4226	Flathead
	S4231	Lincoln
	S4232	Flathead, Lake, Lewis and Clark, Lincoln, Mineral, Missoula, Powell, Sanders
	S4235	Lincoln, Sanders
	S4236	Flathead, Lake, Missoula, Sanders
	S4259	Mineral, Sanders
2018	S4411	Flathead, Lake, Lewis and Clark, Lincoln, Mineral, Missoula, Powell, Sanders
2021	S4931	Gallatin, Park
	S4992	Beaverhead, Ravalli,
	S4993	Beaverhead, Deer Lodge, Madison, Ravalli, Silver Bow, Sweet Grass
	S4998	Gallatin
	S5000	Lincoln, Mineral, Missoula, Ravalli, Sanders
	S5001	Meagher, Sweet Grass
	S5007	Gallatin, Madison, Park, Sweet Grass, Beaverhead, Broadwater, Jefferson, Meagher, Silver Bow
	S5014	Mineral, Sanders
	S5016	Broadwater, Jefferson, Meagher, Silver Bow, Beaverhead, Deer Lodge, Gallatin, Lewis and Clark, Madison, Park, Powell, Sweet Grass
	S5022	Flathead, Lewis and Clark, Lincoln, Mineral, Sanders, Broadwater, Jefferson, Lake, Meagher, Missoula, Powell
	S5029	Deer Lodge, Ravalli, Beaverhead, Granite, Jefferson, Missoula, Powell, Silver Bow
	S5039	Deer Lodge, Flathead, Granite, Jefferson, Lewis and Clark, Missoula, Powell, Ravalli
	S5044	Beaverhead, Gallatin, Madison
	S5057	Flathead
	S5071	Missoula, Flathead, Granite, Lake, Mineral, Powell, Ravalli, Sanders
	S5085	Lake, Flathead, Lewis and Clark, Missoula, Sanders

Source: USDA

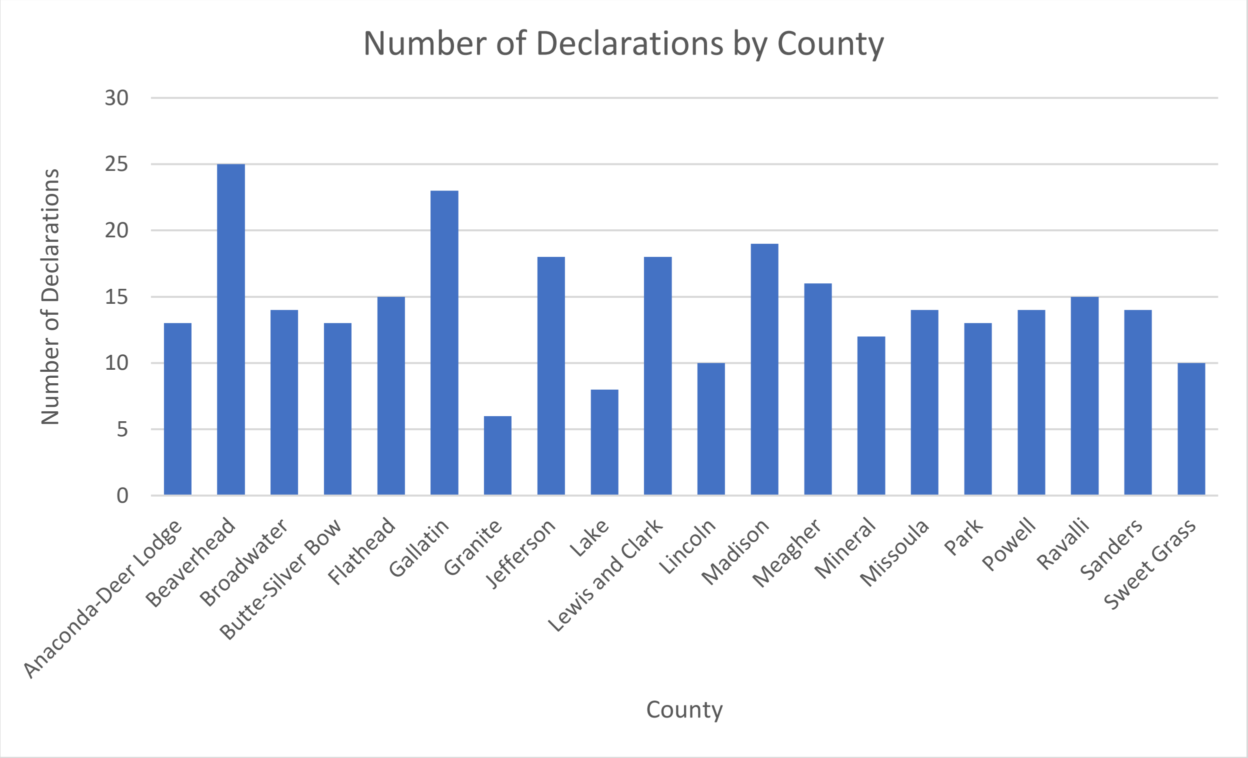
Figure 4-22 the temporal trend in USDA disaster declarations from drought by year in the Western Region. While there is evident variability in the number of declarations from year to year, the greatest number of declarations occurred in 2021. Figure 4-23 displays the breakdown of declarations by county. In the Western Region, Beaverhead County has experienced the greatest number of USDA disaster declarations, followed by Gallatin and Madison Counties

Figure 4-22 USDA Drought Disaster Declarations by Year (2012-2021)



Source: USDA

Figure 4-23 USDA Drought Disaster Declarations by County (2012-2021)



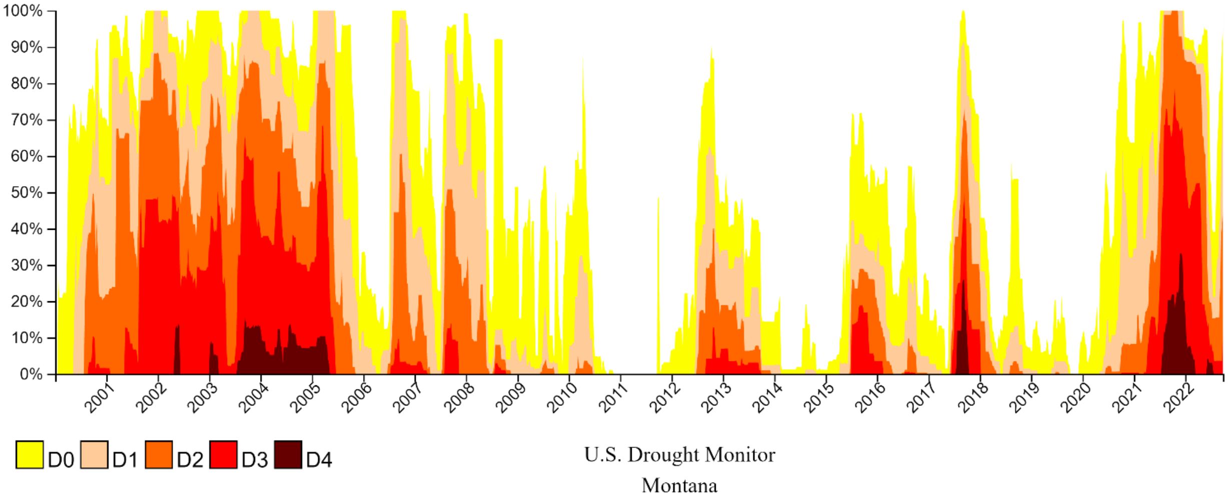
Source: USDA

The State of Montana Hazard Mitigation Plan 2018 provides details of drought history in the State of Montana. Updated to 2023 the history of drought events includes the following.

- **1917-1923:** Rising wheat prices encouraged farmers to transform grasslands into farmland for wheat, corn, and row crops. Significant loss of soil and overconsumption of water for crops.
- **1928-1939:** Driest period in the historic record, the Palmer Hydrologic Drought Index (PHDI) showed the entire State was in a hydrologic deficit for over 10 years. Dust Bowl years. Better conservation practices such as strip cropping were helping to lessen the impacts of the worst water shortages since the 1930's.
- **Mid-1950's**: Montana faced a period of reduced rainfall in eastern and central portions of the State. By November of 1956, a total of 20 Montana counties had applied for federal drought assistance.
- **1961:** Montana's State Crop and Livestock Reporting Service called it the worst drought since the 1930's. By August of 1961, 24 counties had applied for federal drought disaster aid.
- **1966:** The entire State was experiencing yet another episode of drought. Although water shortages were not as great as in 1961, a study of ten weather recording stations across Montana showed all had recorded below normal precipitation amounts for a ten-month period.
- **1977:** In June, officials from Montana were working with others from Idaho, Washington, and Oregon on the Northwest Utility Coordination Committee to moderate potential hydroelectricity shortages. On June 23, Governor Judge issued an energy supply alert and ordered a mandatory ten percent reduction in electricity use by state and local governments.
- **1979-1981:** By October of 1980, estimates of 1980 federal disaster payments were five times those paid in 1979. Total drought related economic losses from Montana in 1980 were estimated to be $380 million (equivalent to $1.26 billion dollars in 2021). Large May storms in 1981 brought flooding to formerly parched areas.
- **1984:** By July, Montana was again experiencing water shortages and rationing schedules were put into effect. Crop losses were estimated at $12 to $15 million. Numerous forest and range fires burned out of control across the State in August.
- **1985:** All 56 counties received disaster declarations for drought. Cattle herds were reduced by approximately one-third. The State's agriculture industry lost nearly $3 billion in equity.
- **1999-2008:** This period of dryness and hydrologic deficits mimicked the Dust Bowl years in every measurable factor besides duration. Severe water losses to the area aquifers as well as municipal water supplies.
- **2017:** Northeastern Montana had record dry conditions for much of 2017, especially through August.
- **2021-2022:** By December of 2021, every county in Montana was identified as experiencing some level of drought. A third of the State was classified as "D4" or "exceptional" drought, a designation the U.S. Department of Agriculture expects to occur in any one location just once every 50 to 100 years.

Figure 4-24 displays data from the U.S. Drought Monitor for the State of Montana from 2000-2022. D0 represents least severe drought conditions and D4 is most severe (see drought severity scale, Figure 4-21. The chart shows peak drought conditions in the years 2001-2005, 2017, and 2021-2022 across the State. The majority of the State was in drought from 2001-2005.

Figure 4-24 U.S. Drought Monitor: State of Montana Drought Conditions (2000-2022)



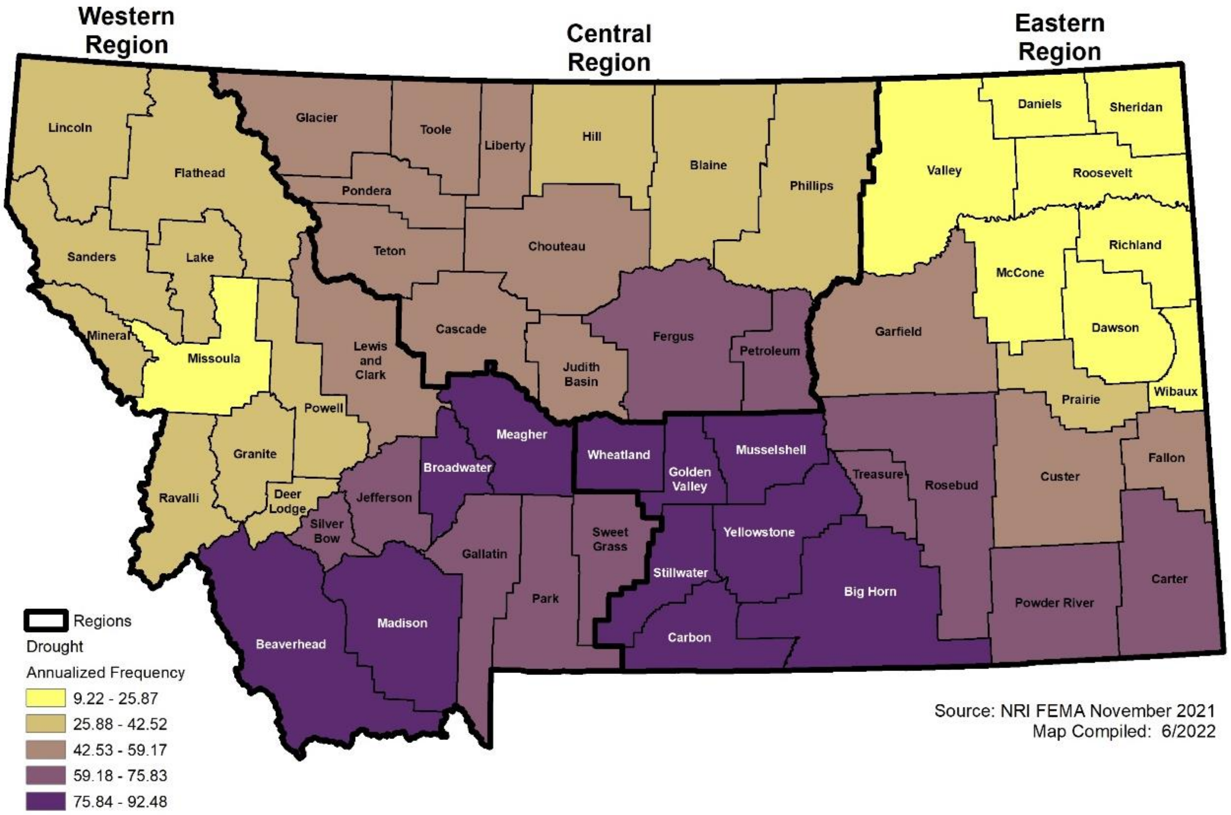
Source: U.S. Drought Monitor

4.2.6.4 Frequency/Likelihood of Occurrence

The likelihood of drought in the Western Region is ranked as **highly likely**. Based on historic drought events, there is continued probability that drought will occur in the future in the Western Region. Although there may be periods of higher-than-average precipitation, the Palmer Drought Severity Index (PDSI) long-term trend data indicate that Montana is one of the highest risk states in the United States for severe drought. The State of Montana Hazard Mitigation Plan 2018 also reported that, despite variation in severity of droughts each year, drought losses are sustained every year in Montana.

Figure 4-25 depicts annualized frequency of drought at a county level based on the NRI. The mapping shows a trend towards increased likelihood in the southern portions of the Region, particularly Beaverhead, Broadwater, and Madison Counties.

Figure 4-25 Annualized Frequency of Drought Events by County



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

4.2.6.5 Climate Change Considerations

Montana's future drought hazard is largely a story of how climate change will impact precipitation, compared to how it will impact evapotranspiration. Evapotranspiration is sensitive to temperature and climate-change associated increases in temperature are fairly certain to increase transpiration for the foreseeable future. The more dynamic part of the drought story is how climate change will affect precipitation.

Changes in the seasonal distribution of precipitation in Montana are becoming evident. The 2021 Montana Climate Change and Human Health Study documents summer precipitation has decreased slightly and is roughly offset by slightly increased spring and fall precipitation. This observation is consistent with observations of increasing drought in recent years and the early stages of anticipated changes due to climate change.

Looking farther into the future, Figure 4-26 shows the projected change in monthly average precipitation for 2040-2069 relative to 1971-2000. During the spring, precipitation is expected to increase in coming decades. The springtime increase in precipitation is likely to offset increases in evapotranspiration driven by increasing temperature. However, during summer months, precipitation is expected to remain relatively stable or continue to decline slightly. This stable or slightly decreasing precipitation, combined with higher evapotranspiration rates due to increasing temperatures, can reasonably be anticipated to increase the drought hazard during summer months. Fall and winter months are less certain but are more likely to resemble the springtime pattern described above.

The magnitude of climate change impact on drought, especially during the summer, is significant and worthy of attention, but not necessarily catastrophic. The Fifth National Climate Assessment confirms that drought is increasing in Montana and is projected under moderate climate change scenarios to be 10% more frequent by 2050, and 20% by 2100.

Figure 4-26 Projected Change in Montana Monthly Precipitation

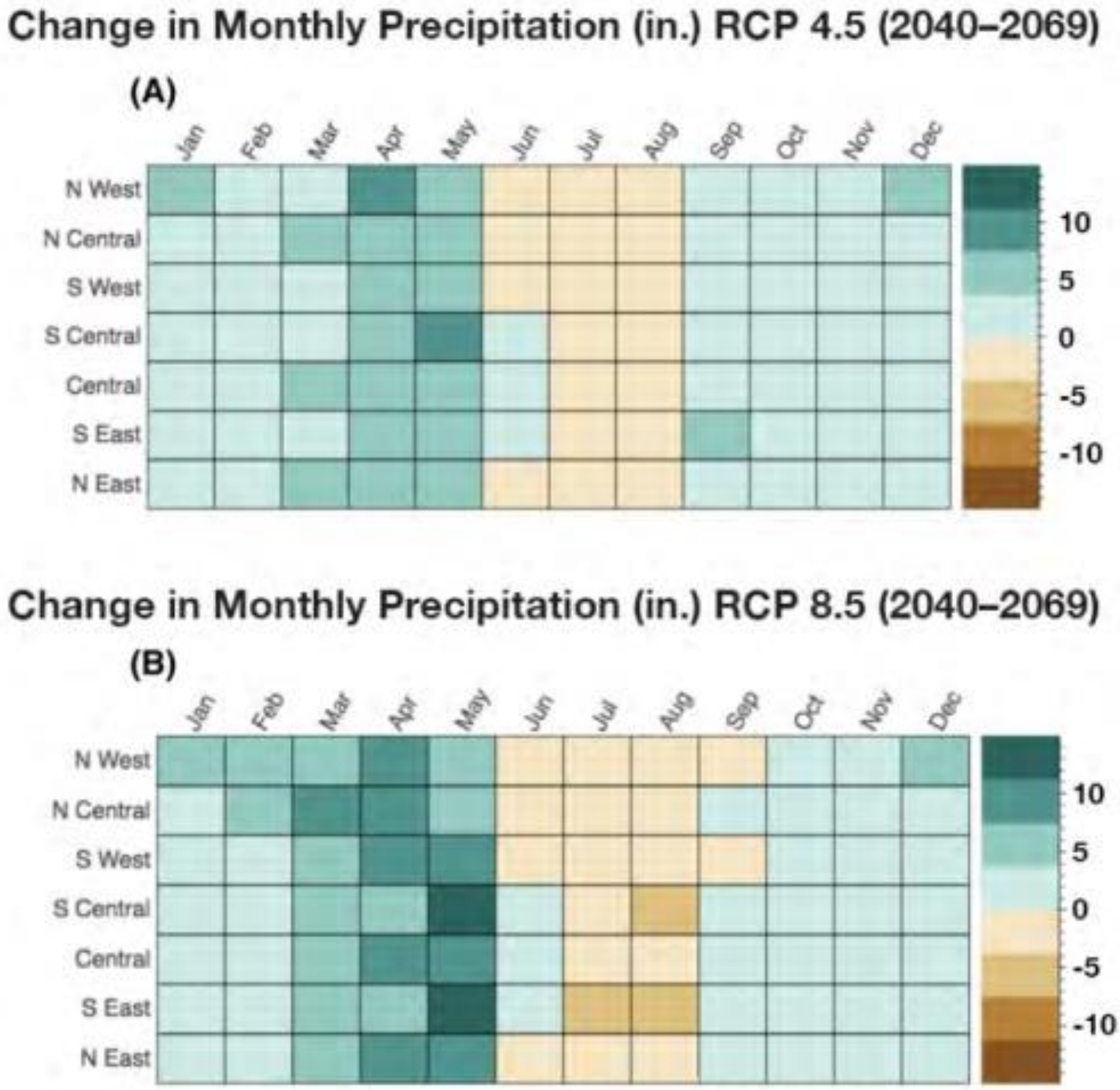


Figure source: Montana Climate Change and Human Health report, 2021. RCP 4.5 (figure A) is described as the "stabilization scenario" and RCP 8.5 (figure B) is described as the upper-bound emission scenario.

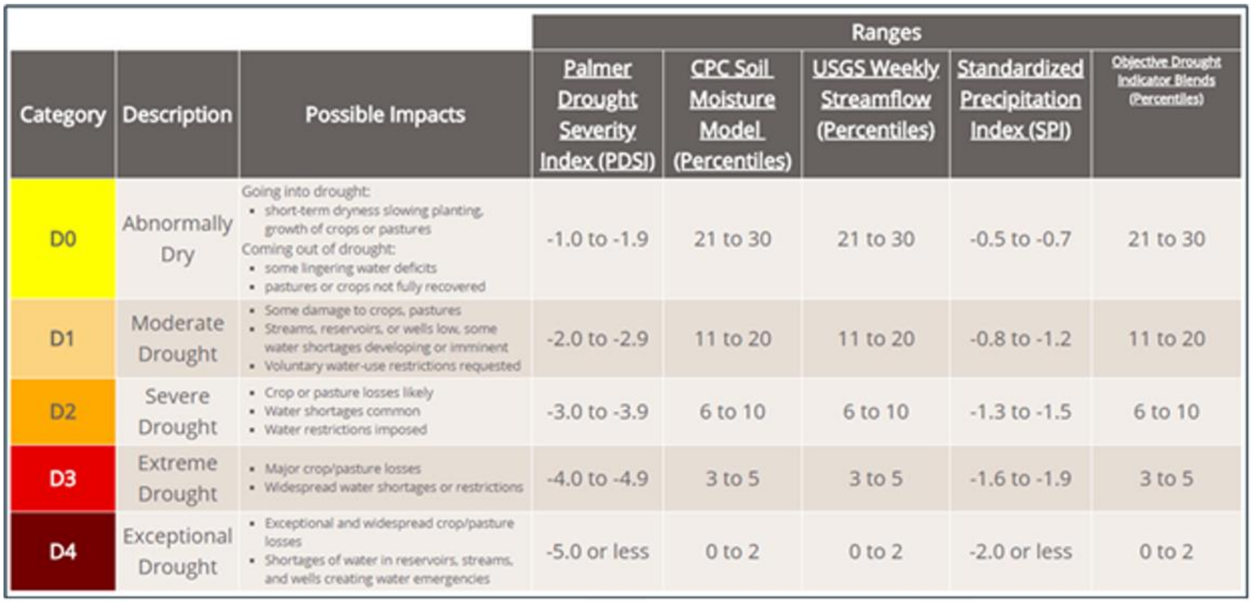
Climate science has advanced far in recent years but limitations in our understanding of climate change remain, especially at projecting changes at small spatial scales. Scientifically defensible projections do not yet exist to differentiate the effects of climate change on the drought hazard in each jurisdiction within the Western Region. For example, current scientific information indicates exposure to summertime drought is likely to get worse throughout the region. However, there is virtually no scientific information regarding if or how drought will get worse in one part of the Western Region relative to another part. In summary, the intensities of droughts will increase because of increased summer temperatures and decreased overall summer precipitation. Droughts are also projected to increase in frequency and have a longer duration due to shifts in seasonal precipitation patterns, including drier summers and less precipitation falling as snow in early spring.

Susceptibility to drought may also shift from jurisdiction to jurisdiction in ways that are difficult to predict and may or may not be related to climate change. For example, consider a scenario where deteriorating infrastructure degrades the reliability of irrigation water supply in a specific jurisdiction. Susceptibility to drought would increase in the affected jurisdiction more than in others. Whatever the cause of increase susceptibility to drought, climate change will amplify the consequence of the change. Future updates to this plan should revisit the topic of future drought conditions and susceptibility as scientific knowledge progresses and note any trends that emerge over time.

4.2.6.6 Potential Magnitude and Severity

The potential magnitude and severity in the Western Region is rated **critical**. The most widely utilized scale for describing magnitude and severity of drought is the Palmer Drought Severity Index, which attempts to measure the duration and intensity of long-term drought inducing circulation patterns. According to NOAA, long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. Since weather patterns can change almost literally overnight from a long-term drought pattern to a long-term wet pattern, the PDSI can respond fairly rapidly. Table 4-22 below shows the Palmer Drought Severity Index along with each level's intensity, impacts, and reference data ranges.

Table 4-22 Palmer Drought Severity Index

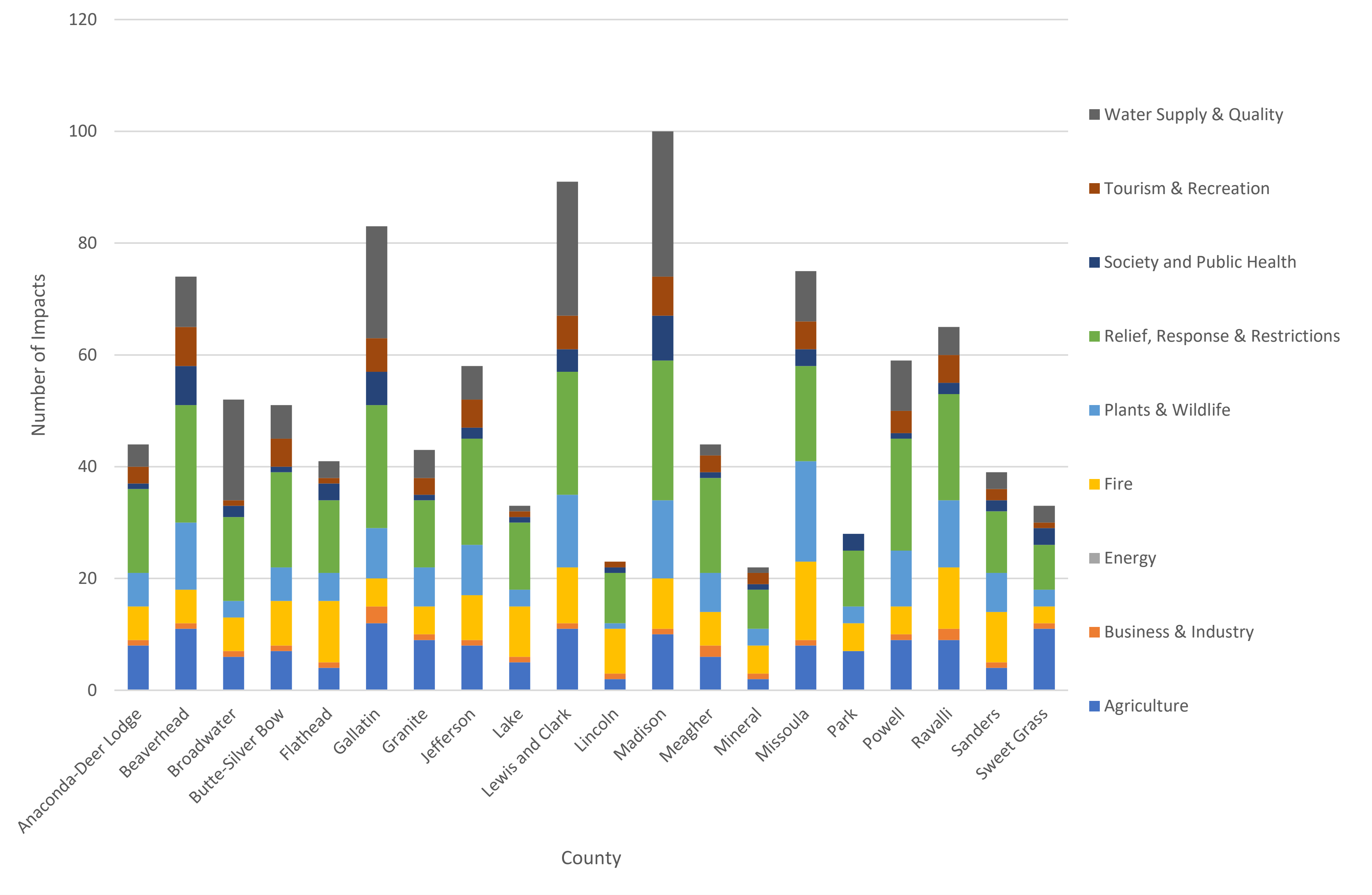


			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: • short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • some lingering water deficits • pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: U.S. Drought Monitor

The most significant impacts associated with drought in the Western Region are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. Indirect effects include those impacts that ripple out from the direct effect and include reduced business and income for local retailers, increased credit risk for financial institutions, capital shortfalls, loss of tax revenues and reduction in government services, unemployment, and outmigration. Figure 4-27 displays number of impacts from drought in the Western Region by impact type and county.

Figure 4-27 Drought Impacts by County and Impact Type (2000-2021)



Source: The Drought Impact Reporter (2000-2021), Chart by WSP

4.2.6.7 Vulnerability Assessment

The drought *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to drought, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with drought hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience drought hazards. *Susceptible* indicates a strong likelihood of damage from exposure to drought hazards and is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is increasing evapotranspiration and is shifting precipitation seasonality. Current projections are for a 10% increase in drought frequency by mid-century. It isn’t clear if or how climate change will affect vulnerability to drought in next decade or two in the Western Region, though this assessment will be revisited in future plan updates (see section titled *Climate Change Considerations*, above). Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

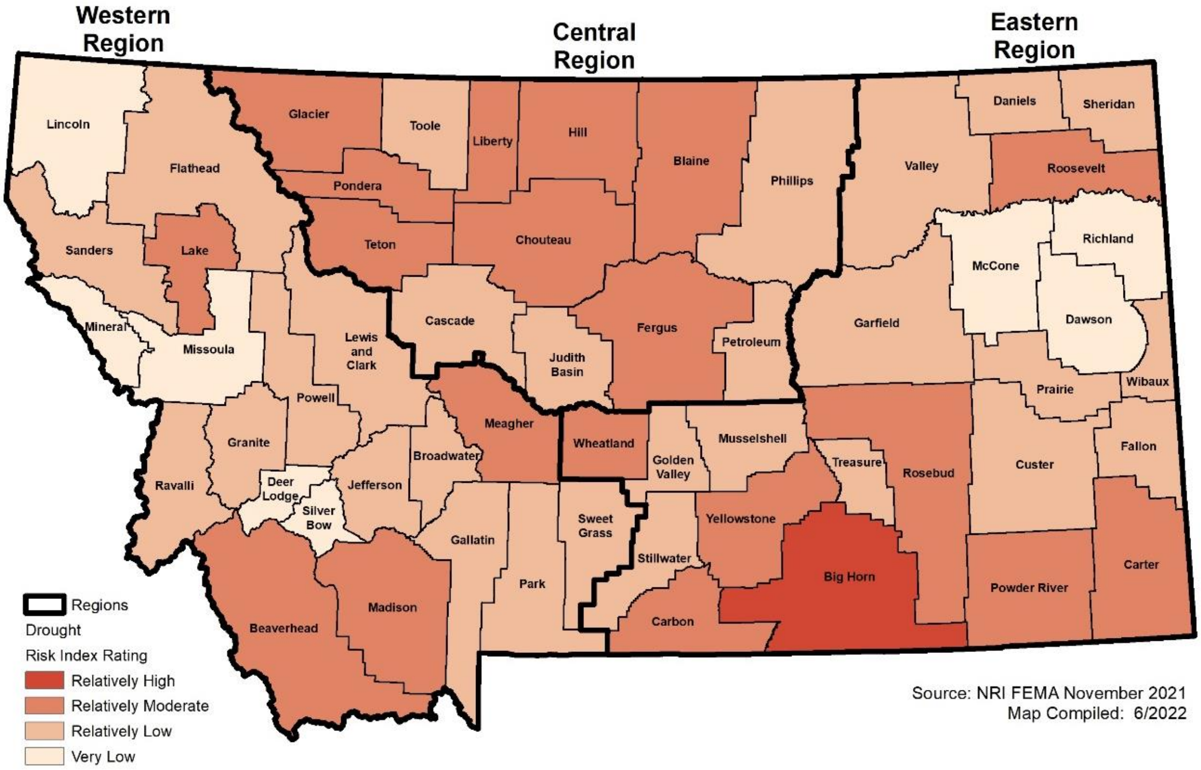
The high-hazard zone for drought extends throughout the Western Region of Montana. Variability in the hazard severity exists from drought to drought, but over time all parts of the Western Region are exposed to severe drought conditions. Susceptibility to drought is variable throughout the Western Region and is discussed further in the asset-specific subsections, below.

The role of climate change in future vulnerability to drought is discussed above in the section titled, *Climate Change Considerations*, while the effect of future development is considered below in the section titled *Development Trends Related to Hazards and Risk*.

A key limitation of hazard mitigation planning is that most non-agricultural drought impacts are indirect. This complicates the evaluation of assets that are vulnerable to drought hazards.

Figure 4-28 shows the NRI risk index rating for drought in Montana counties. The risk index calculation considers the expected annual losses from drought, social vulnerability, and community resilience in each county. Drought index ratings are variable for counties in the Western Region. Lake, Beaverhead, and Madison Counties are rated as *relatively moderate,* the highest risk index rating in the Western Region. Lincoln, Mineral, Missoula, Deer Lodge, and Silver Bow are rated very low, the lowest in the Western Region.

Figure 4-28 NRI Risk Index Rating for Drought



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

People

The historical and potential impacts of drought on populations include agricultural sector job loss, secondary economic losses to local businesses and public recreational resources, increased cost to local and state government for large-scale water acquisition and delivery, and water rationing and water wells running dry for individuals and families. As drought is often accompanied by prolonged periods of extreme heat, negative health impacts such as dehydration can also occur, where children and elderly are most susceptible. Other public health issues can include impaired drinking water quality, increased incidence of mosquito-borne illness, increased wildlife-human confrontations, and respiratory complications due to declined air quality in times of drought.

Farmers are likely to experience economic losses due to drought. The Montana Governor's Drought Report of May 2004 referenced the economic and societal effects of drought:

> *The state's biggest drought story remains the deepening socio-economic drought. The drought threatens to change the very fabric of Montana's rural communities and landscape. It is the final straw that can bankrupt 4th and 5th generation farmers and ranchers, placing the birthright of descendants of pioneer families on the auction block. And like the changing vistas, many of the well-established County agri-businesses are disappearing forever, along with other main street institutions.*

Exposure to drought occurs similarly across the Western Region. The vulnerability of people to that exposure is variable and is what drives the variability in drought impacts described in the opening paragraph of this subsection. Relationships between drought exposure, susceptibility, and impact are generally consistent throughout the planning area. For example, rain-fed agriculture is susceptible to the effects of drought wherever it occurs in the Western Region and when crops fail jobs are lost in a similar fashion across the Western Region. Individual annexes discuss drought vulnerabilities that are particularly important at the jurisdiction-level.

Property

Direct structural damage from drought is rare, though it can happen. Drought can affect soil shrinking and swelling cycles and can result in cracked foundations and infrastructure damage. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. There is a greater threat of structure damage in a drought-affected area due to secondary hazards because of drought. For example, drought increases the risk of wildfire and may create water shortages that inhibit adequate fire response. Additionally, heavy rains after prolonged drought conditions can result in significant flooding, which can damage property.

Critical Facilities and Lifelines

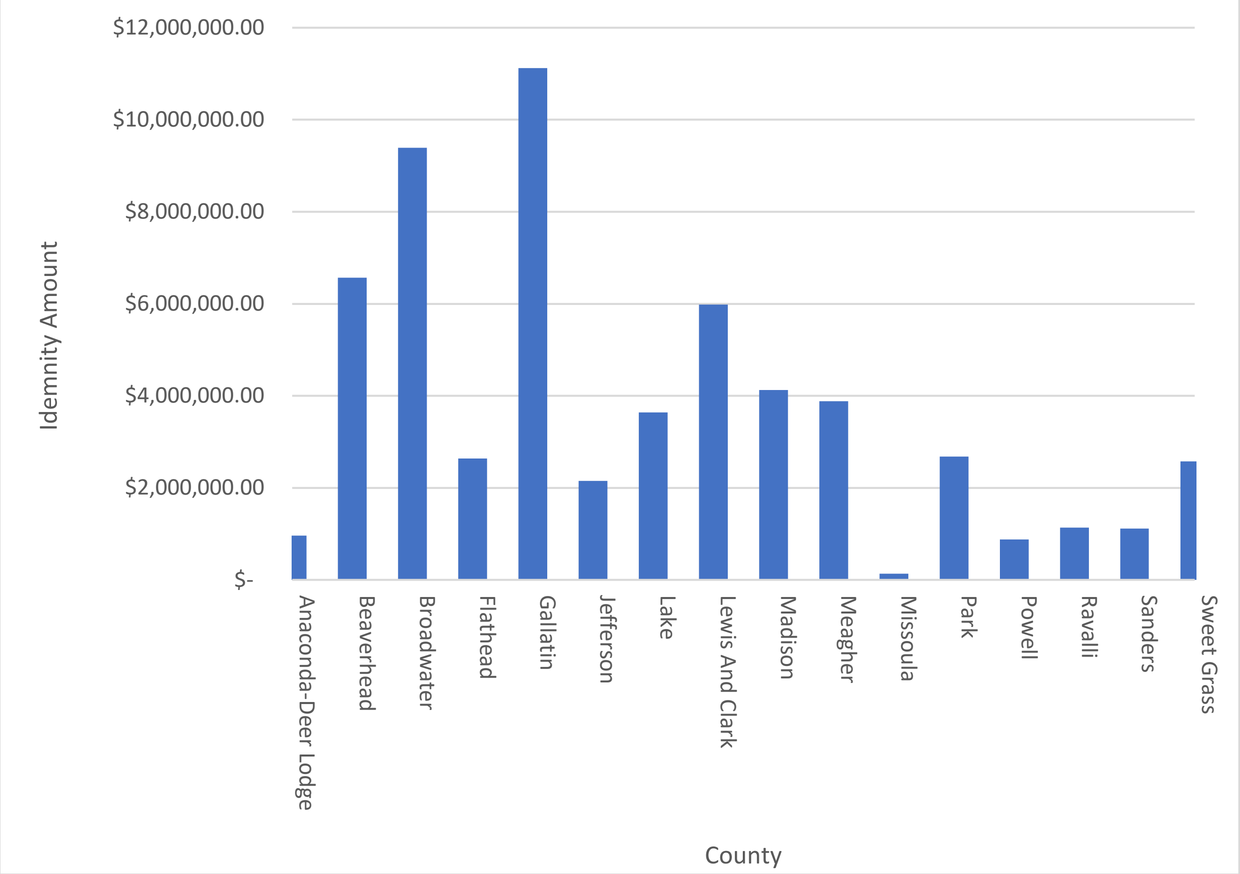
Water systems are the most susceptible to drought. Nearly all the counties in the Western Region have experienced impacts to water supply and quality due to drought (Figure 4-27). Additionally, hydroelectric power is susceptible to being reduced during periods of drought. Drought-caused reduction of biofuel seedstock, can cause energy conservation mandates. Most critical facility infrastructure is more likely to experience losses due to the secondary hazards caused by drought, such as wildfire and flooding.

Exposure to drought occurs similarly across the Western Region, especially in the long-term. Vulnerability of critical facilities and lifelines follows the pattern of susceptibility described above. In other words, everything is exposed to drought, critical facilities and lifelines that are susceptible to damage are vulnerable. The general pattern of exposure, susceptibility, and vulnerability of critical facilities and lifelines to that exposure typically holds true for each participating jurisdiction. Local variability is discussed further in the jurisdiction-specific annexes.

Economy

Economic impact will be largely associated with industries that depend on water for their business. In Western Montana, this may include ski resorts that rely on fresh and reliable snow to attract tourists. Additionally, drought can exacerbate the risk of wildfires and flooding, increase the cost of municipal water usage, and deplete water resources used for recreation. Agricultural industries will be impacted if water usage is restricted for irrigation. The Risk Management Agency (RMA) reported that from 2007-2021, $58,980,292 was lost as indemnity payments to farmers due to lost crops from drought in the Western Region. Figure 4-29 displays indemnity payments by county from 2007-2021.

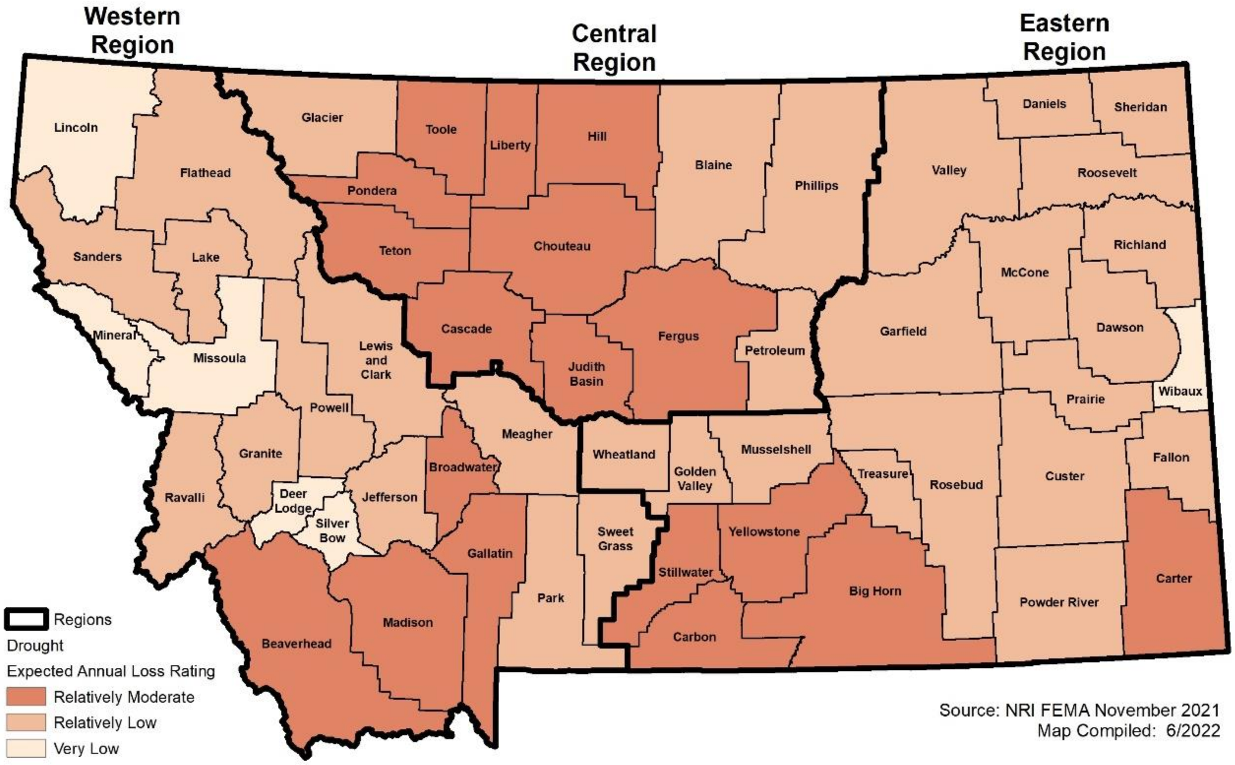
Figure 4-29 Losses to Agricultural Commodities 2007-2021



Source: RMA, Chart by WSP

Figure 4-30illustrates the relative risk of EAL rating due to drought for Montana counties based on data in the NRI. These losses are to crop agriculture only and do not include other losses such as to tourism in years with poor snowfall. Most counties in the Region have a *relatively low* or *relatively moderate* rating, while a handful of counties are rated very low, reflecting the importance of agriculture in the region.

Figure 4-30 NRI Drought Expected Annual Loss Rating



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Historic and Cultural Resources

The biggest threat to historic and cultural resources due to drought is to the long-standing farms and ranches existing in the Western Region. Past droughts have threatened to bankrupt farmers and ranchers and alter the farming tradition in the State.

The long-standing, multi-generational farms that exist in the Western Region are the greatest susceptibility of historic and cultural resources to drought. Past droughts have threatened to bankrupt farmers and ranchers and alter the farming tradition in the State. This vulnerability holds true within each participating jurisdiction, though the relative extent of this vulnerability is presumed to be proportional to agriculture present.

Natural Resources

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, air and water quality, forest and range fires, degradation of landscape quality, loss of biodiversity, and soil erosion. Some of the effects are short-term, and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

Susceptibility of natural resources to drought is most commonly associated with plants, animals, and wildlife habitat; and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration, and may even depend on it. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity, soil loss during the dust bowl years is a notable example. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

Exposure to drought occurs similarly across the Western Region. Vulnerability exists where natural resources are susceptible to drought hazards. The susceptibilities described above of natural resources to drought exist in all counties of the Western Region.

Development Trends Related to Hazards and Risk

The effect of development on vulnerability to drought is a result of either changing the assets that are exposed to drought or by changing the susceptibility of assets to drought. Neither of these factors were cause for concern among plan participants. In addition, the Montana Department of Environmental Quality (DEQ) is responsible for monitoring and regulating public water systems and they consider the impact of future development with respect to drought to be low.

While development is generally not a significant concern, variability inevitably exists throughout the planning area. Where relevant, he jurisdiction-specific annexes address these relatively isolated concerns regarding development and vulnerability to drought hazards.

4.2.6.8 Risk Summary

In summary, drought is considered to be **high** significance for the Region. Variations in risk by jurisdiction are summarized in Table 4-23.

- Frequency of drought is rated as **highly Likely** because the Western Region experiences agricultural losses from drought every year and the US Drought Monitor indicates a high frequency of drought conditions.
- Due to historic economic losses from drought in the Western Region, and large reliance on agricultural and tourism economies, the magnitude of drought is ranked as **critical**.
- Drought, like other climate hazards, occurs on a regional scale and can impact every county in the Western Region; therefore, geographic extent is rated as **extensive**.
- Drought impacts to people include public health issues such as impaired drinking water quality, increased incidence of mosquito-borne illness, an increase in wildlife-human confrontations and respiratory complications because of declined air quality in times of drought.
- Most common impacts to property from drought are damage from secondary hazards caused by drought such as flooding and wildfire, however, a direct impact from drought is structural damage resulting from lack of moisture in the soil.
- Significant economic impacts are likely to result from drought from direct damages to crops and livestock, as well as indirect economic losses from business disruptions particularly the water-dependent recreation industry including skiing, rafting, and fishing.
- Water systems are at significant risk to drought, as well as energy systems that depend on biofuels or hydropower.
- Related Hazards: Wildfire, Flooding, Severe Summer Weather.

Table 4-23 Risk Summary Table: Drought

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	High	NA	See below
Beaverhead	High	City of Dillon Town of Lima	Beaverhead County has had more USDA drought declarations than any other county in Western Montana and has a high frequency of events based and moderate EAL based on the NRI.
Broadwater	High	City of Townsend	Has a high frequency of events based and moderate EAL based on the NRI.
Butte-Silver Bow County	Medium	City of Butte Town of Walkerville	None
Confederated Salish and Kootenai Tribes of the Flathead Reservation	High		In 2021, Energy Keepers of the Confederated Salish and Kootenai Tribes began refilling Flathead Lake earlier than scheduled due to a historically dry season.
Flathead	High	City of Columbia Falls City of Kalispell Town of Whitefish	None
Granite County	High	Town of Drummond Town of Philipsburg	None
Jefferson	High	City of Boulder Town of Whitehall	Poor crop yields due to drought have been reported in 2021 and 2022.
Lake	Medium	City of Polson City of Ronan Town of St. Ignatius	None
Lewis and Clark	High	City of Helena City of East Helena	None
Lincoln	Medium	City of Libby City of Troy Town of Eureka Town of Rexford	Lincoln County is the only county in Western Montana with no reported drought impacts on water supply and quality.
Madison	High	Town of Ennis Town of Sheridan Town of Twin Bridges Virginia City	Madison County has had the most reported impacts due to drought in Western Montana. Ranchers have reported selling off cattle due to lack of forage and groundwater. Has a high frequency of events based and moderate EAL based on the NRI.
Meagher	High	City of White Sulphur Springs	None
Mineral	Medium	Town of Superior Town of Alberton	None
Park	Medium	City of Livingston Town of Clyde Park	None
Powell	High	City of Deer Lodge	None
Ravalli	High	City of Hamilton Town of Darby Town of Stevensville Town of Pinesdale	None
Sanders	High	City of Thompson Fall Town of Plains	None

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
		Town of Hot Springs	
Sweet Grass	Medium	City of Big Timber	Lincoln and Sweet Grass Counties have had the fewest drought declarations of all counties in Western Montana.

4.2.7 Earthquake

4.2.7.1 Hazard/Problem Description

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a volcanic eruption or by the sudden dislocation of the crust, which is the cause of most destructive earthquakes. 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. Disruption of communications, electrical power supplies and gas, sewer, and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides, uneven ground settling, flooding, and releases of hazardous material, resulting in damage to homes, buildings, power and telephone infrastructure, roads, tunnels, and railways, further 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. Thousands of faults have been mapped in Montana, but scientists think only about 95 of these faults have been active in the past 1.6 million years (the Quaternary Period). Although it has been over six decades since the last destructive earthquake in Montana, small earthquakes are common in the Region, occurring at an average rate of 4-5 earthquakes per day. Scientists continue to study faults in Montana to determine future earthquake potential.

A "great" earthquake is defined as any earthquake classified as a magnitude 8 or larger on the Richter scale. Montana has not experienced a great earthquake in recorded history. A great earthquake is not likely in Montana, but a major earthquake (magnitude 7.0-7.9) occurred near Hebgen Lake in Madison County in 1959 and dozens of active faults have generated magnitude 6.5-7.5 earthquakes during recent geologic time.

Liquefaction is the process by which water-saturated sediment temporarily loses strength due to strong ground shaking and acts as a fluid. Buildings and road foundations may lose load-bearing strength and cause major damage if liquefaction occurs beneath them. The increased water pressure that accompanies liquefaction can also cause landslides and dam failure.

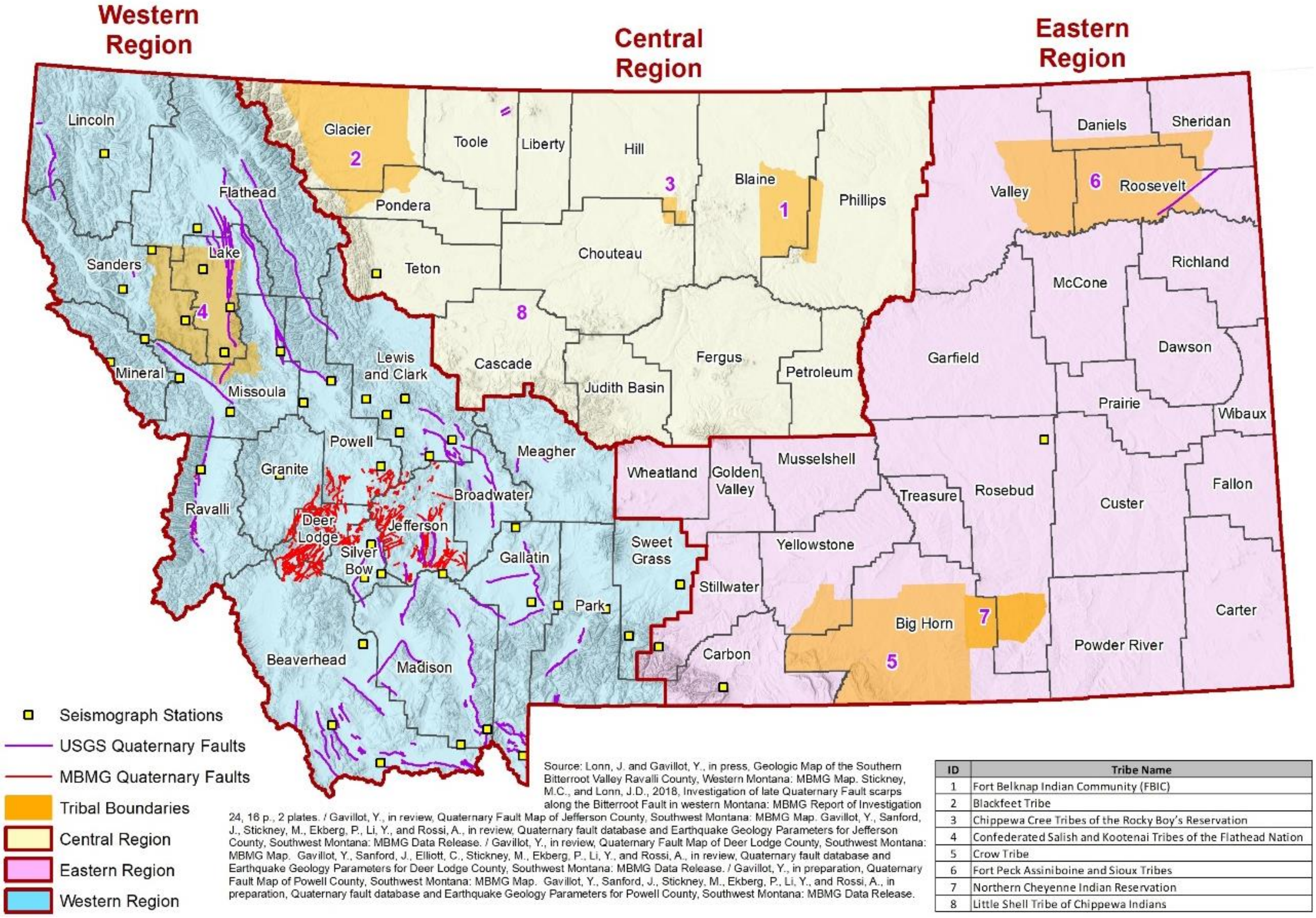
Seismic events may lead to landslides, uneven ground settling, flooding, and damage to homes, dams, levees, buildings, power and telephone lines, roads, tunnels, and railways. Broken natural gas lines may also lead to fires as a cascading hazard.

4.2.7.2 Geographical Area Affected

The geographic extent of earthquakes in the planning area is **extensive**. Montana is one of the most seismically active states in the United States according to the USGS. There is a belt of seismicity known as the Intermountain Seismic Belt which extends through Western Montana. This Intermountain Seismic Belt ranges from the Flathead Lake Region in the northwest corner of the State to the Yellowstone National Park Region. Since 1925, the State has experienced five shocks that reached intensity VIII or greater (modified Mercalli Scale, discussed in Section 4.2.7.6). During the same interval, hundreds of less severe tremors were felt within the State. Montana's earthquake activity is concentrated mostly in the mountainous western third of the State, which lies within the Intermountain Seismic Belt.

All of the Western Region could be impacted by earthquakes, but the probability of a damaging earthquake is greater in the counties that contain faults (Figure 4-31) especially where soils are susceptible to liquefaction (Figure 4-32). These two maps suggest that the highest risk counties in the Western Region are in the southwest portion of Region, including Beaverhead, Madison, Butte-Silver Bow, Jefferson, and Broadwater Counties. Additionally, counties located in the northern portion of the Rocky Mountains are likely to experience earthquakes as well, specifically Flathead and Lake Counties. Seismic events may lead to landslides, uneven ground settling, flooding, and damage to homes, dams, levees, buildings, power and telephone lines, roads, tunnels, and railways. Broken natural gas lines may also ignite fires as a cascading hazard.

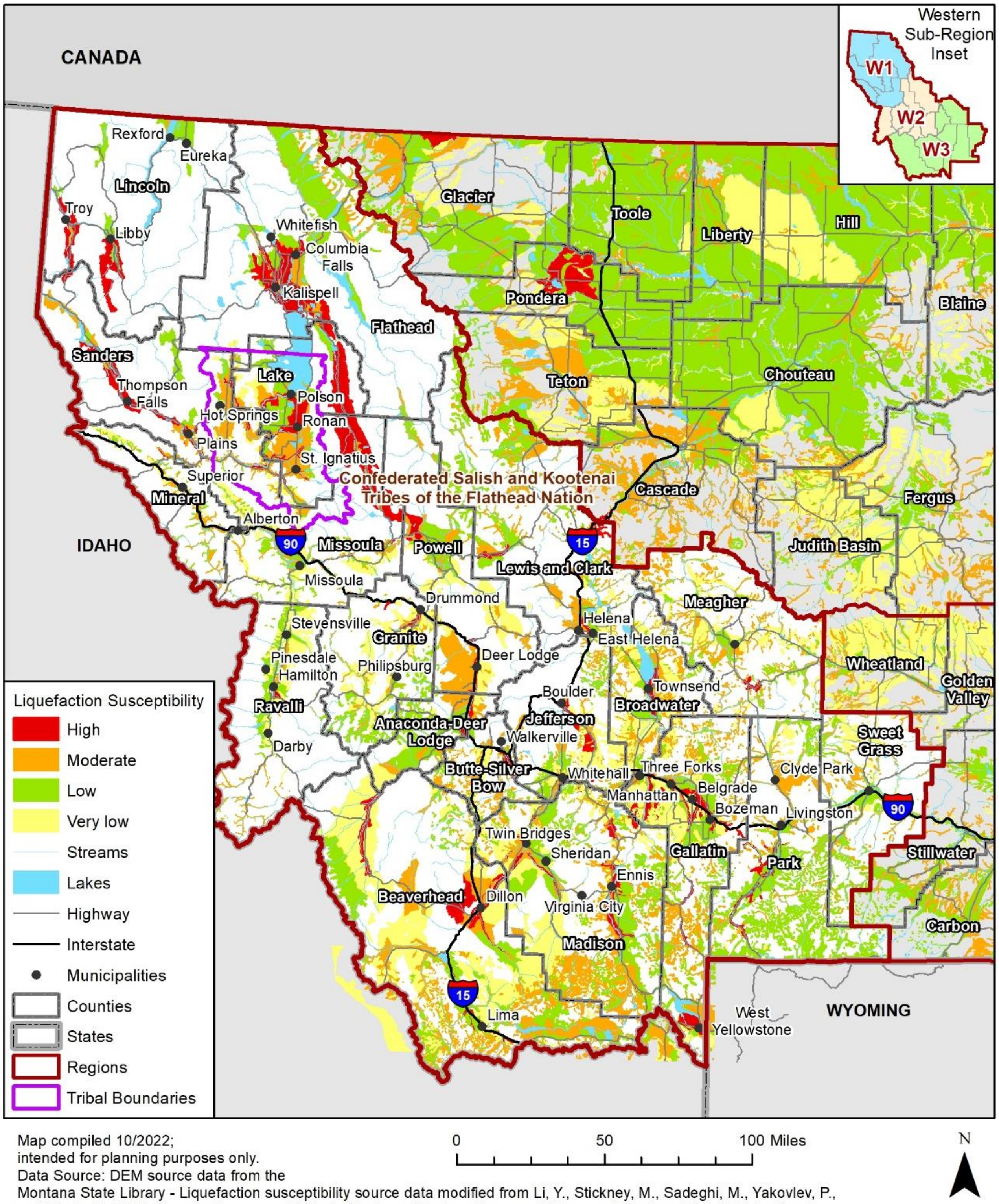
Figure 4-31 Fault Map of Montana



Source: Lonn, J. and Gavillot, Y., in press, Geologic Map of the Southern Bitterroot Valley Ravalli County, Western Montana: MBMG Map. Stickney, M.C., and Lonn, J.D., 2018, Investigation of late Quaternary Fault scarps along the Bitterroot Fault in western Montana: MBMG Report of Investigation 24, 16 p., 2 plates. / Gavillot, Y., in review, Quaternary Fault Map of Jefferson County, Southwest Montana: MBMG Map. Gavillot, Y., Sanford, J., Stickney, M., Ekberg, P., Li, Y., and Rossi, A., in review, Quaternary fault database and Earthquake Geology Parameters for Jefferson County, Southwest Montana: MBMG Data Release. / Gavillot, Y., in review, Quaternary Fault Map of Deer Lodge County, Southwest Montana: MBMG Map. Gavillot, Y., Sanford, J., Elliott, C., Stickney, M., Ekberg, P., Li, Y., and Rossi, A., in review, Quaternary fault database and Earthquake Geology Parameters for Deer Lodge County, Southwest Montana: MBMG Data Release. / Gavillot, Y., in preparation, Quaternary Fault Map of Powell County, Southwest Montana: MBMG Map. Gavillot, Y., Sanford, J., Stickney, M., Ekberg, P., Li, Y., and Rossi, A., in preparation, Quaternary fault database and Earthquake Geology Parameters for Powell County, Southwest Montana: MBMG Data Release.

ID	Tribe Name
1	Fort Belknap Indian Community (FBIC)
2	Blackfeet Tribe
3	Chippewa Cree Tribes of the Rocky Boy's Reservation
4	Confederated Salish and Kootenai Tribes of the Flathead Nation
5	Crow Tribe
6	Fort Peck Assiniboine and Sioux Tribes
7	Northern Cheyenne Indian Reservation
8	Little Shell Tribe of Chippewa Indians

Figure 4-32 Liquefaction Map of the Western Region

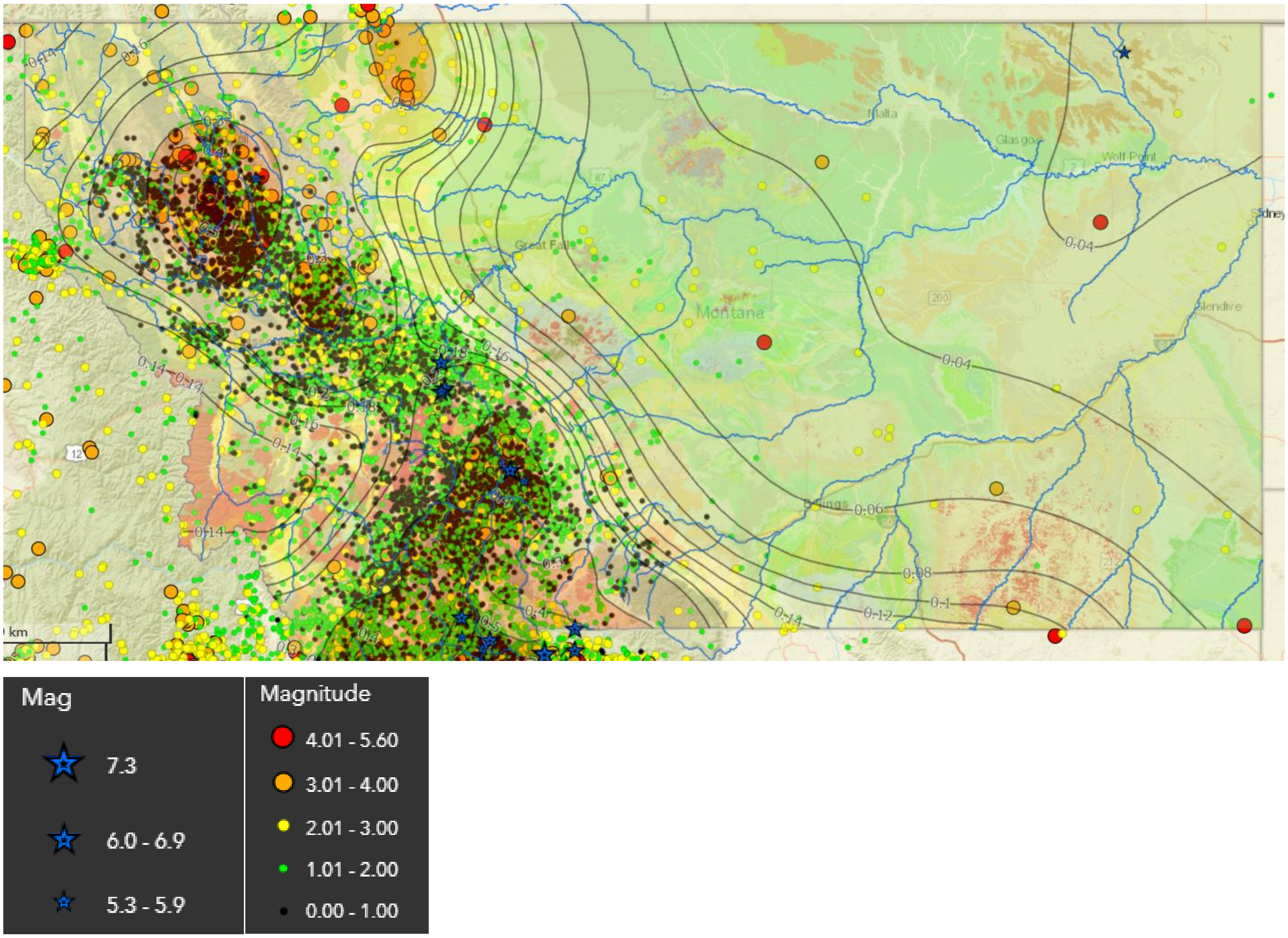


Map compiled 10/2022;
intended for planning purposes only.
Data Source: DEM source data from the
Montana State Library - Liquefaction susceptibility source data modified from Li, Y., Stickney, M., Sadeghi, M., Yakovlev, P., and Thale, P., 2021, Liquefaction susceptibility in Montana: Montana Bureau of Mines and Geology Digital Publication 4

4.2.7.3 Past Occurrences

The Montana Bureau of Mines and Geology records the magnitude of historic earthquake events across Montana. In the Western Region, there have been various severe earthquakes with a magnitude above 5.3, indicated by stars in Figure 4-33. These severe types of earthquakes can cause structural damage, injuries, and even death.

Figure 4-33 Statewide Map of Earthquake Epicenters



Source: Montana Bureau of Mines and Geology (https://mbmg.mtech.edu/mapper/mapper.asp?view=Quakes&).

The overwhelming majority of past recorded earthquakes in Montana have occurred in the Western Region, far outpacing the rest of the state. The strongest and deadliest of these events was the 1959 Hebgen Lake earthquake. The event occurred with a magnitude of 7.2, and a MMI maximum intensity of X (Extreme). This event also resulted in numerous large aftershocks in southwestern Montana and northwestern Wyoming over the following days. This earthquake resulted in 28 confirmed fatalities and about $11 million (equivalent to $110 million in 2022) in damages. The following excerpt is from the USGS impact summary for the event:

> *The most spectacular and disastrous effect of the earthquake was the huge avalanche of rock, soil and trees that cascaded from the steep south wall of the Madison River Canyon. This slide formed a barrier that blocked the gorge and stopped the flow of the Madison River and, within a few weeks, created a lake almost 53 meters deep. The volume of material that blocked the Madison River below*

> *Hebgen Dam has been estimated at 28 - 33 million cubic meters. Most of the 28 deaths were caused by rockslides that covered the Rock Creek public campground on the Madison River, about 9.5 kilometers below Hebgen Dam.*

As shown in Table 4-24, since 1900 there have been 41 earthquakes of Magnitude 4.5 or greater that have been centered in the Western Region counties, listed by magnitude. Due to the high seismic activity in Yellowstone National Park, it is very likely for shaking and impacts to be felt in the southern counties of the Western Region resulting from earthquakes centered in Wyoming. However, this table only includes events specifically centered in the Western Region. Where relevant, additional details on specific past events are provided in the respective county annexes.

Table 4-24 Western Region Earthquakes of Magnitude 4.5 or Greater, 1900-2023

Date	Magnitude	Location
August 18, 1959	7.3	The 1959 Hebgen Lake Earthquake, Montana
June 28, 1925	6.6	12 km ENE of Ponderosa Pines, Montana
October 19, 1935	6.1	12 km N of Winston, Montana
November 23, 1947	6.1	30 km SSW of Big Sky, Montana
October 31, 1935	5.9	6 km E of Montana City, Montana
October 12, 1935	5.9	2 km ENE of Helena, Montana
July 6, 2017	5.8	11 km SE of Lincoln, Montana
July 26, 2005	5.6	16 km N of Dillon, Montana
February 16, 1929	5.6	9 km NE of Ponderosa Pines, Montana
April 1, 1952	5.5	Western Montana
December 13, 1926	5.4	14 km ENE of Ponderosa Pines, Montana
April 19, 1910	5.4	2 km E of Butte, Montana
March 11, 1977	5.2	26 km WNW of Hebgen Lake Estates, Montana
October 21, 1964	5.2	32 km WNW of Hebgen Lake Estates, Montana
August 20, 1999	5.1	22 km NW of Lima, Montana
January 6, 1965	5.1	19 km NW of Lima, Montana
July 6, 2017	5	15 km S of Lincoln, Montana
August 20, 1959	5	39 km W of Hebgen Lake Estates, Montana
August 19, 1959	5	31 km W of Hebgen Lake Estates, Montana
November 28, 1935	5	2 km ENE of Helena, Montana
June 9, 1974	4.9	11 km ENE of Hebgen Lake Estates, Montana
October 8, 1965	4.9	8 km SW of Hebgen Lake Estates, Montana
February 29, 1928	4.9	4 km NNW of Clancy, Montana
April 1, 1985	4.8	21 km ENE of Seeley Lake, Montana
March 7, 1966	4.8	2 km SE of Townsend, Montana
December 22, 1998	4.7	Idaho-Montana border region
October 19, 1977	4.7	49 km W of Hebgen Lake Estates, Montana
April 1, 1969	4.7	4 km NNW of Dayton, Montana
August 19, 1959	4.7	32 km W of Hebgen Lake Estates, Montana
April 9, 2019	4.6	9 km NE of Lima, Montana
October 26, 1982	4.6	44 km W of Hebgen Lake Estates, Montana

Date	Magnitude	Location
May 8, 1979	4.6	15 km W of Hebgen Lake Estates, Montana
March 11, 1977	4.6	6 km SSW of Toston, Montana
February 4, 1975	4.6	12 km E of Evergreen, Montana
October 14, 1964	4.6	4 km NNW of Dayton, Montana
October 9, 1964	4.6	2 km ESE of Lindisfarne, Montana
October 31, 2005	4.5	21 km N of Leadore, Idaho
April 23, 1978	4.5	12 km WSW of Ovando, Montana
August 27, 1977	4.5	15 km NW of Three Forks, Montana
April 1, 1969	4.5	4 km NNE of Lake Mary Ronan, Montana
February 16, 1963	4.5	Western Montana

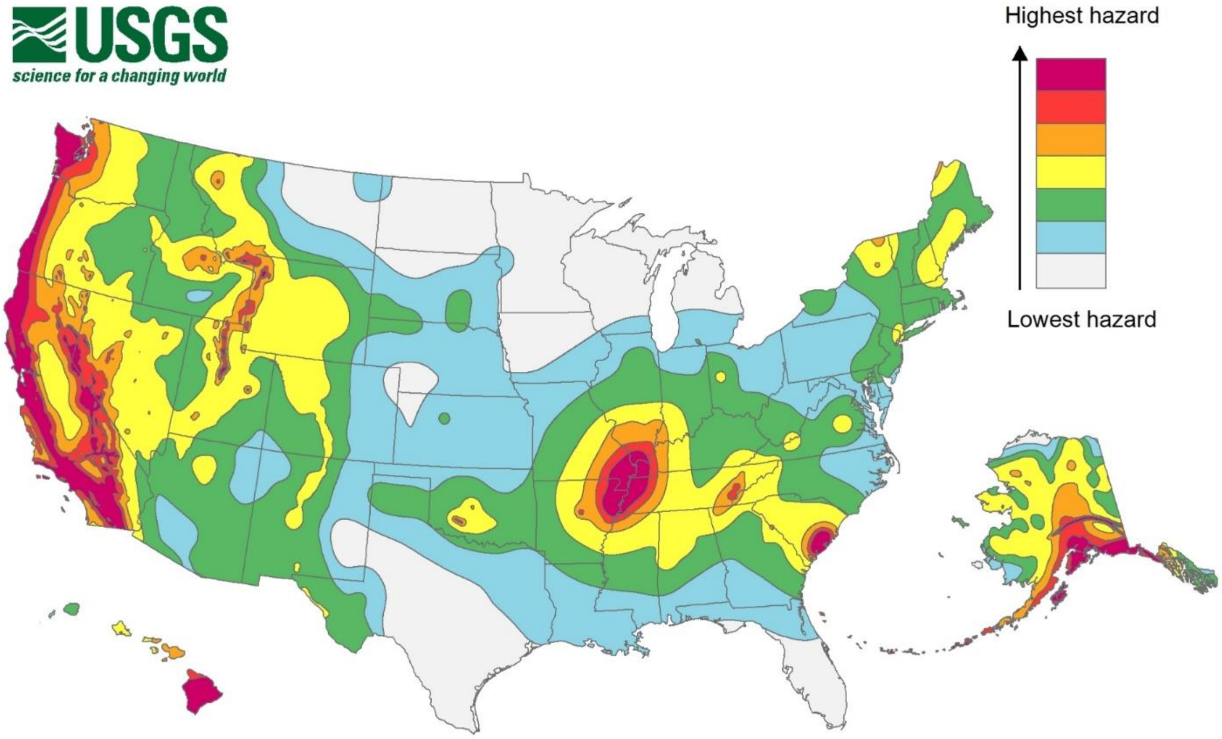
Source: USGS Earthquake Catalog, Earthquake Hazards Program (https://earthquake.usgs.gov/earthquakes/search/)

4.2.7.4 Frequency/Likelihood of Occurrence

The frequency of earthquakes in the Western Region is ranked as **likely**. Earthquakes will continue to occur in Montana; however, the precise time, location, and magnitude of future events cannot be predicted. As discussed above, earthquake hazard areas in Montana are concentrated in the western portion of the State, which is part of the Intermountain Seismic Belt. The Western Region will experience a greater frequency of earthquake events than the Central or Eastern Region in Montana.

The U.S. Geological Survey (USGS) issues National Seismic Hazard Maps that quantify the spatial distribution of the magnitude of seismic hazards (Figure 4-34). USGS also produces maps of peak ground accelerations having a 2 percent probability of being exceeded in various time period, for a firm rock site. These maps are based on seismicity and fault-slip rates and consider the frequency of earthquakes of various magnitudes. Until recently, the 500-year map was often used for planning purposes for average structures and was the basis of the most current Uniform Building Code. The current International Building Code, however, uses a 2,500-year map as the basis for building design.

Figure 4-34 USGS Long-Term National Seismic Hazard Map



Source: USGS

4.2.7.5 Climate Change Considerations

Global climate change is not anticipated to affect earthquake hazards in the planning area.

4.2.7.6 Potential Magnitude and Severity

The expected magnitude of earthquakes in the Western Region is **critical**. 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. Damage and loss of life can be particularly devastating in communities where buildings were not designed to withstand seismic forces (e.g., historic structures). Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, rock falls, liquefaction, fires, dam failure, and hazardous materials (HAZMAT) incidents.

The severity of an earthquake event can be measured in the following terms:

- How hard did the ground shake?
- How did the ground move (horizontally or vertically)?
- How stable was the soil?
- What is the fragility of the built environment in the area of impact?

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity. A comparison of magnitude and intensity is shown in Figure 4-25 below.

Table 4-25 Magnitude and Modified Mercalli Scales for Measuring Earthquakes

Magnitude	Modified Mercalli Intensity
1.0 – 3.0	I
3.0 – 3.9	II, III
4.0 – 4.9	IV – V
5.0 – 5.9	VI – VII
6.0 – 6.0	VII – IX
7.0 and higher	VIII or higher

Source: USGS Earthquake Hazards Program

Magnitude

Magnitude measures the energy released at the source of the earthquake and is measured by a seismograph. Currently the most used magnitude scale is the moment magnitude (Mw) scale, with the follow classifications of magnitude:

- Great—Mw > 8.
- Major—Mw = 7.0 – 7.9.
- Strong—Mw = 6.0 – 6.9.
- Moderate—Mw = 5.0 – 5.9.
- Light—Mw = 4.0 – 4.9.
- Minor—Mw = 3.0 – 3.9.
- Micro—Mw < 3.

Estimates of Mw scale roughly match the local magnitude scale (ML), commonly called the Richter scale. One advantage of the Mw scale is that, unlike other magnitude scales, it does not saturate at the upper end. That is, there is no value beyond which all large earthquakes have about the same magnitude. For this reason, Mw scale is now the most often used estimate of large earthquake magnitudes.

Intensity

Intensity is a measure of the shaking produced by an earthquake at a certain location and is based on felt affects. Currently the most used intensity scale is the modified Mercalli intensity scale, with ratings defined as follows (US Geological Survey [USGS] 1989):

Table 4-26 Modified Mercalli Intensity (MMI) Scale

Magnitude	Mercalli Intensity	Effects	Frequency
Less than 2.0	I	Micro-earthquakes, not felt or rarely felt; recorded by seismographs.	Continual
2.0-2.9	I to II	Felt slightly by some people; damages to buildings.	Over 1M per year
3.0-3.9	II to IV	Often felt by people; rarely causes damage; shaking of indoor objects noticeable.	Over 100,000 per year
4.0-4.9	IV to VI	Noticeable shaking of indoor objects and rattling noises; felt by most people in the affected area; slightly felt outside; generally, no to minimal damage.	10K to 15K per year
5.0-5.9	VI to VIII	Can cause damage of varying severity to poorly constructed buildings; at most, none to slight damage to all other buildings. Felt by everyone.	1K to 1,500 per year
6.0-6.9	VII to X	Damage to a moderate number of well-built structures in populated areas; earthquake-resistant structures survive	100 to 150 per year

Magnitude	Mercalli Intensity	Effects	Frequency
		with slight to moderate damage; poorly designed structures receive moderate to severe damage; felt in wider areas; up to hundreds of miles/kilometers from the epicenter; strong to violent shaking in epicenter area.	
7.0-7.9	VIII<	Causes damage to most buildings, some to partially or completely collapse or receive severe damage; well-designed structures are likely to receive damage; felt across great distances with major damage mostly limited to 250 km from epicenter.	10 to 20 per year
8.0-8.9	VIII<	Major damage to buildings, structures likely to be destroyed; will cause moderate to heavy damage to sturdy or earthquake-resistant buildings; damaging in large areas; felt in extremely large regions.	One per year
9.0 and Greater	VIII<	At or near total destruction - severe damage or collapse to all buildings; heavy damage and shaking extends to distant locations; permanent changes in ground topography.	One per 10-50 years

Source: USGS Earthquake Hazards Program

4.2.7.7 Vulnerability Assessment

The earthquake *Vulnerability Assessment* identifies, or at least discusses, *assets* that are both *likely to be exposed* to earthquake, *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with earthquake hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience earthquake hazards. *Susceptible* indicates a strong likelihood of damage from exposure to earthquake hazards and is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is not known to affect earthquake hazards and is not considered further. However, vulnerability under future development conditions is considered below in the subsection titled, *Development Trends Related to Hazards and Risk*.

Numerous factors contribute to determining areas of vulnerability such as historical earthquake occurrence, proximity to faults, soil characteristics, building construction, and population density. Earthquake vulnerability data was generated during the 2022 planning process using a Level 1 Hazus-MH analysis for the Western Region. 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. Details specific to the Hazus analysis for each county are provided in each county’s respective annex. Missoula and Gallatin Counties were not included in the Hazus analysis, as these counties did not participate in the planning process.

The HAZUS analysis also incorporates information on what assets are susceptible to earthquake damage and provides information on earthquake vulnerability. The results of the HAZUS analysis are discussed further in the asset-specific subsections, below.

The role of climate change in future vulnerability to earthquake is discussed above in the section titled, *Climate Change Considerations* and notes climate change effects on earthquake hazards are not anticipated or known to exist in the planning area. The effect of future development on earthquake risk is considered below in the section titled *Development Trends Related to Hazards and Risk.*

People

The entire population of the Western Region is within an earthquake hazard area and is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, such as the soil type their homes are constructed on, and their proximity to fault location and earthquake epicenter. The degree of susceptibility to earthquake hazards is also dependent on various factors, such as the age and construction type of the structures people live in.

Impacts on persons and households in the planning area were estimated for the entire Region for a 2,500-Year Probabilistic Earthquake (Table 4-27). Based on this analysis, over 1,600 people would be displaced from their homes and in need of shelter after a significant earthquake in the Western Region.

Additionally, the model simulation estimated that in a 2 p.m. time of occurrence scenario, which is likely to be a worst-case scenario, that there would be a total of 2,382 injuries across the Region. Of these injuries, 1,823 would not require hospitalization, 483 would require hospitalization but would not be life threatening, and 76 considered life threatening injuries. The model also estimates that 147 people would be killed. There could be increased risk of damage or injury from rock fall or landslides to travelers, hikers, and others recreating outdoors at the time of the earthquake. More detailed descriptions of the numbers of estimated casualties in the Region under the various time of occurrence scenarios are available in the county and tribal annexes.

Table 4-27 Estimated Earthquake Impacts on Persons and Households

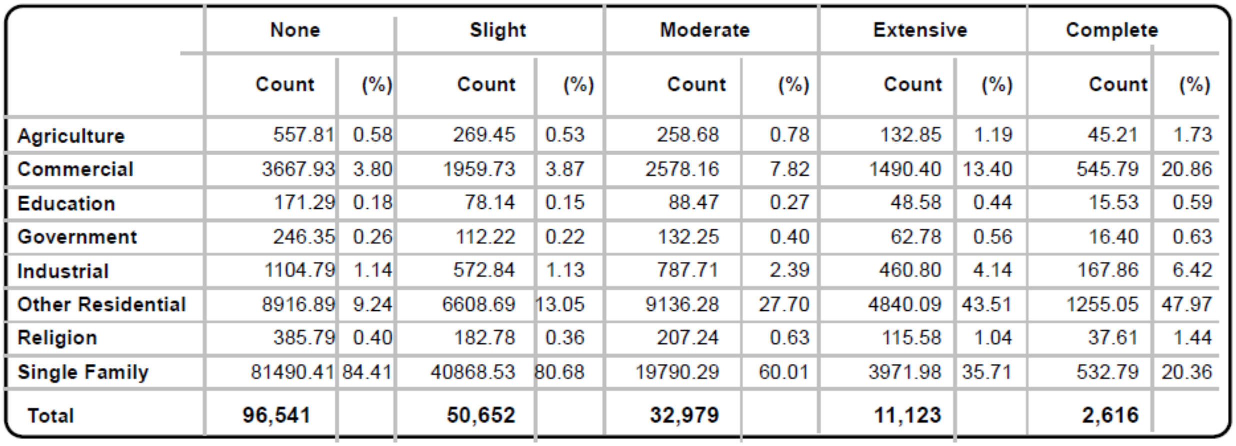
Scenario	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
2,500-Year Earthquake	2,809	1,612

Source: Hazus-MH 6.0 Global Summary Report, WSP Analysis

Property

The Hazus simulation results estimate 193,000 buildings with a total replacement value of over $39.8 billion dollars exist in the Western Region and are exposed to seismic hazards. Most of the buildings and associated building value are residential. Simulation results indicate 97,370 (50.2%) of the buildings in the planning area will experience some level of damage, including complete destruction of 2,616 buildings.

Table 4-28 Estimated Building Damage by Occupancy



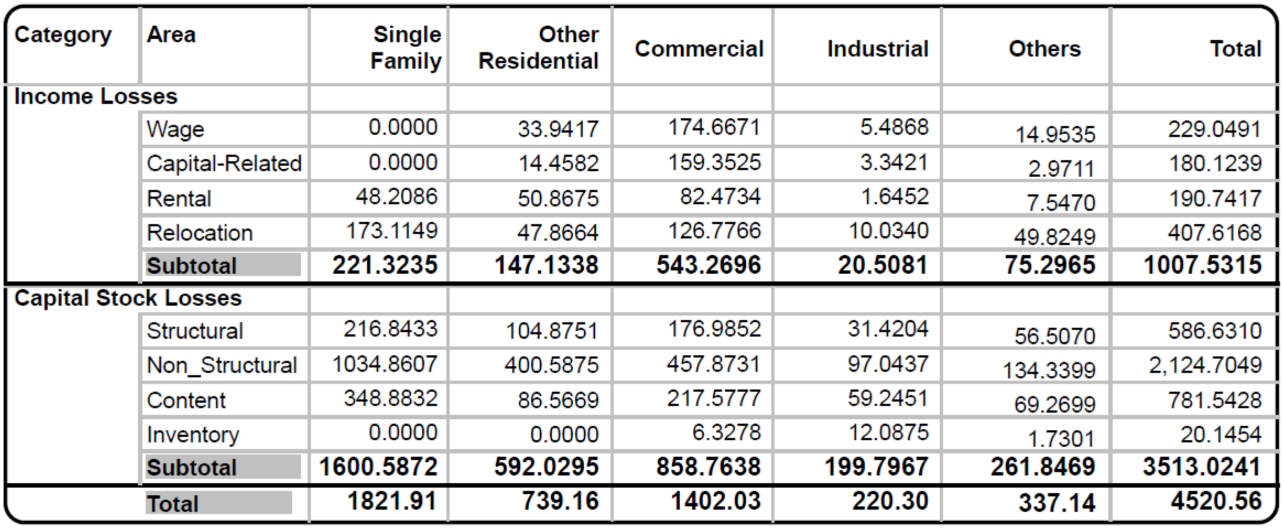
	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	557.81	0.58	269.45	0.53	258.68	0.78	132.85	1.19	45.21	1.73
Commercial	3667.93	3.80	1959.73	3.87	2578.16	7.82	1490.40	13.40	545.79	20.86
Education	171.29	0.18	78.14	0.15	88.47	0.27	48.58	0.44	15.53	0.59
Government	246.35	0.26	112.22	0.22	132.25	0.40	62.78	0.56	16.40	0.63
Industrial	1104.79	1.14	572.84	1.13	787.71	2.39	460.80	4.14	167.86	6.42
Other Residential	8916.89	9.24	6608.69	13.05	9136.28	27.70	4840.09	43.51	1255.05	47.97
Religion	385.79	0.40	182.78	0.36	207.24	0.63	115.58	1.04	37.61	1.44
Single Family	81490.41	84.41	40868.53	80.68	19790.29	60.01	3971.98	35.71	532.79	20.36
Total	**96,541**		**50,652**		**32,979**		**11,123**		**2,616**	

Source: Hazus-MH Global Summary Report, WSP Analysis

The Hazus simulation results provide estimates for two categories of building-related losses, direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

For the 2,500-year probabilistic earthquake scenario, the total building related losses for the entire planning area is an estimated $4.52 billion. Of this total, direct building losses are estimated at $3.51 billion and $1.01 billion in income-related losses, shown in. The Hazus analysis also estimated the amount of earthquake-caused debris in the planning area for the 2,500-Year probabilistic earthquake scenario event, which is estimated to be 1.2 million tons. A map of these losses per county is shown in Figure 4-35, indicating that Lake and Flathead Counties are most likely to experience direct economic losses from an earthquake event.

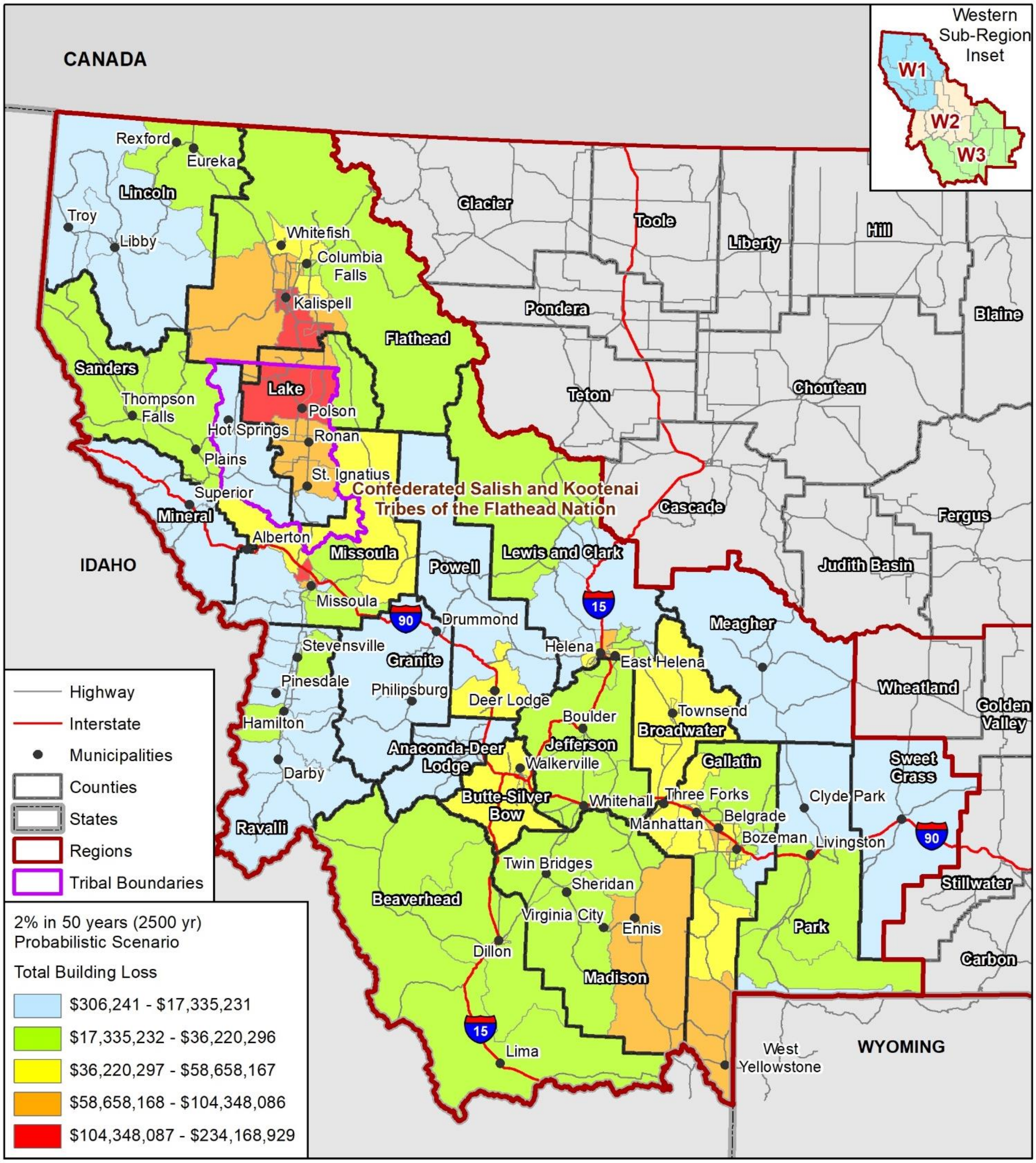
Table 4-29 Hazus Building Related Economic Loss Estimates for 2,500-Year Scenario (Millions of Dollars)



Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	33.9417	174.6671	5.4868	14.9535	229.0491
	Capital-Related	0.0000	14.4582	159.3525	3.3421	2.9711	180.1239
	Rental	48.2086	50.8675	82.4734	1.6452	7.5470	190.7417
	Relocation	173.1149	47.8664	126.7766	10.0340	49.8249	407.6168
	Subtotal	**221.3235**	**147.1338**	**543.2696**	**20.5081**	**75.2965**	**1007.5315**
Capital Stock Losses							
	Structural	216.8433	104.8751	176.9852	31.4204	56.5070	586.6310
	Non_Structural	1034.8607	400.5875	457.8731	97.0437	134.3399	2,124.7049
	Content	348.8832	86.5669	217.5777	59.2451	69.2699	781.5428
	Inventory	0.0000	0.0000	6.3278	12.0875	1.7301	20.1454
	Subtotal	**1600.5872**	**592.0295**	**858.7638**	**199.7967**	**261.8469**	**3513.0241**
	Total	**1821.91**	**739.16**	**1402.03**	**220.30**	**337.14**	**4520.56**

Source: Hazus-MH Global Summary Report, WSP Analysis

Figure 4-35 Western Region Hazus 2,500-Year Probabilistic Scenario Direct Economic Loss



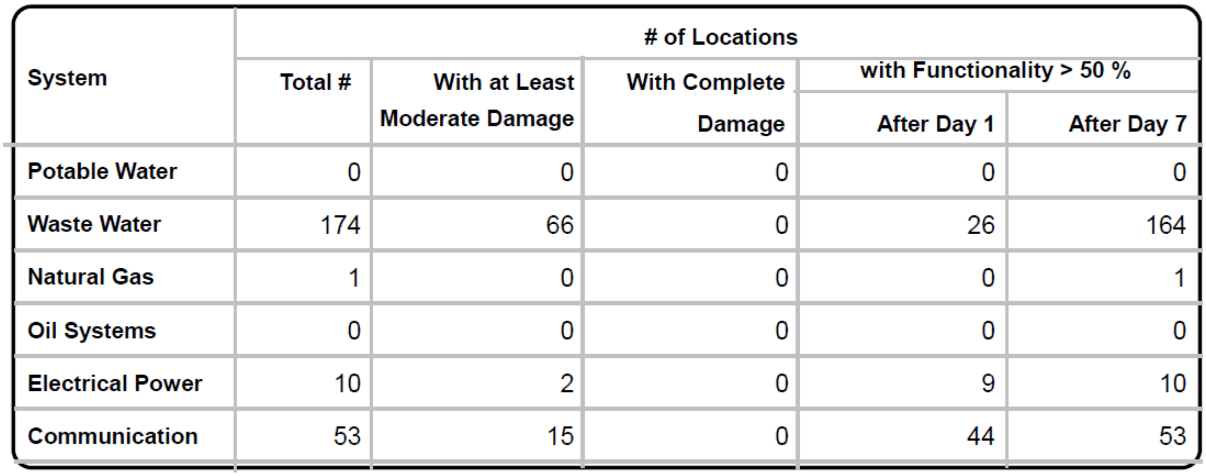
Map compiled 10/2022;
intended for planning purposes only.
Data Source: Montana State Library, Hazus 5.1

Critical Facilities and Lifelines

All critical facilities and infrastructure in the planning area are exposed to earthquakes. 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.

Hazus-MH simulation results classify the vulnerability of essential facilities to earthquake damage two ways, as experiencing at least moderate damage or complete damage. Simulation results indicate at least moderate damages to 38% of the wastewater facilities, 20% of electrical power facilities, and 28% of communication facilities in the Western Region. No facilities would be completely damaged.

Table 4-30 Expected Utility System Facility Damage in the Western Region



System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	174	66	0	26	164
Natural Gas	1	0	0	0	1
Oil Systems	0	0	0	0	0
Electrical Power	10	2	0	9	10
Communication	53	15	0	44	53

Source: Hazus-MH Global Summary Report, WSP Analysis

Results also anticipate pipeline breaks and leaks in the county's potable water, wastewater, and natural gas lines. Across these linear networks, the earthquake is expected to cause 18,614 pipeline leaks and 4,653 complete fractures in the potable water, wastewater, and natural gas systems. This is expected to leave 5,428 households without potable water service on the first day of the earthquake. The model also estimates lifeline damages to linear networks such as transportation and utilities. Damage to the transportation system is estimated at $29.9 billion and utility lifelines at $35 billion. The steep terrain in the western counties of the Region would likely experience multiple rockslides that could damage roadways and disrupt traffic along the rail, highway, and road corridors.

Economy

Economic impacts of an earthquake could be staggering in the impacted areas due to direct damage to property, infrastructure, and inventory, and additional losses incurred by businesses forced to close temporarily or permanently.

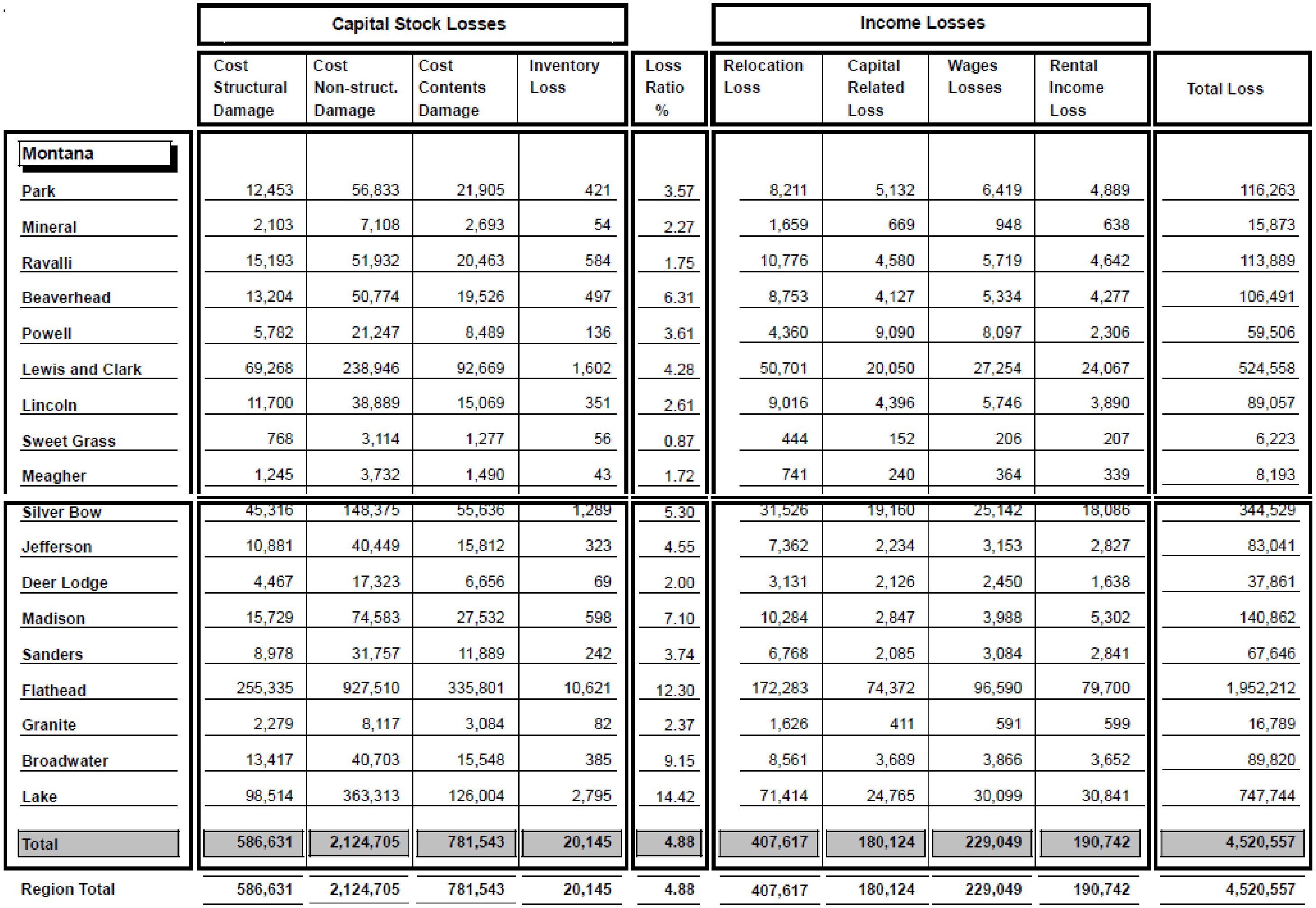
Table 4-31 summarizes impacts to the Western Region from the Hazus-MH simulation. Table 4-32 summarizes the simulated direct economic losses by county in the Western Region. While Flathead County would experience the greatest total direct losses from an earthquake event, Lake County has the greatest loss ratio.

Table 4-31 Hazus-MH Earthquake Loss Estimation 2,500-Year Scenario Results

Type of Impact	Impacts to Region
Total Buildings Damaged	Slight: 50,652 Moderate: 32,979 Extensive: 11,123 Complete: 2,616
Building and Income-Related Losses	$4.52 billion 57% of damage related to residential structures 22% of loss due to business interruption
Total Economic Losses (includes building, income, and lifeline losses)	Total: $9.09 billion Building: $4.52 billion Income: $1.01 billion Lifeline losses: $167 million
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 658 Requiring hospitalization: 120 Life threatening: 11 Fatalities: 20
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 1,823 Requiring hospitalization: 483 Life threatening: 76 Fatalities: 147
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 1,234 Requiring hospitalization: 320 Life threatening: 60 Fatalities: 92
Fire Following Earthquake	0 Ignitions
Debris Generation	1.2 million tons of debris generated 48,760 estimated truckloads to remove
Displaced Households	2,809
Shelter Requirements	1,612

Source: Hazus-MH Global Summary Report, WSP Analysis

Table 4-32 Direct Economic Losses by County (In thousands of Dollars)



	Capital Stock Losses					Income Losses				
	Cost Structural Damage	Cost Non-struct. Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Montana										
Park	12,453	56,833	21,905	421	3.57	8,211	5,132	6,419	4,889	116,263
Mineral	2,103	7,108	2,693	54	2.27	1,659	669	948	638	15,873
Ravalli	15,193	51,932	20,463	584	1.75	10,776	4,580	5,719	4,642	113,889
Beaverhead	13,204	50,774	19,526	497	6.31	8,753	4,127	5,334	4,277	106,491
Powell	5,782	21,247	8,489	136	3.61	4,360	9,090	8,097	2,306	59,506
Lewis and Clark	69,268	238,946	92,669	1,602	4.28	50,701	20,050	27,254	24,067	524,558
Lincoln	11,700	38,889	15,069	351	2.61	9,016	4,396	5,746	3,890	89,057
Sweet Grass	768	3,114	1,277	56	0.87	444	152	206	207	6,223
Meagher	1,245	3,732	1,490	43	1.72	741	240	364	339	8,193
Silver Bow	45,316	148,375	55,636	1,289	5.30	31,526	19,160	25,142	18,086	344,529
Jefferson	10,881	40,449	15,812	323	4.55	7,362	2,234	3,153	2,827	83,041
Deer Lodge	4,467	17,323	6,656	69	2.00	3,131	2,126	2,450	1,638	37,861
Madison	15,729	74,583	27,532	598	7.10	10,284	2,847	3,988	5,302	140,862
Sanders	8,978	31,757	11,889	242	3.74	6,768	2,085	3,084	2,841	67,646
Flathead	255,335	927,510	335,801	10,621	12.30	172,283	74,372	96,590	79,700	1,952,212
Granite	2,279	8,117	3,084	82	2.37	1,626	411	591	599	16,789
Broadwater	13,417	40,703	15,548	385	9.15	8,561	3,689	3,866	3,652	89,820
Lake	98,514	363,313	126,004	2,795	14.42	71,414	24,765	30,099	30,841	747,744
Total	586,631	2,124,705	781,543	20,145	4.88	407,617	180,124	229,049	190,742	4,520,557
Region Total	586,631	2,124,705	781,543	20,145	4.88	407,617	180,124	229,049	190,742	4,520,557

Source: Hazus-MH Global Summary Report, WSP Analysis

Historic and Cultural Resources

Among historic and cultural resources, old and historic buildings are the greatest concern for earthquake damage and destruction. Historic building stock was constructed before the adoption of modern building and seismic codes and is commonly made of unreinforced masonry, which is more susceptible to damage from earthquakes.

Natural Resources

Secondary hazards associated with earthquakes will likely have some of the most damaging effects on the environment and natural resources. Earthquake-induced landslides can significantly impact surrounding habitat. For example, the 1959 Hebgen Lake earthquake caused a landslide that formed a dam on the Madison River to a height of 220 feet that formed what is now known as Earthquake Lake (Section 4.2.7.3). Earthquake-caused impacts such as this can profoundly change wildlife habitat but are extremely rare.

Development Trends Related to Hazards and Risk

Future population growth and building development in general will increase the assets exposed to earthquake hazards. However, development in the planning area will be regulated through building standards and performance measures that mitigates the susceptibility of new development to seismic hazards to some degree. Development increases the risk to seismic hazards, but to a reduced extent relative to the risk to existing assets.

4.2.7.8 Risk Summary

Earthquake is considered a **medium** significance hazard in the Western Region, though jurisdictional differences exist (Table 4-33). This rating is due to the presence of multiple faults, a history of damaging earthquakes, and Hazus simulations that predict significant losses. Risk is limited by the long recurrence interval for damaging earthquakes, especially compared to recurrence intervals of other damaging hazard events such as flood or wildfire.

- Thousands of faults have been mapped in Montana, but scientists think only about 95 of these faults have been active in the past 1.6 million years.
- Earthquake risk was estimated in a Hazus simulation of a 2,500-Year Probabilistic Earthquake scenario.
- Effects on people: People can be injured or killed in earthquakes due to falling items or structures, as well as from cascading events triggered by the earthquake. Region-wide, the Hazus scenario simulation projects 2,382 injuries and 147 fatalities, as well as 2,809 displaced households.
- Effects on property: Impacts on property include direct damage to structures from the shaking. Region-wide, Region-wide, the Hazus scenario simulation projects 97,370 damaged buildings, including complete destruction of 2,616.
- Flathead and Lake Counties have the highest loss ratios and direct economic losses from the Hazus scenario simulation.
- Effects on the economy: economic impacts can be from direct damages to structures as well as lost wages and income. Region-wide, the Hazus scenario simulation projects a total economic loss from the scenario simulation of $9.09 billion.
- Effects on critical facilities and infrastructure: Linear facilities, such as pipelines, railroads, and roadways, are largely at much greater risk than other facility types. Region-wide, the Hazus scenario simulation projects $29.9 billion of damage to the transportation system and $35 billion to utility lifelines.
- Unique vulnerability: Historic buildings and unreinforced masonry common to the downtown areas of many towns in the Western Region are more prone to damage and pose a risk to public safety.
- Related hazards: Landslide, dam incidents.
- Differences in earthquake vulnerability between jurisdictions exist, many are documented in Table 4-33. Additional differences between jurisdictions are discussed in county or tribe-specific annexes.

Table 4-33 Risk Summary Table: Earthquake

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	N/A	See below
Beaverhead	Low	City of Dillon Town of Lima	None
Broadwater	Medium	City of Townsend	None
Butte-Silver Bow	Medium	Town of Walkerville	The City of Butte is home to hundreds of unreinforced masonry buildings which are far more vulnerable to seismic damage. This potentially makes the city much more likely to experience extensive damage in an earthquake in the Western Region, depending on the scenario.
CSKT	Low	N/A	N/A
Flathead	High	Columbia Falls, Kalispell, Whitefish	The City of Kalispell has the greatest estimated direct losses and greatest population
Granite	Low	Towns of Drummond and Philipsburg	None
Jefferson	Low	City of Boulder, Town of Whitehall	None
Lake	Medium	City of Polson, City of Ronan, Town of St. Ignatius	City of Polson has the greatest estimated direct losses and greatest population
Lewis and Clark	Medium	City of Helena, City of East Helena	The City of Helena has a significantly greater population than East Helena, but they are very close in proximity and will experience similar types of impacts
Lincoln	Low	City of Libby, City of Troy, Town of Eureka	Town of Eureka has greater estimated direct losses
Madison	Medium	Town of Ennis, Town of Sheridan, Town Virginia City	Town of Ennis has greater estimated direct losses
Meagher	Low	City of White Sulphur Springs	None
Mineral	Low	N/A	N/A
Park	Low	City of Livingston, Town of Clyde Park	City of Livingston has greatest estimated direct losses
Powell	Low	City of Deer Lodge	None
Ravalli	Medium	City of Hamilton, Town of Darby, Town of Stevensville	City of Hamilton and Town of Stevensville have greater estimated direct losses than the Town of Darby
Sanders	Low	City of Thompson Fall, Town of Plains, Town of Hot Springs	None
Sweet Grass	Low	City of Big Timber	None

4.2.8 Flooding

4.2.8.1 Hazard/Problem Description

Riverine flooding is defined as when a watercourse exceeds its “bank-full” capacity and is usually the most common type of flood event. Riverine flooding generally occurs because of prolonged rainfall, or rainfall that is combined with soils already saturated from previous rain events. The area adjacent to a river channel is its floodplain. In its common usage, “floodplain” most often refers to that area that is inundated by the 100-year flood, the flood that has a 1 percent chance in any given year of being equaled or exceeded. Other types of floods include general rain floods, thunderstorm generated flash floods, alluvial fan floods, snowmelt, rain on snow floods, dam failure and dam release floods, and local drainage floods. The 100-year flood is the national standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP).

The potential for flooding can change and increase through various land use changes and changes to land surface. A change in 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. These changes can also be created by other events such as wildland fires. Wildland fires 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.

Montana is susceptible to the following types of flooding:

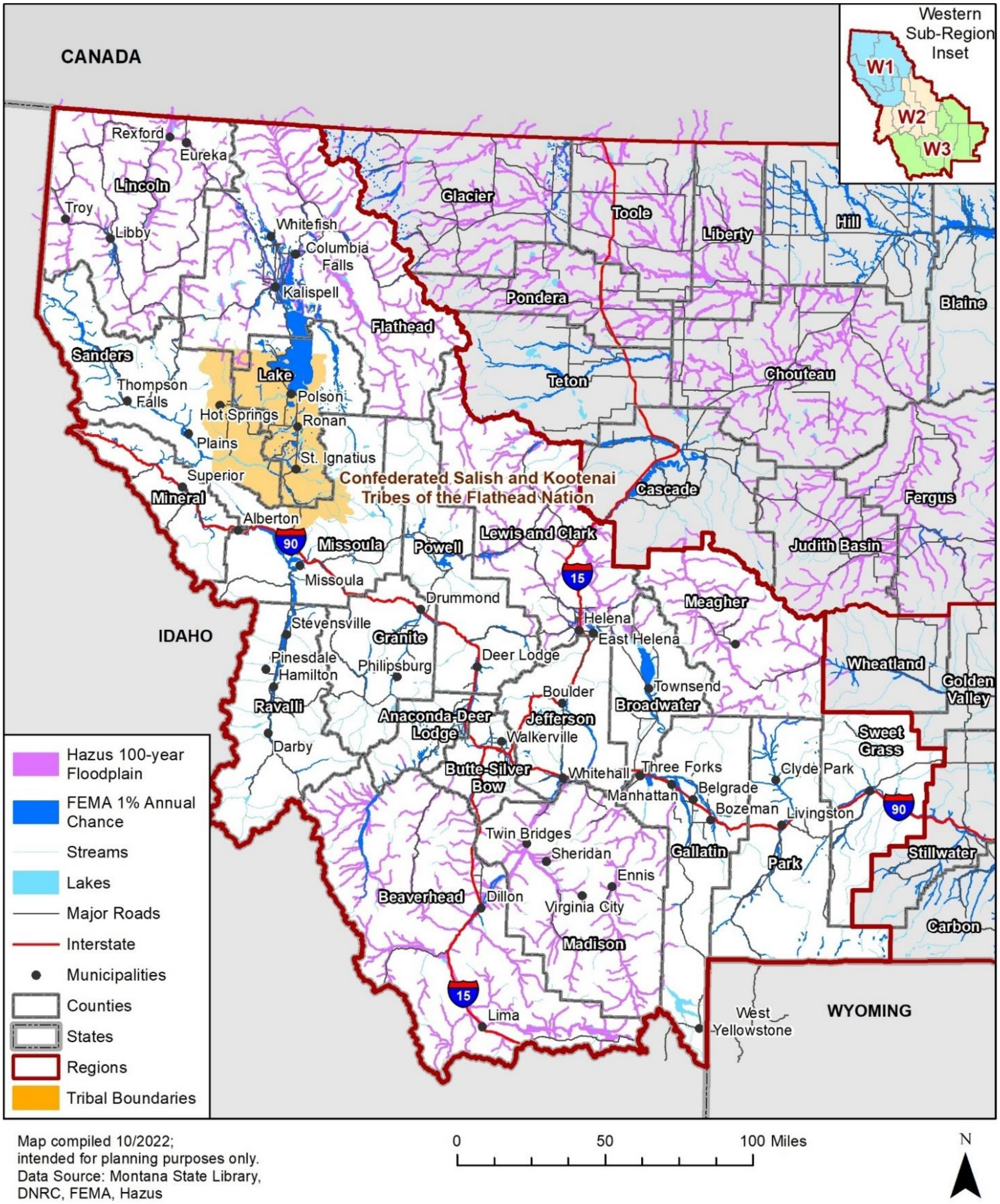
- Rain in a general storm system
- Rain in a localized intense thunderstorm
- Melting snow
- Rain on melting snow
- Ice Jams
- Dam failure
- Urban stormwater drainage
- Rain on fire damaged watersheds

Slow rise floods associated with snowmelt and sustained precipitation usually are preceded with adequate warning, though the event can last several days. Flash floods are also characteristic. Flash floods, by their nature, occur very suddenly but usually dissipate within hours. Even flash floods are usually preceded with warning from the NWS in terms of flash flood advisories, watches, and warnings.

The average total annual precipitation in Montana is roughly 15.37 inches. The average total annual snowfall is 49 inches. Generally, the flood season extends from late spring and early summer, when snowmelt runoff swells rivers and creeks, to fall. Much of the rainfall occurs with thunderstorms during April to August. Four Western Region counties rank in the top five statewide for average annual precipitation; Mineral (24.96 inches), Sanders (22.10 inches), Lincoln (20.52 inches), and Flathead (19.77 inches).

4.2.8.2 Geographical Area Affected

Figure 4-36 Western Region Flood Hazards (National Flood Hazard Level [NFHL] and Hazus)



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Montana State Library, DNRC, FEMA, Hazus

Designated flood hazard areas for the Western Region are based on a combination of digital flood hazard maps from FEMA and those modeled with Hazus (Figure 4-36). The major river basins in the Western Region include the upper Missouri River, Clark Fork, Kootenai, and Yellowstone. Among the rivers and tributaries are the Blackfoot, Beaverhead, Bitterroot, Clark Fork, Kootenai and Flathead and Yellowstone rivers. Flooding along typically occurs during the spring and is caused by long rainstorms. Flooding may also occur during the spring and early summer due to snowmelt runoff. Localized thunderstorms during the summer can also result in flash flooding throughout the planning area.

Since the last plan update, USGS developed and online mapping tool to conceptualize the spatial extent of elevated flash flood and debris flow risk in watersheds affected by wildfire. This tool provides maps of fire scars and their potential to cause debris flows and in some cases the probability of debris flows on individual stream segments. Figures Figure 4-37 and Figure 4-38 provide examples of products available at the USGS webpage (https://landslides.usgs.gov/hazards/postfire_debrisflow/). Maps are available for some wildfires in Montana occurring since 2017.

Figure 4-37 Big Knife Fire, Flathead Reservation, MT (July 2023) Debris Flow Hazards

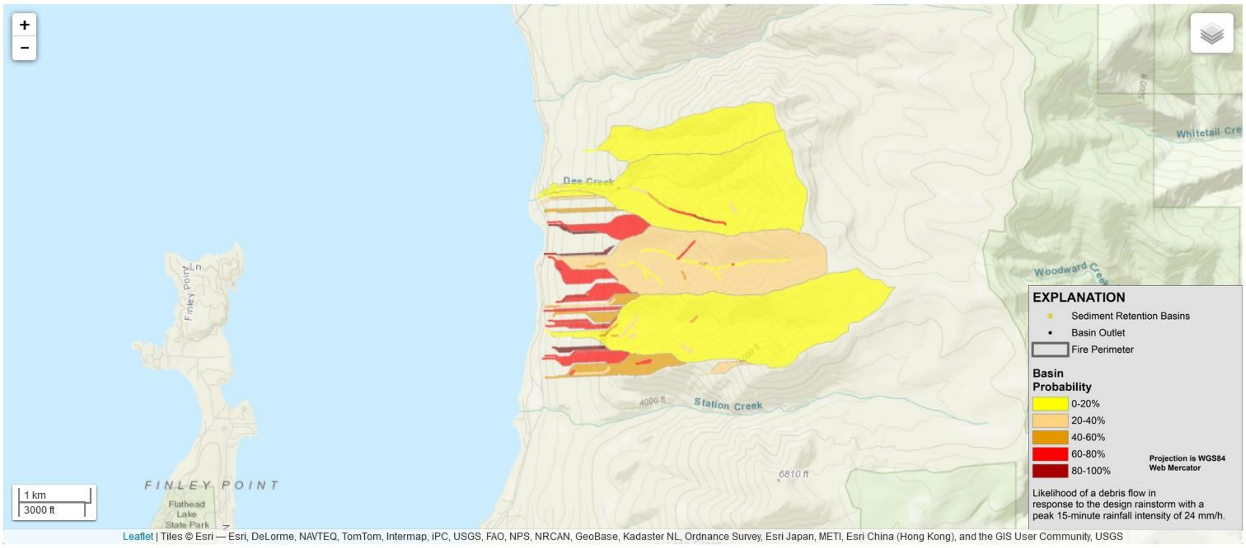


Image source: USGS Emergency Assessment of Post-Fire Debris-Flow Hazards website, https://landslides.usgs.gov/hazards/postfire_debrisflow/

Image available at: https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=366

Figure 4-38 Horsefly Fire, Helena-Lewis & Clark Nat'l Forest, MT (Aug 2019) Debris Flow Hazards

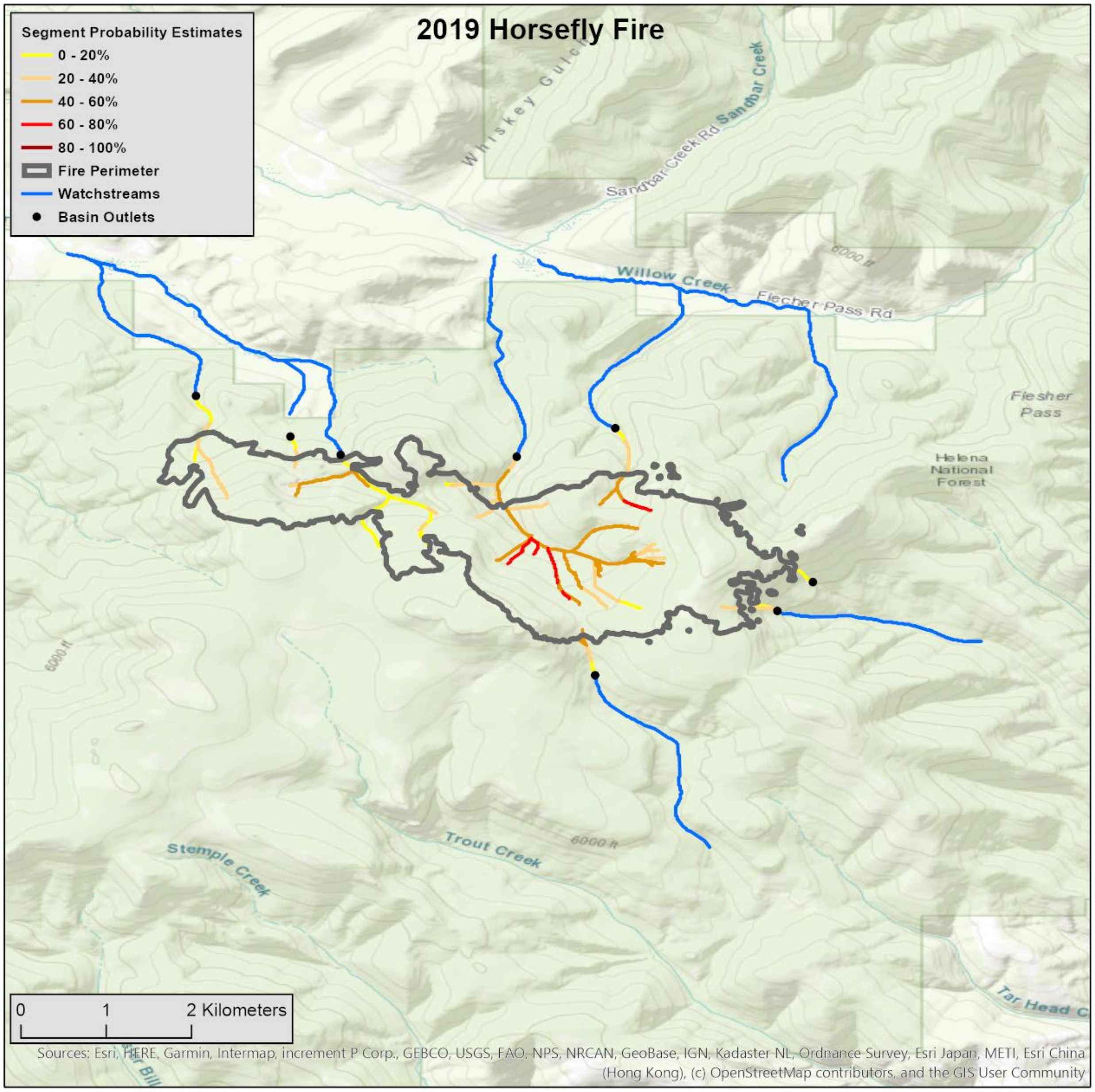


Image source: USGS Emergency Assessment of Post-Fire Debris-Flow Hazards website, https://landslides.usgs.gov/hazards/postfire_debrisflow/

Image available at: https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=245

4.2.8.3 Past Occurrences

Flooding is a natural event and rivers and tributaries in the study area have experienced periodic flooding with associated floods and flash floods. There has been 8 federally declared disasters within the 18 counties and one Indian Reservation located in the Western Region from 1974 to 2022. The federal declarations since 1974 to present are summarized in Table 4-34 below.

An atmospheric river, a narrow band of tropical moisture, overwhelmed the Pacific Northwest in mid-June 2022. It resulted in several inches of rain to parts of southern Montana, coinciding with above-normal temperatures that caused snowmelt. Extreme rain and melting snow led to catastrophic flooding at Yellowstone National Park. On June 13, park officials closed Yellowstone, evacuating more than 10,000 visitors due to safety concerns over flooding.

Table 4-34 Federally Declared Flooding Events Montana Western Region 1974-2022

Year	Declaration Title	Disaster Number	County/Reservation Impacted
1974	Severe Storms, Flooding & Landslides	DR-417-MT	Anaconda-Deer Lodge, Flathead, Lincoln, Mineral, Missoula, Sanders
1975	Rains, Showmelt, Storms & Flooding	DR-472-MT	Broadwater, Flathead, Jefferson, Lewis and Clark, Powell, Meagher
1981	Severe Storms & Flooding	DR-640-MT	Broadwater, Gallatin, Granite, Jefferson, Lewis and Clark, Meagher, Missoula, Powell
1986	Heavy Rains, Landslides & Flooding	DR-761-MT	Anaconda-Deer Lodge, Granite, Powell, Sanders
2014	Ice Jams and Flooding	DR-4172-MT	Broadwater, Jefferson, Lake, Park, Ravalli, Sanders
2019	Flooding	DR-4405-MT	Lewis and Clark, Missoula, Park, Powell
2019	Flooding	DR-4437-MT	Lake, Park
2022	Severe Storm and Flooding	DR-4655-MT	Flathead, Park, Sweet Grass

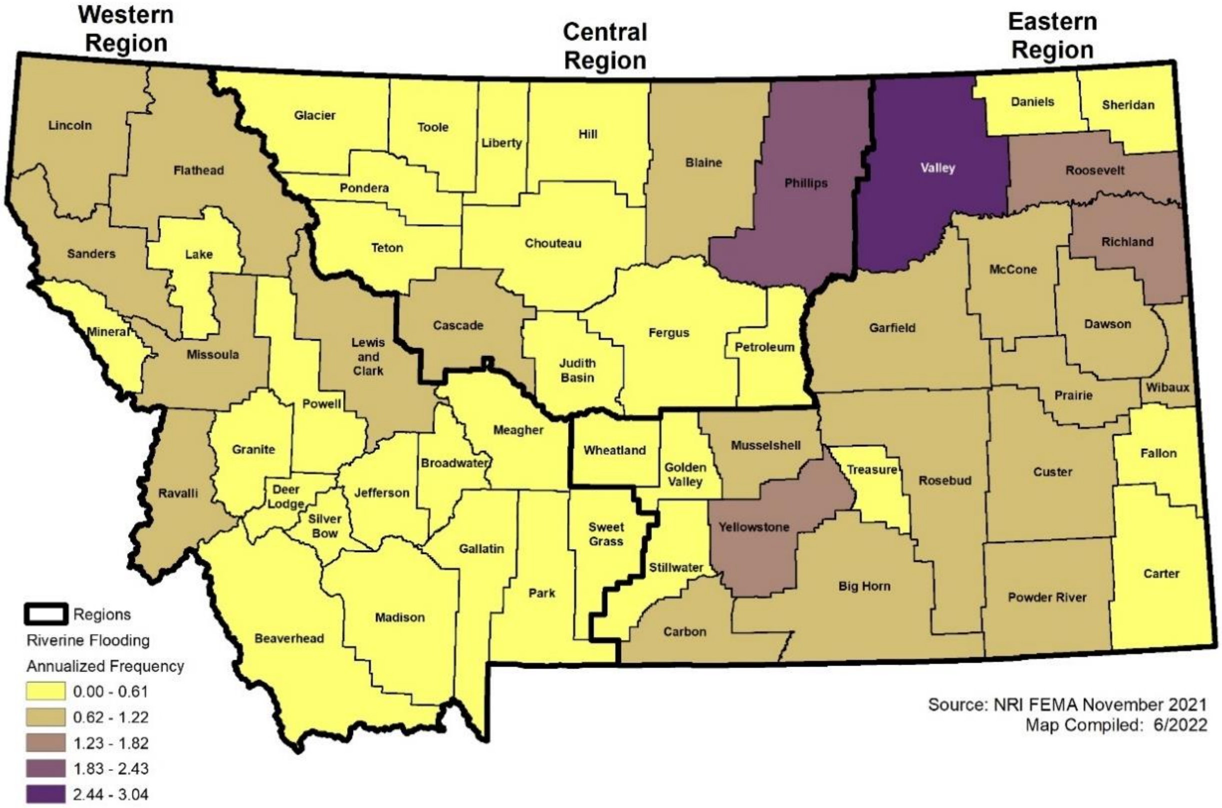
Source: FEMA.gov

4.2.8.4 Frequency/Likelihood of Occurrence

The Western Region has experienced multiple catastrophic flood event resulting in large-scale property damages. Snowmelt runoffs present a threat of serious flooding along rivers and creeks in the study area each year. Flash floods that produce debris flows and mudflows occur regularly and have caused significant damages in the past to homes, roads, bridges, and culverts. Based on the historical record of eight federally declared events in the 49 years from 1974-2022, the Western Region averages a major flood resulting in a FEMA declaration about every 6 years. Using past occurrences as an indicator of future probability, flooding has the probability of future occurrence rating of **likely** throughout the Western Region.

Figure 4-39 depicts the annualized frequency of riverine flooding at a county level based on the NRI. The mapping shows a higher annualized frequency of flooding in counties in the northern portions of the Western Region. Counties like Flathead, Lincoln and Sanders have an annual chance of flooding in 0.62 to 1.22 percent chance of flooding hazard based on NRI data in comparison to the southern portion of the Western Region. In comparison counties like Beaverhead, Gallatin and Madison counties have a 0.02 to 0.61 percent annualized frequency of a flood occurring, showcasing the contrast of risk.

Figure 4-39 Annualized Frequency of Riverine Flooding by County



Source: NRI FEMA November 2021
Map Compiled: 6/2022

4.2.8.5 Climate Change Considerations

As documented in Section 4.2.8 *Flooding*, precipitation is one factor of several that determine flooding. Other factors include existing soil moisture conditions, frozen soils, rainfall *rate*, and special conditions such as rain-on-snow. In urban areas, stormwater infrastructure is perhaps the single greatest determinant of flooding. Other infrastructure, in the form of large dams that are abundant across the planning area, provides a large degree of protection from flooding in rural and urban areas. Perhaps the biggest concern of climate change impacts on flooding involves complex cascading effects that start with increased drought, which drives increased wildfire, which leaves more and larger fire scars, which can dramatically increase runoff and create flooding or debris flows on a scale that did not previously exist. These factors complicate the impact of climate change on flooding. Nevertheless, much can be said about the current and future effects of climate change on flooding in the planning area.

The Climate Change and Human Health report documents that a shift in the seasonality of precipitation amount is occurring. Spring precipitation has slightly increased, which has been offset by decreases during other times of the year (see Section 4.2.6.5 *Climate Change Considerations*).

The Montana Climate Change and Human Health report (2021) projects the seasonal shift from snow to rain will occur earlier, as will peak runoff on streams. Peak runoff already occurs 10-20 days earlier than in 1948. The Climate Change and Human Health report also documents research indicating peak runoff at the end of the century is projected to occur 5-35 days earlier than it did from 1951-1980.

This early-and-rapid snowmelt scenario can cause spring flooding or even ice-jam flooding and appears to already be playing out. In recent years these have been problems on many rivers in Montana, leading to great damage and loss of life, as documented in the 2021 Montana Climate Change and Human Health report. It is unclear if increasing late winter snow and early spring rain will increase the probability of rain-on-snow events, but this issue is potentially serious and worthy of monitoring in future HMPs.

Ice jams are responsible for much of the worst flooding in Montana's history. Ice-jam flooding typically occurs along mountain streams, when heavy rainfall or upstream melting raises stream flows to the point of breaking up the ice cover, which can pile up on bridge piers or other channel obstructions and cause flooding behind the jam. Once the ice jam breaks up, downstream areas are vulnerable to flash floods. The increasing possibility of midwinter thaws and heavy early spring rainfall events could increase the risk of sudden ice break up. The situation is further exacerbated if the ground is still frozen and unable to soak up rainwater.

Due to limitations in projecting the effects of climate change on floods at fine spatial scales, it is not possible to define with further specificity the variability of these changes between jurisdictions. Future updates to this plan should revisit this topic as scientific knowledge improves and inter-jurisdictional trends become apparent.

4.2.8.6 Potential Magnitude and Severity

Magnitude and severity can be described by several factors that contribute to the relative vulnerabilities of certain areas in the floodplain. Development, or the presence of people and property in the hazardous areas, is a critical factor in determining vulnerability to flooding. Additional factors that contribute to flood vulnerability range from specific characteristics of the floodplain to characteristics of the structures located within the floodplain. The following is a brief discussion of some of these flood factors which pose risk.

- **Elevation:** The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage, due to the higher likelihood that it will come into contact with water for a prolonged amount of time.
- **Flood depth:** The greater the depth of flooding, the higher the potential for significant damages due to larger availability of flooding waters.
- **Flood duration:** The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for damage.
- **Velocity:** Flowing water exerts forces on the structural members of a building, increasing the likelihood of significant damage (such as scouring).
- **Construction type:** Certain types of construction and materials are more resistant to the effects of floodwaters than others. Typically, masonry buildings, constructed of brick or concrete blocks, are the most resistant to damages simply because masonry materials can be in contact with limited depths of flooding without sustaining significant damage. Wood frame structures are more susceptible to damage because the construction materials used are easily damaged when inundated with water.

Major flood events present a risk to life and property, including buildings, contents, and their use. Floods can also affect lifeline utilities (e.g., water, sewage, and power), transportation, the environment, jobs, and the local economy.

Past flood events in Montana's Western Region have damaged roads, bridges, private property, businesses, and critical lifeline facilities. Future events may result in greater damages depending on patterns of growth, land use development and climate change.

National Flood Insurance Program Policy Analysis

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. The State has analyzed NFIP flood-loss data to determine areas of Montana's

Western Region with the greatest flood risk. Montana's Western Region flood-loss information was obtained from FEMA's "Montana's Coverage Claims" for Montana's Western Region, which documents losses from 1978. This section was updated based on information obtained from FEMA through Montana Dept. of Military Affairs current as of August 10th, 2022.

There are several limitations to analyzing flood risk entirely on this data, including:

- Only losses to participating NFIP communities are represented,
- Communities joined the NFIP at various times since 1978,
- The number of flood insurance policies in effect may not include all structures at risk to flooding, and
- Some of the historical loss areas have been mitigated with property buyouts.

Missoula County has the highest amount of dollars paid out due to flood claims with $976,035, followed by Flathead with $690,320 in flood insurance payouts due to flood losses. Third and fourth are Lincoln and Lewis and Clark County with $446,923 and $432,256 respectively. Flathead, Gallatin, and Missoula Counties have the highest number of current policies with 495, 333, and 259. Focusing on floodplain and hazard mitigation activities on a local, state, and federal level will allow each of these enlisted counties to better their Community Rating System (CRS) scores. The Western Region has a total of $303,590,400 in NFIP coverage. There are 807 total flood claims, 1,788 current polices and $6,111,295 dollars paid out total due to flood damage and losses. NFIP data and statistics for the Western Region is summarized in Table 4-35.

Table 4-35 Montana Western Region NFIP Statistics

County	Date Joined	Effective Firm Date	Dollars Paid (Historical)	Flood Claims	Current Policies	Coverage ($)
Beaverhead	9/30/1982	9/30/1982	$2,464	12	22	$4,856,600
Broadwater	12/1/1986	8/18/2014	-	2	8	$2,318,000
Butte-Silver Bow	9/28/1979	6/1/2022	$8,245	10	24	$8,004,000
Flathead	9/5/1984	11/4/2015	$690,321	131	495	$118,260,200
Gallatin	05/16/78	08/01/84	$323,244	73	333	$86,865,600
Granite	9/5/1984	11/4/2015	$16,934	7	18	$4,810,500
Jefferson	6/17/1986	06/17/86(M)	$6,966	5	22	$4,205,500
Lake	12/17/1987	2/6/2013	$20,285	12	35	$10,546,000
Lewis and Clark	4/1/1981	9/19/2012	$432,257	102	169	$40,762,300
Lincoln	8/1/1980	9/29/2006	$446,923	38	57	$16,698,600
Madison	(NSFHA)	(NSFHA)	$26,091	6	39	$11,963,500
Meagher	11/13/1985	(NSFHA)	$78,057	5	12	$4,979,300
Mineral	11/1/1996	11/01/96(L)	$10,768	5	15	$3,228,900
Missoula*	08/30/74	08/15/83	$976,035	174	259	$71,288,900
Park	1/1/1987	10/18/2011	$2,227,355	141	87	$22,226,700
Powell	6/3/1981	9/30/1994	$66,564	17	19	$3,049,800
Ravalli	7/19/1982	1/16/2015	$115,489	36	116	$33,694,300
Sanders	3/1/1996	6/5/2012	$223,490	10	32	$6,619,000
Sweet Grass	8/2/1982	5/18/2015	$431,524	12	15	$5,092,200
Total			$6,111,295	807	1788	$461,744,900

Source: FEMA Pivot NFIP Data as of August 10th, 2022; FEMA Community Status Book Report
* Results include county overall, not analyzed further for loss by jurisdiction

Repetitive Loss

Repetitive losses are NFIP-insured structures that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978. The Western Region has a total of 41 repetitive loss properties, as of 2022, with the majority being located in Lewis and Clark, Missoula, and Park Counties.

SRL properties are defined as those that have had four or more separate claims payments. There are three Severe Repetitive Loss (SRL) properties in the Western Region, one in Missoula County and two in Park County. To date there has been a repetitive loss cumulative payout of $1,301,148 with $95,642 of this being SRL property loss payouts. Repetitive loss properties within Montana's Western Region are shown in Table 4-36.

All the repetitive loss properties are residential occupancy type, either single unit, 2-4 unit, or more than 4-unit dwellings with the exception of one classified as non-residential. This is based on data available on OpenFEMA.gov site.

Table 4-36 Western Region Repetitive Loss Properties by County

County	Repetitive Loss Structures per County	Repetitive Loss Claims	Total Paid Out*
Flathead County	3	7	$89,602.81
Gallatin County	3	6	$88,477.61
Lewis And Clark County	7	15	$110,881.17
Lincoln County	3	6	$288,961.59
Meagher County	1	2	$56,021.23
Missoula County*	12 (1 SRL)	27	$252,928.28
Park County*	9 (2 SRL)	15	$381,697.83
Ravalli County	3	4	$32,577.63
Total	**41**	**82**	**$1,301,148.15**

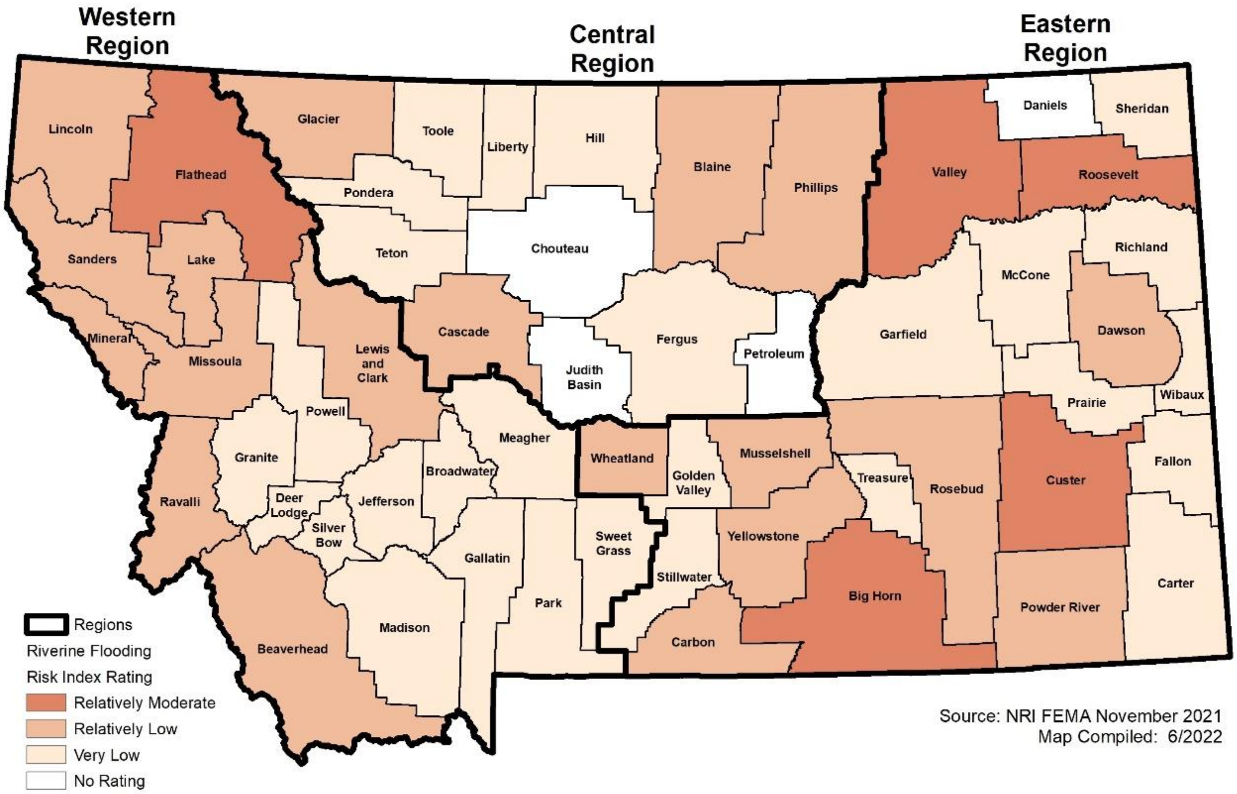
Source: FEMA Pivot NFIP Data as of August 10th, 2022; FEMA Community Status Book Report; supplemented with OpenFEMA data July 2024.
*Totals include SRL properties

4.2.8.7 Vulnerability Assessment

The flooding *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to flooding hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with flooding hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience flooding hazards. *Susceptible* indicates a strong likelihood of damage from exposure to flooding hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is a concern for flooding hazards in the Western Region for potentially increasing ice jam flooding and for increasing fire-scar flooding and debris flows (see section titled *Climate Change Considerations*, above). It is not clear how these impacts will affect asset exposure and vulnerability to flood, but it remains a concern. Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

The NRI risk index rating for flooding in the Western Region is shown in Figure 4-40. The risk index rating considers impacts to many types of assets and provides insight to the overall significance of flooding hazards in jurisdictions throughout the Western Region. A deeper analysis of the vulnerability of each type of asset to flooding hazards in Western Region jurisdictions is provided below.

Figure 4-40 Risk Index Rating for Riverine Flooding by County



Source: NRI FEMA November 2021
Map Compiled: 6/2022

Vulnerability to flooding is also dependent on local weather conditions and site-specific flood water constraints. Some areas can be completely immune to flooding because the steeply incised riverbanks have physically impeded development near the river, limiting flood damage when floodwaters arrive. Other areas experience flooding annually where meandering rivers have created broad floodplains and development have encroached and impeded floodwaters. Because local conditions have a significant impact on the vulnerability to flooding, historic data on occurrence and loss is the best means to assess flooding vulnerability statewide.

There is an increased risk of flash flooding and debris flows in Montana as a result of recent active fire seasons. Most burn areas will be prone to flash flooding and debris flows for at least 2 years after the fire. Locations downhill and downstream from burned areas are most susceptible, especially near steep terrain. Rainfall that would normally be absorbed will run off extremely quickly after a wildfire, as burned soil can be as water repellant as pavement. As a result, much less rainfall is required to produce a flash flood. As water runs downhill through burned areas it can create major erosion and pick up large amounts of ash, sand, silt, rocks and burned vegetation.

People

Vulnerable populations in Montana’s Western Region include those that live within known floodplains or near areas vulnerable to flash floods, as well as people traveling through or in areas used for recreational purposes prone to flash flooding. Certain populations are particularly vulnerable. Within the Western Region Flathead County has the highest amount of people located in the floodplain with 8,674. This is followed by Lewis and Clark County with 3,600. Third is Gallatin County with 2,181. Of these totals, this can include the elderly and very young, those living in long-term care facilities, mobile homes, hospitals, low-income housing areas, or temporary shelters, people who do not speak English well, tourists and visitors, and those with developmental, physical, or sensory disabilities.

The impacts of flooding on vulnerable populations can be more severe. Families may have fewer financial resources to prepare for or recover from a flood, and they may be more likely to be uninsured or underinsured. Individuals with disabilities may need more time to evacuate, so evacuation notices will need to be issued as soon as feasible, and communicated by multiple, inclusive methods. Population totals for the Western Region are shown in Table 4-37. The CSKT population was included in the county population statistics that it coincides with, which is why it shows as a null value in the table.

Table 4-37 Western Region Population Located in the 1% Annual Chance Floodplain

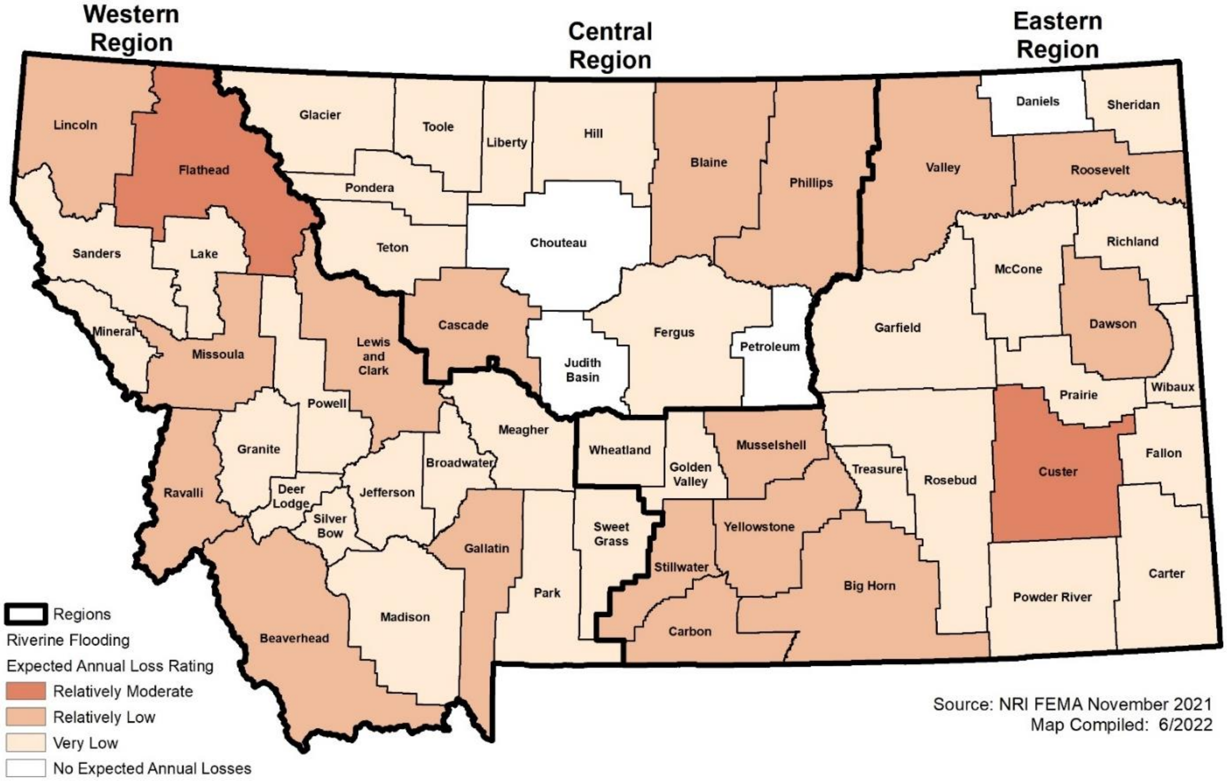
County/Reservation	Population
Beaverhead	1,117
Broadwater	102
Butte-Silver Bow	437
CSKT	-
Flathead	11,481
Gallatin*	2,181
Granite	274
Jefferson	466
Lake	570
Lewis and Clark	3,694
Lincoln	1,518
Madison	1,065
Meagher	115
Missoula*	1,612
Mineral	294
Park	669
Powell	406
Ravalli	900
Sanders	543
Sweet Grass	96
Total	**27,540**

Sources: DNRC, Hazus, FEMA NFHL
* Results include county overall, not analyzed further for loss by jurisdiction

Property

The NRI rating for expected annual loss to counties in the Western Region from flooding is shown in Figure 4-41. Flathead County has the highest expected annual loss rating in the Western Region, coinciding with its highest population within the Special Flood Hazard Area (SFHA; Table 4-37).

Figure 4-41 Expected Annual Loss Rating Riverine Flooding by County



Source: NRI FEMA November 2021
Map Compiled: 6/2022

GIS analysis was used to estimate Montana's Western Region potential property and economic losses from flooding. The April 2022 MSDI Cadastral Parcel layer was 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 layer. Multiple flood layers from different sources were used in the analysis to try and create a complete full coverage of risk for the Region, through the utilization of FEMA's NFHL with the effective date of 6/1/2022, and other sources. The DNRC provided digitized flood mapping from paper maps that FEMA has not converted over to the NFHL yet. FEMA Region VIII also provided Hazus flood models to help fill in areas where FEMA has not mapped flooding within the State. 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 region, county, jurisdiction, property type and flood zone. County-level results for the Western Region are shown below. Results presented in each county or tribal annex specify results for individual communities.

Table 4-38 provides parcel counts and value within the 1% annual chance floodplain. Estimated loss is calculated as a proportion of the improved value and content value of parcels and is intended to represent the value that would be lost in the event of a 1% annual chance flood.

Flathead County has the highest estimated loss due to a 1% annual chance flood with $383,391,245. Lewis and Clark County and Gallatin County follow, with $143,720,150 and $119,866,299, respectively. Montana's Western Region has $4,373,466,260 in total value, $1,093,366,565 of which is estimated to be lost in a 1% annual chance flood.

There are 11,859 parcels located in the floodplain and 24,660 people within the 1% annual chance floodplain in the Western Region (Table 4-38). Each annex provides greater detail, including results for jurisdictions within each county or tribal reservation.

Table 4-38 Western Region Parcels at Risk to 1% Flood Hazard by County, Reservation, and Jurisdiction

County/Reservation	Improved Parcels	Improved Value	Content Value	Total Value	Estimated Loss
Anaconda-Deer Lodge*	106	$12,303,639	$7,126,725	$19,430,364	$4,857,591
Beaverhead	615	$110,527,891	$65,729,691	$176,257,582	$44,064,395
Broadwater	63	$13,059,075	$8,424,203	$21,483,278	$5,370,819
Butte-Silver Bow	221	$52,342,664	$31,968,517	$84,311,181	$21,077,795
CSKT	127	$26,592,359	$16,315,210	$42,907,569	$10,726,892
Flathead	3,931	$989,972,063	$543,592,916	$1,533,564,979	$383,391,245
Gallatin*	1,028	$306,928,837	$172,536,359	$479,465,196	$119,866,299
Granite	135	$20,931,697	$12,534,501	$33,466,198	$8,366,550
Jefferson	229	$38,325,934	$25,474,413	$63,800,347	$15,950,087
Lake	261	$69,595,155	$38,381,973	$107,977,128	$26,994,282
Lewis and Clark	1,636	$369,579,501	$205,301,098	$574,880,599	$143,720,150
Lincoln	638	$97,549,428	$54,693,222	$152,242,650	$38,060,662
Madison	587	$112,975,153	$72,354,280	$185,329,433	$46,332,358
Meagher	70	$8,513,470	$6,474,705	$14,988,175	$3,747,044
Mineral	141	$28,107,461	$16,014,056	$44,121,517	$11,030,379
Missoula*	763	$172,559,054	$95,729,539	$268,288,593	$67,072,148
Park	379	$133,391,064	$79,363,842	$212,754,906	$53,188,727
Powell	233	$32,135,558	$21,300,919	$53,436,477	$13,359,119
Ravalli	464	$144,387,729	$96,208,844	$240,596,573	$60,149,143
Sanders	293	$47,408,482	$27,031,653	$74,440,135	$18,610,034
Sweet Grass	66	$19,203,097	$13,427,859	$32,630,956	$8,157,739
Total	**11,859**	**$2,779,796,952**	**$1,593,669,308**	**$4,373,466,260**	**$1,093,366,565**

Sources: DNRC, Hazus, FEMA NFHL

* Results include county overall, not analyzed further for loss by jurisdiction

Critical Facilities and Lifelines

To estimate the potential impact of floods on critical facilities, a GIS overlay was performed of the flood hazard layer with critical facility point locations data. Critical facilities within the 1% annual chance floodplain are summarized in Table 4-39 by county and FEMA Lifeline category. Impacts to any of these facilities could have cascading impacts. Flathead County has the largest amount of critical lifeline facilities located in the floodplain with 136. This is followed by Lewis and Clark County with 118 and third is Lincoln County which has 71 total.

Table 4-39 Western Region Critical Facilities at Risk from 1% Annual Chance of Flood by Facility Type

County/ Reservation	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Beaverhead	0	1	1	0	0	0	2	**4**
Broadwater	0	2	1	0	0	1	13	**17**
Butte-Silver Bow	1	0	2	0	0	2	11	**16**
CSKT	-	-	-	-	-	-	-	**-**
Flathead	12	6	5	0	0	5	108	**136**
Granite	1	5	1	0	0	0	24	**31**
Jefferson	0	0	2	0	0	1	49	**52**
Lake	0	0	1	0	0	0	27	**28**
Lewis and Clark	10	7	2	0	0	7	92	**118**
Lincoln	0	0	3	0	1	1	66	**71**
Madison	0	2	1	0	1	5	61	**70**
Meagher	0	0	0	0	0	0	32	**32**
Mineral	0	0	0	0	0	1	67	**68**
Park	1	0	1	0	0	0	55	**57**
Powell	0	0	1	0	0	1	45	**47**
Ravalli	1	0	1	0	0	0	32	**34**
Sanders	0	3	2	0	0	0	40	**45**
Sweet Grass	0	0	1	0	0	0	27	**28**
Total	**26**	**26**	**25**	**0**	**2**	**24**	**751**	**854**

Source: Montana DNRC, FEMA, Hazus, HIFLD 2022, Montana DES, NBI

* Results include county overall, not analyzed further for loss by jurisdiction

The transportation lifeline accounts for 88% (751 of 854) of the total critical facilities that exist within the 1% annual chance of floodplain. The majority of the critical facilities in Table 4-39 are bridges. Bridges are, obviously, located within the floodplain, but are typically situated above the elevation of a 1% chance flood and have a low risk of flooding. Nevertheless, bridges can become unusable during a flood if the approaches become submerged. Bridges can also be damaged, or destroyed by scouring around their supports, or if the bridge is not elevated sufficiently to avoid floodwaters. Also, bridges that are functionally obsolete or are in poor condition may not resist flood damage as intended. (A bridge is considered functionally obsolete when design components are outdated. A bridge is considered to be in poor condition when key components like the superstructure are inspected and rated 'poor' or worse by a bridge engineer).

There are 26 communication facilities located within the 1% annual chance floodplain. 85% of which are located in Flathead and Lewis and Clark Counties. The Energy; food, water, and shelter; and Safety and Security lifelines each have 26, 25, and 24 facilities located within the floodplain, respectively. These can be facilities such as power plants (Energy Lifeline), wastewater treatment plants and food assistance buildings (Food, Water, and Shelter Lifeline), or fire and police stations (Safety and Security Lifeline).

Economy

Flooding can have major negative impacts on the local and regional economy, including indirect losses such as business interruption, lost wages, reduced tourism and visitation, and other downtime costs. 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. Tourism and outdoor recreation are an important part of the Region's economy. If part of the planning area were damaged by flooding, tourism and outdoor recreation could potentially suffer. Additionally, flooding can impact the economy through the direct damages and losses to property and costs to recover, as summarized in the property section above.

Historic and Cultural Resources

Floodplains and their adjacent areas are regularly used for different types of cultural and economic resources such as environmental conservation, leisure, recreation, and tourism. In the event of a major flooding event, damages to historic and cultural resources are possible.

Natural Resources

Natural resources are generally resistant to flooding and floodplains provide many natural and beneficial functions. Wetlands, for example, exist because of periodic or permanent inundation. Nonetheless, with human development factored in or in areas after periods of previous disasters such as drought and fire, flooding can impact the environment in negative ways. Areas that are no longer wetlands may suffer from oversaturation of water, as will areas that are particularly impacted by drought. Areas recently suffering from wildfire damage may erode because of flooding, which can permanently alter an ecological system. Fish can wash into roads or over dikes into flooded fields, with no possibility of escape.

Pollution from roads, such as oil, and HAZMAT 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.

Development Trends Related to Hazards and Risk

Flooding becomes especially damaging when people compete with nature for the use of floodplains. If floodplain areas were left in their natural state, flooding would not cause major damage. Urban, industrial, and other surface development in natural floodplain areas has created exposure to flooding. In urbanized areas, the extent of artificial surface area created by development prevents rainfall from soaking into the ground and increases the rate of runoff. If stormwater infrastructure is insufficient to channel excess runoff safely, flooding may result.

Development within the floodplain increases the assets potentially exposed to flood hazards and may require mitigation measures such as floodproofing, relocation, or elevation.

4.2.8.8 Risk Summary

Flooding is rated as having **high** significance in the Western Region. Jurisdictional differences are specified in Table 4-40 and in annexes to this base plan.

- The Western Region averages one major presidential disaster declaration due to flooding every six years. Flooding is rated **likely** in the Western Region. Where relevant, jurisdictional differences are specified in annexes to this base plan.
- There are 27,724 people estimated to exist within the 1% annual chance floodplain in the Western Region. Flathead, Lewis and Clark, and Missoula Counties account for 41%, 13%, and 6% of this total, respectively.
- An estimated $1.2 billion in property is vulnerable to flood loss in the Western Region.
- Economic impacts from flooding are from direct loss (see previous bullet point) and indirect losses such as business interruption, lost wages, reduced tourism and visitation, and other downtime costs.

- 88% of critical facilities located within the 1% annual chance floodplain are classified as being transportation lifeline assets, mostly bridges. Flathead, Lewis and Clark, and Lincoln Counties account for 15%, 13%, and 8% of all critical facilities, respectively.
- Related hazards: Dam Failure, Landslide, Wildfire.

Table 4-40 Risk Summary Table: Flooding

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	High	NA	NA
Beaverhead	Medium	Dillon, Lima	Beaverhead County has 1,117 people located within the SFHA with Dillon having $15,870,495 in total property value
Broadwater	Medium	Townsend	None
Butte-Silver Bow	Medium	Walkerville	None
CSKT	Medium	Hot Springs, Polson, Ronan, St. Ignatius	City of Polson located in the SFHA; 127 improved parcels in SFHA
Flathead	High	Columbia Falls, Kalispell, Whitefish	All cities within Flathead located in the SFHA. They also have the highest population located in the SFHA with 8,674. Three cities combined have $383,391,245 in estimated property losses
Gallatin	High	Belgrade, Bozeman, Three Forks	N/A
Granite	Medium	Drummond, Philipsburg	Drummond and Philipsburg have 52 improved parcels in the floodplain and $788,793 in estimated property losses
Jefferson	Medium	Boulder, Whitehall	Has 461 people located within the SFHA with $63,800,347 in total property value. Boulder and Whitehall have 130 people combined within the floodplain
Lake	Medium	Polson, Ronan, St. Ignatius	Polson has SFHA
Lewis and Clark	High	East Helena, Helena	East Helena and Helena have 409 people within the floodplain combined. With $143,720,150 in estimated losses within all jurisdictions combined
Lincoln	High	Eureka, Libby, Rexford, Troy	Eureka, Libby, Troy and unincorporated Lincoln Co. have 1,375 people combined in the floodplain. 638 improved parcels and $38,060,662 in estimated property losses
Madison	High	Ennis, Sheridan, Twin Bridges, Virginia City	Ennis, Sheridan, and Twin Bridges have 484 people in the floodplain. These three cities also have 10,157,272 in estimated property losses to flooding
Meagher	Medium	City of White Sulphur Springs	None
Mineral	Medium	Superior	Superior has 16 improved parcels in the floodplain and $821,892 in estimated property losses
Missoula	Medium	Missoula	Missoula Co. has $268,288,593 in estimated total value susceptible to flood damages
Park	High	Clyde Park, Livingston	None
Powell	Medium	Deer Lodge	None
Ravalli	High	Darby, Hamilton, Pinesdale, Stevensville	Ravalli Co. has $240,596,573 in estimated total value susceptible to flood damages. Hamilton has $2,405,321 in estimated property losses

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Sanders	Medium	Hot Springs, Plains, Thompson Falls	None
Sweet Grass	Medium	City of Big Timber	N/A

4.2.9 Hazardous Materials Incidents

4.2.9.1 Hazard/Problem Description

A hazardous material incident is defined as any actual or threatened uncontrolled release of a hazardous material, its hazardous reaction products or the energy released by its reactions that pose a significant risk to human life and health, property and/or the environment. HAZMAT incidents may also include chemical, biological, radiological, nuclear, and explosive (CBRNE) incidents. CBRNE incidents can cause a variety of impacts within Montana, depending on the nature of the incident, material used, and environmental factors.

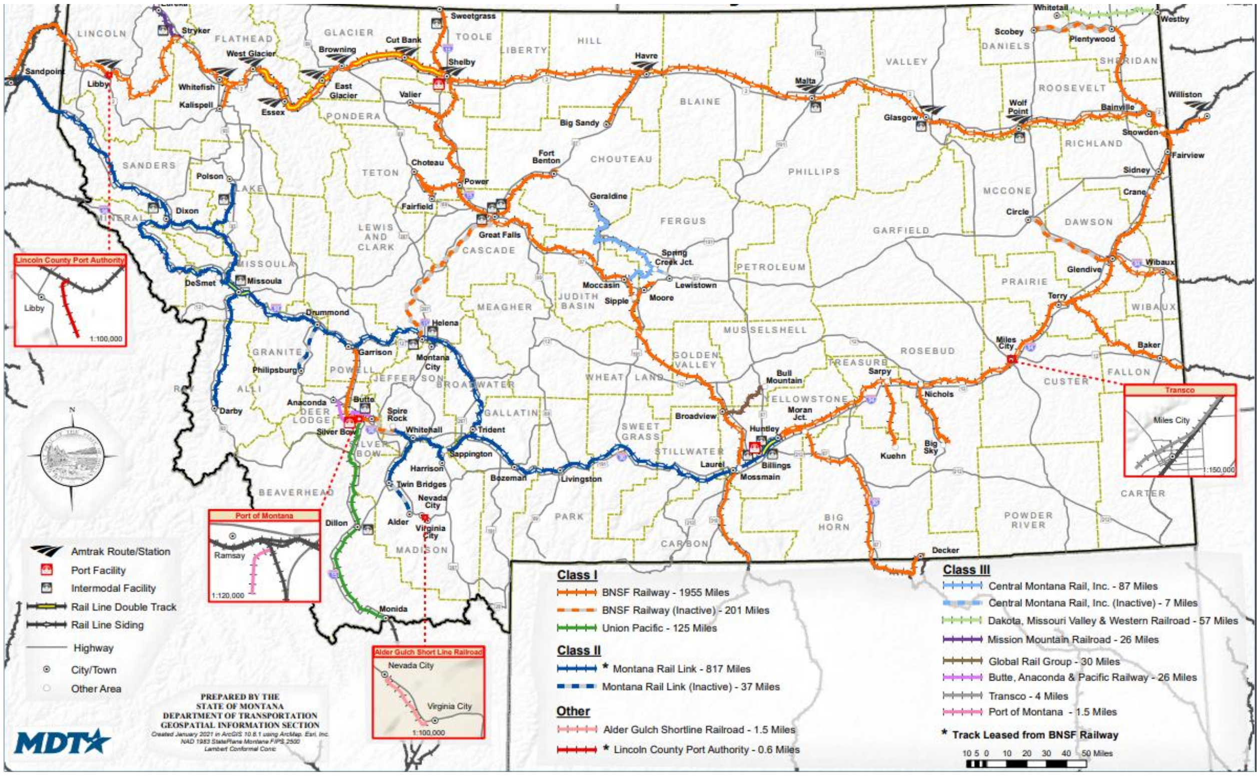
HAZMAT incidents can occur anywhere hazardous materials are stored or transported. There are no designated transportation routes throughout the Region. Although there are several fixed facilities within some of the city limits. Routes that are used for transporting nuclear and HAZMAT through the Western Montana Region by vehicle are Interstates 90 and 15, and U.S. Highways 2, 93, 12, and 287, and state highways throughout the Region. In the 2018 State Plan, it is noted that a 0.25-mile buffer is placed around all highways, major roadways, railroads, and Risk Management Plans (RMP) facilities as a proxy for potential impact areas. The major highways and railways within Montana and its Western Region are shown in Figure 4-42 and Figure 4-43 below.

The Environmental Protection Agency (EPA) also requires facilities containing certain extremely hazardous substances to generate RMPs and resubmit these plans every five years. As of 2022 there were 12 RMP facilities located in the Montana's Western Region. In 2022 there were also 58 Tier II facilities located throughout Western Montana. Although most are located along the Region's transportation routes, there are several within close proximity to population centers in the Western Region.

As a general rule, any hazmat release is anticipated to have an impact of no more than one mile around the spill area. The impact to life and property from any given release depends primarily on:

- The type and quantity of material released.
- The human act(s) or unintended event(s) necessary to cause the hazard to occur.
- The length of time the hazard is present in the area.
- The tendency of a hazard, or that of its effects, to either expand, contract, or remain confined in time, magnitude, and space.
- Characteristics of the location and its physical environment that can either magnify or reduce the effects of a hazard.

Figure 4-42 Montana's Rail Systems

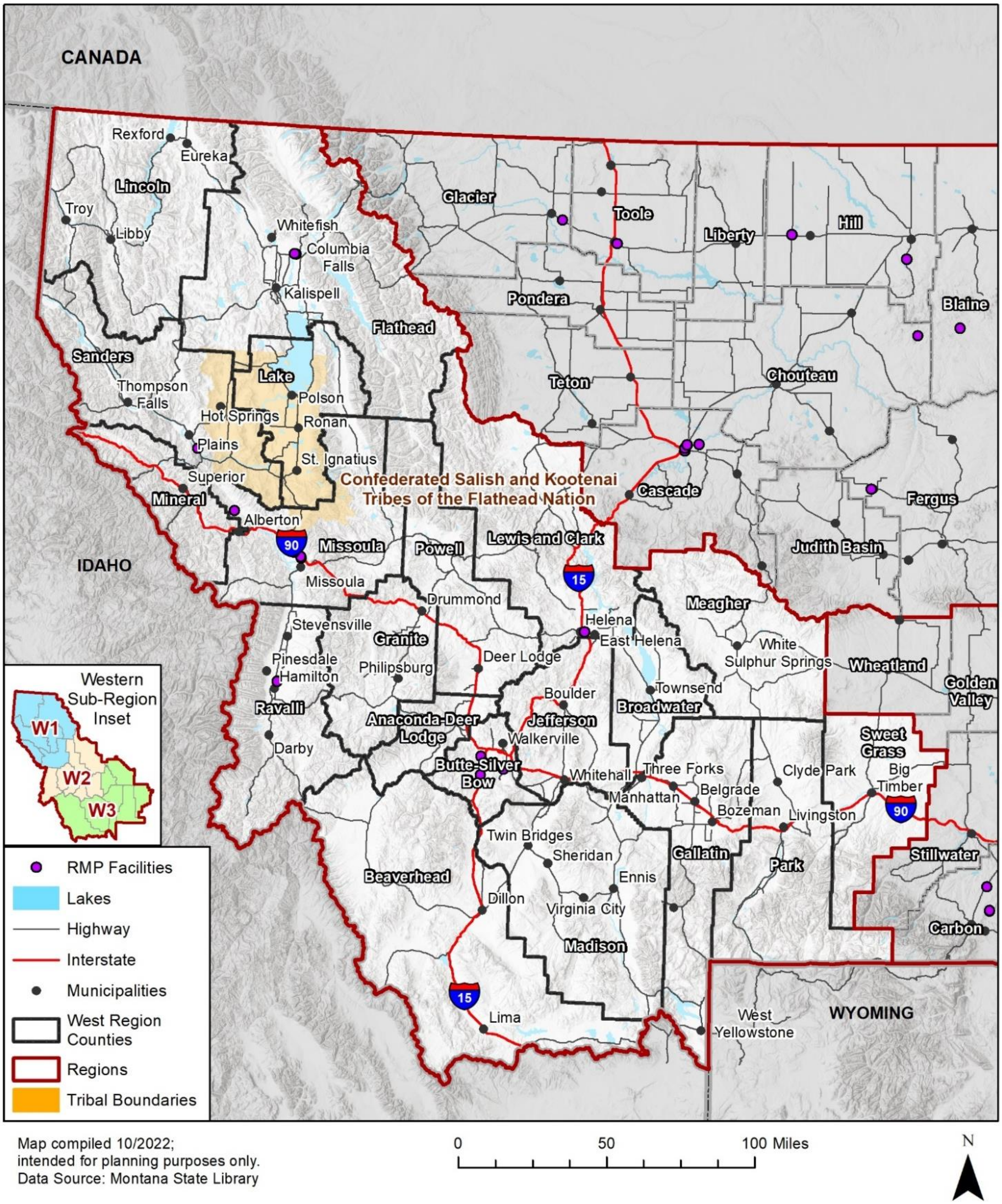


4.2.9.2 Geographical Area Affected

HAZMAT incidents can occur at a fixed facility or during transportation. HAZMAT facilities are identified and mapped by the counties they reside in, along with the types of materials stored there; facilities generally are located in and around communities. Some facilities contain extremely hazardous substances; these facilities are required to generate RMPs and resubmit these plans every five years. In transportation, HAZMAT generally follows major shipping routes where possible (including road, rail, and pipelines), creating a hazard area immediately neighboring these routes.

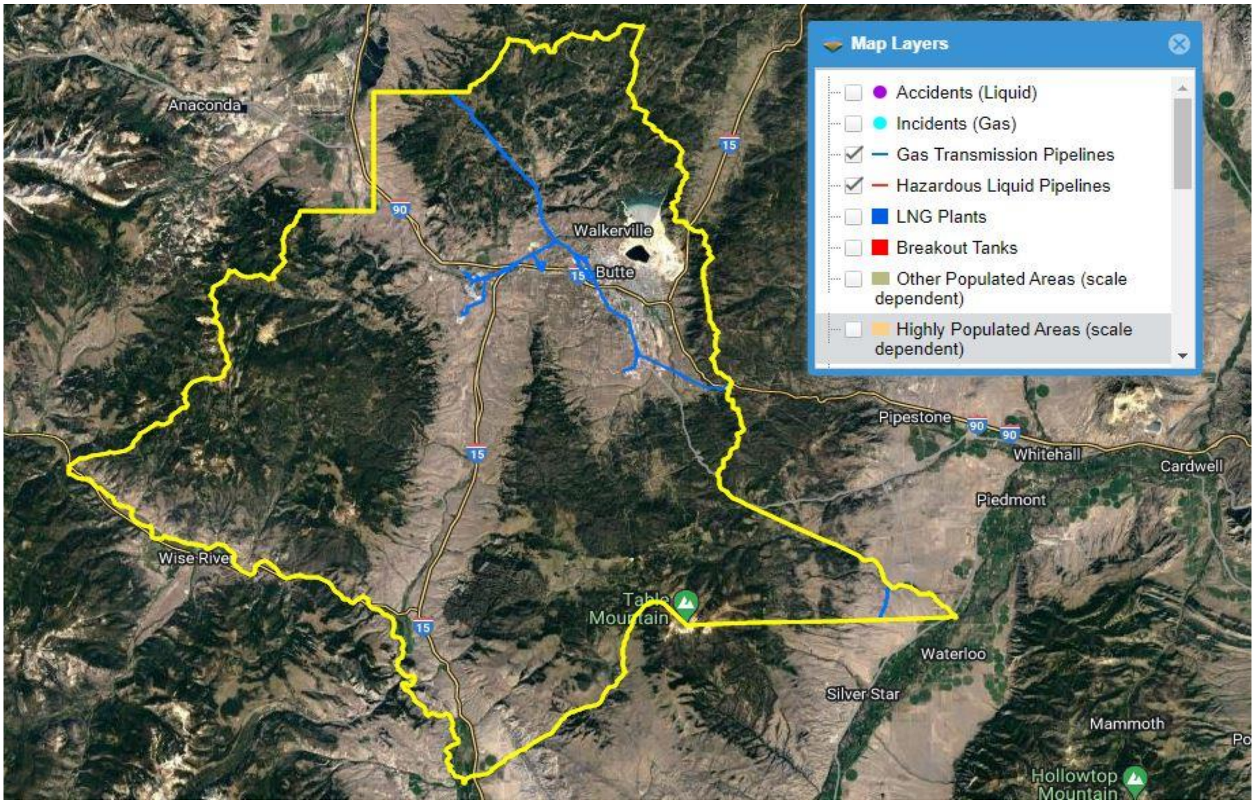
Information provided by the National Pipeline Mapping System (NPMS) indicate several pipelines conveying gas or hazardous liquids across the planning area. Pipeline ruptures can result in major spills, or even explosions. These pipelines also pass through areas where denser populations of people and property are located. The three counties with the highest number of documented pipeline incidents are Butte-Silver Bow, Lewis & Clark, and Flathead Counties. Maps of each counties pipeline networks from the NPMS are shown in Figure 4-44, Figure 4-45, and Figure 4-46 below, respectively.

Figure 4-43 Western Region Hazardous Materials & Transportation Routes



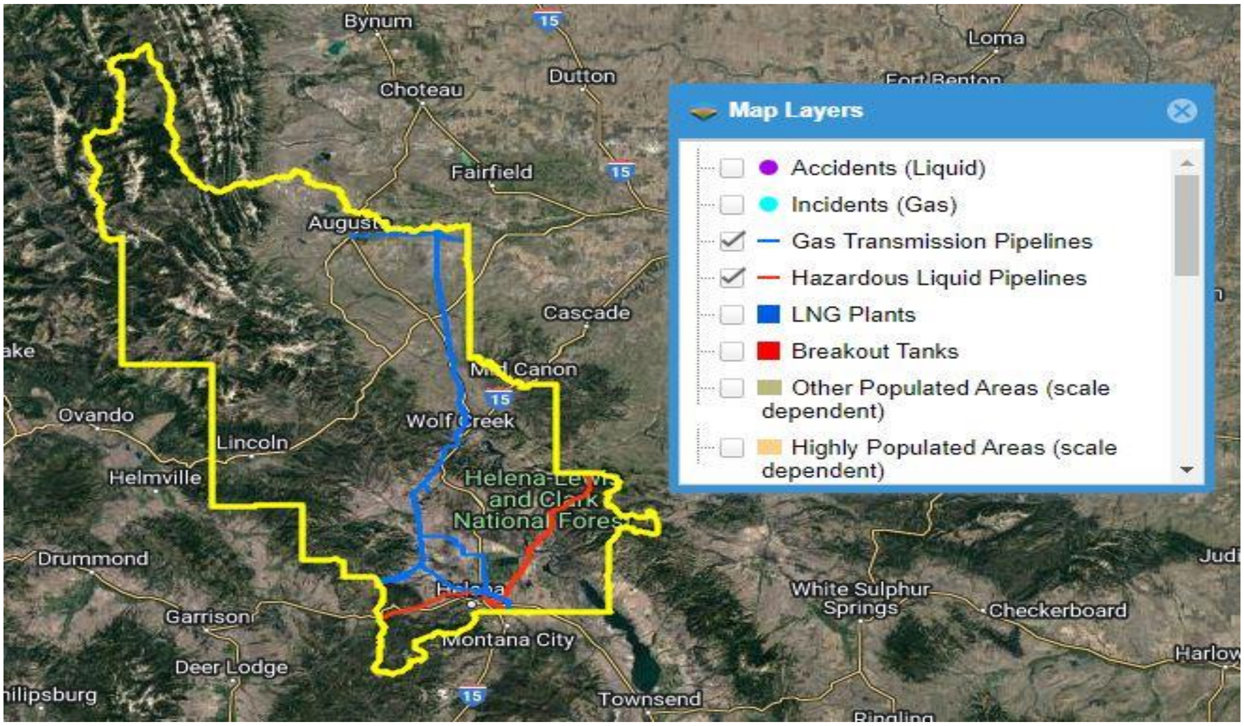
Map compiled 10/2022;
intended for planning purposes only.
Data Source: Montana State Library

Figure 4-44 Pipelines Located Within Butte-Silver Bow County



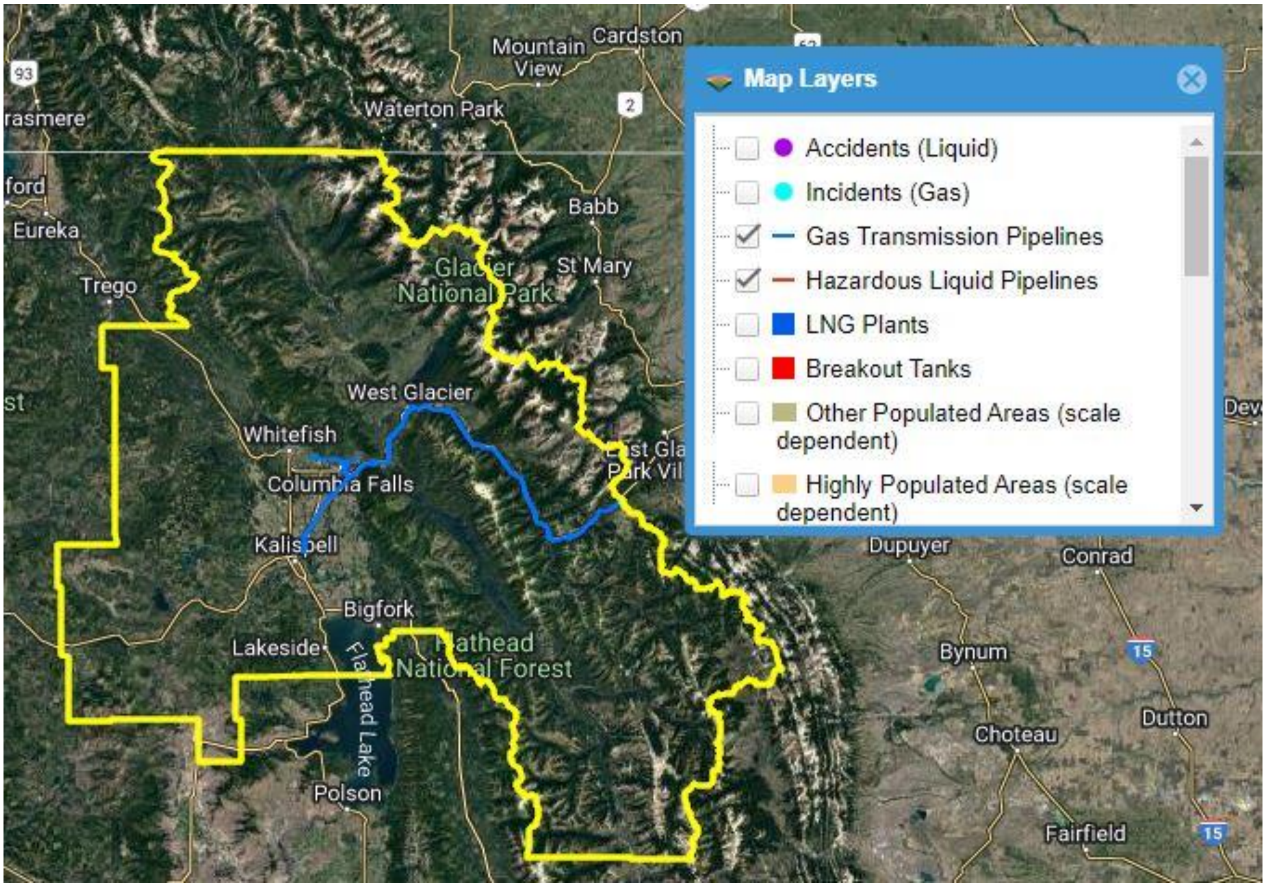
Source: NPMS

Figure 4-45 Pipelines Located Within Lewis & Clark County



Source: NPMS

Figure 4-46 Pipelines Located Within Flathead County



Source: NPMS

4.2.9.3 Past Occurrences

There are a variety of mechanisms to get an idea of the number and types of past HAZMAT incidents in the Western Region. One such repository is the catalogue of HAZMAT spill and accident reports at the National Response Center (NRC) as part of the Right to Know Network (RTK NET). According to this database, between 1990 and 2022 there were 649 incidents reported across the 18 participating counties within the Region. Table 4-41 below shows the 32-year record for reported incidents in Montana’s Western Region.

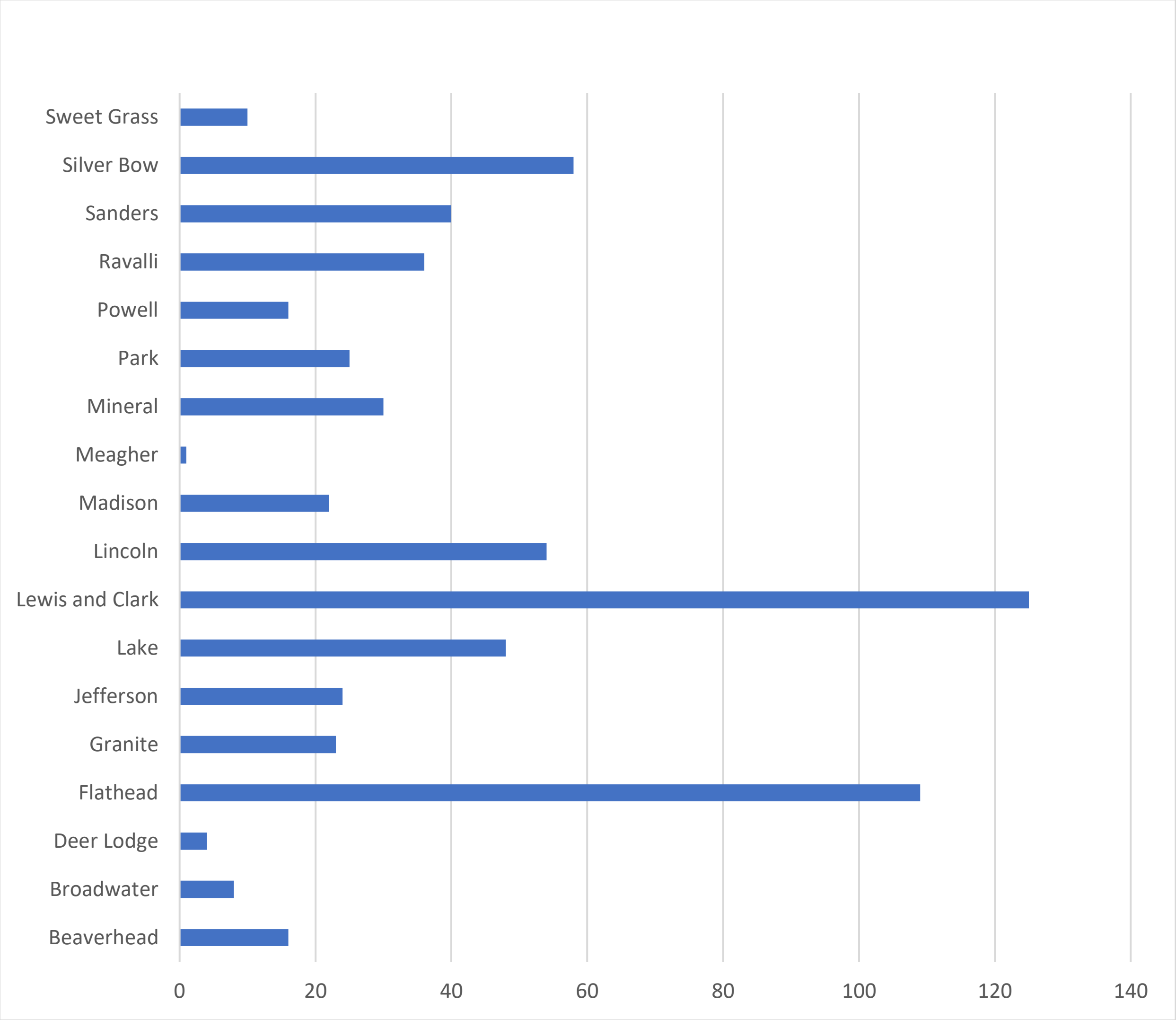
Table 4-41 NRC-Reported Incidents Western Montana Region 1990-2022

County	# of Incidents	County	# of Incidents
Beaverhead	16	Madison	22
Broadwater	8	Meagher	1
Butte-Silver Bow	58	Mineral	30
Flathead	109	Park	25
Granite	23	Powell	16
Jefferson	24	Ravalli	36
Lake	48	Sanders	40
Lewis and Clark	125	Sweet Grass	10
Lincoln	54	**Total**	**645**

Source: NRC Incident Report Database

According to the data, during the time period between 1990 and 2022 the Region saw an average of approximately 20 NRC-reported incidents per year, which means that each county can reasonably expect multiple HAZMAT incidents annually. Lewis & Clark, Flathead, and Butte-Silver Bow Counties have had the highest number of hazmat incidents and spills. Figure 4-47 shows the number of hazardous material incidents by county between 1990 and 2022.

Figure 4-47 Hazardous Materials Incidents Reported to the NRC by County - Western Region: 1990-2022

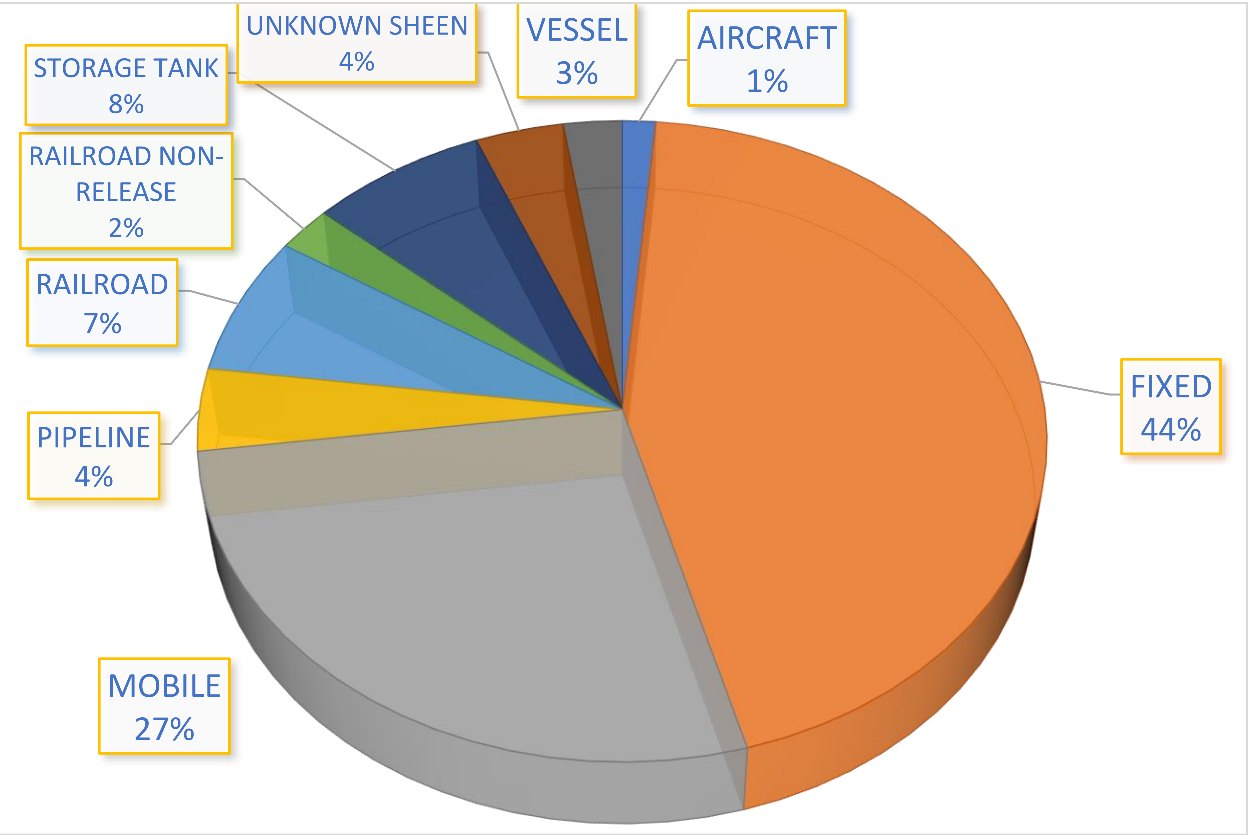


Source: NRC Incident Report Database

Figure 4-48 shows the percentage of each type of incident over the 32-year period between 1990 and 2022. Spills from fixed non-mobile facilities such as Tier II or RMP facilities have the highest percentage of hazmat incidents reported, accounting for 44% total. The second most common percentage of incident types accrued are mobile incidents with 27%. These can occur when hazmat materials are being transported along state highways and interstates and where injuries or fatalities are more likely to potentially occur.

Leakage or spills from storage tanks rank third with, with 8% of incidents. Railroad spills make up 7% of incidents and can also have an impact on the transportation sector. These incidents can occur rapidly, and reliable communication and warnings are needed to inform communities in the study area when incidents such as these may take place. Pipeline spills are fifth in types of incidents with 4%. Regular maintenance and detailed planning locations are necessary to ensure that these incident types are properly accounted and prepared for.

Figure 4-48 Hazardous Materials Incidents Reported to the NRC by Type - Western Region: 1990-2022

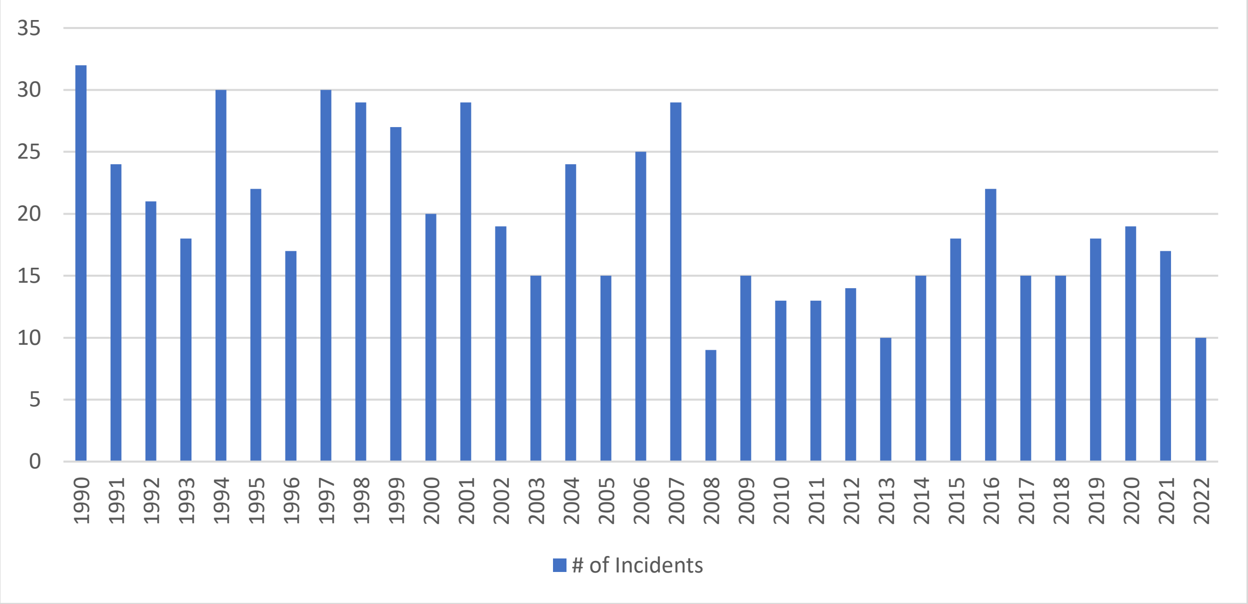


Source: NRC Incident Report Database

4.2.9.4 Frequency/Likelihood of Occurrence

The study area experiences multiple HAZMAT incidents each year, with different degrees of effect; based on the history of past occurrences, there is a 100% chance that the Western Region will see a HAZMAT incident in any given year. Hazardous material spills and releases, both from fixed facilities and during transport, will continue to occur in each county in Montana's Western Region annually. Figure 4-49 below depicts the number of HAZMAT incidents reported each year in the Western Region counties, which shows that while the rates of incidents were generally higher in the 1990s, HAZMAT incidents do still occur throughout the Region on an annual basis and can be expected to continue occurring in the future.

Figure 4-49 HAZMAT Incidents per year in Montana Western Region, 1990-2022



Source: NRC Incident Report Database

4.2.9.5 Climate Change Considerations

Changes in future climate conditions are unlikely to impact the rates of occurrence for human-caused hazards, such as hazardous material incidents. Nevertheless, 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 HAZMAT releases from transportation events.

4.2.9.6 Potential Magnitude and Severity

Potential effects 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

Various considerations go into the impacts of a HAZMAT release, including method of release, the type of material, location of release, weather conditions, and time of day. This makes it complicated to pinpoint definite impacts. It can still be assumed that events occurring in the region will result in at least one of the impacts listed above.

The majority of hazardous materials incidents in the Western Region are minor spills with no significant impacts beyond localized cleanup. Of the 649 incidents in the NRC database, only 94 (14%) caused significant impacts. Those 94 significant incidents resulted in a total of 27 fatalities, 108 injuries, 17 evacuations and a total of $3.2 million in property damage associated with the incidents. Annualized over 32 years, that equates to an average of 0.84 fatalities, 3.4 injuries, 0.5 evacuations, and $100,919 of property damage per year. However, it is important to note that the NRC counts all injuries or damages resulting from an accident where hazardous materials were involved, whether or not the injuries or damages were caused by exposure to the hazardous substance; closer analysis shows that a majority of the injuries, fatalities, and property damages result from the physical impacts of the accident that caused the release, rather from exposure to hazardous materials themselves.

4.2.9.7 Vulnerability Assessment

The Western Region has energy pipelines, railroad tracks which carry many types of HAZMAT, and state highways running through its boundaries. A variety of HAZMAT 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.

No specific HAZMAT routes are designated in the Western Region; any routes used to carry HAZMAT 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 many have mixed payloads that do not list material amounts. Extractive industries were identified as the biggest source of HAZMAT within and moving through the Region.

People

HAZMAT 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 HAZMAT 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.

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. There are 12 RMP facilities located throughout the Western Region, as noted in Table 4-42. Some of these are discussed in more detail in the county annexes. It should be noted that four of these facilities are located in Missoula County, which is not participating in this planning process.

Table 4-42 RMP Facilities in the Western Region

County	Jurisdiction	Number of Facilities
Flathead	Flathead County	2
Lewis and Clark	Lewis and Clark County	1
Missoula	Missoula County	4
Ravalli	Hamilton	1

County	Jurisdiction	Number of Facilities
Sanders	Sanders County	1
Butte-Silver Bow	Butte-Silver Bow County	3
Total		**12**

Source: http://www.rtknet.org/db/erns, HIFLD 2022

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.

Historic and Cultural Resources

Hazardous material incidents may affect a small area at a regulated facility or cover a large area outside such a facility. Impacts to cultural resources could include contamination of important cultural sites for the tribes of the Western Region. Additionally, loss of access to outdoor recreation opportunities could result from HAZMAT incidents.

Natural Resources

Widespread effects occur when HAZMAT contaminate the groundwater and eventually a potential county or jurisdiction's 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 if they occurred near one of the several wildlife refuges in the planning area.

Development Trends Related to Hazards and Risk

Future development is expected to increase the number of people potentially exposed to the impacts of HAZMAT incidents. The number of HAZMAT that are stored, used, and transported across the County may continue to increase over the coming years if regional growth continues.

4.2.9.8 Risk Summary

The study area experiences multiple HAZMAT incidents each year, with different degrees of effect; based on the history of past occurrences, there is a 100% chance that the Western Region will see a HAZMAT incident in any given year.

- HAZMAT incidents can cause injuries, hospitalizations, and even fatalities to people nearby. 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.
- 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.
- 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 is a total of 12 RMP facilities within the study area. These are located in Flathead, Lewis & Clark, Sanders, Butte-Silver Bow, Ravalli, and Missoula Counties. (Missoula County is not participating in this plan).
- Related Hazards: Cyber- Attack, Human Conflict, Transportation Accidents.

Table 4-43 Risk Summary Table: HAZMAT Incidents

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Low	NA	Major interstates, state highways and rail systems located throughout the study area
Beaverhead County	Low	Dillon, Lima	BNSF Railways
Broadwater County	Low	Townsend	BNSF Railways
Butte-Silver Bow County	Medium/High	NA	BNSF Railways also has a higher concentration of transportation routes. Higher rates of past occurrences in this County. Highest Concentration of RMP facilities
CKST	Low	NA	
Flathead County	Medium	Columbia Falls, Kalispell, Whitefish	BNSF Railways. Has the second highest number of recorded incidents in the Region
Granite County	Low	Drummond, Philipsburg	BNSF Railways
Jefferson County	Low	Boulder, Whitehall	BNSF Railways
Lake County	Low	Polson, Ronan, St. Ignatius	BNSF
Lewis & Clark County	Medium	East Helena, Helena	BNSF Railway and Montana Rail Link and transportation routes concentrated here. Also has the highest number of recorded incidents in the Region
Lincoln County	Low	Eureka, Libby, Rexford, Troy	BNSF Railways
Madison County	Low	Ennis, Sheridan, Twin Bridges, Virginia City	BNSF Railways
Meagher County	Low	White Sulphur Springs	
Mineral County	Low	Alberton, Superior	BNSF Railways
Park County	Medium	Clyde Park, Livingston	BNSF Railways
Powell County	Low	Deer Lodge	BNSF Railways
Ravalli County	Low	Darby, Hamilton, Pinesdale, Stevensville	
Sanders County	Low	Hot Springs, Plains, Thompson Falls	BNSF Railways
Sweet Grass County	Low	Big Timber	BNSF Railways

4.2.10 Landslide

4.2.10.1 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 defined as a rapid slipping of a mass of earth or rock from a higher elevation to a lower level under the influence of gravity and water lubrication. More specifically, rockslides are the rapid downhill movement of large masses of rock with little or no hydraulic flow, similar to an avalanche. Water-saturated soil or clay on a slope may slide downhill over a period of several hours. Earthflows of this type are usually not serious threats to life because of their slow movement, yet they can block roads and damage property. Debris flows are fast-moving landslides that are particularly dangerous to life and property because they move quickly, destroy objects in their paths, and often strike without warning.

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 movement include saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides, rockfall or other geological events. Freeze-thaw cycles loosen rock on steep slopes, thus many landslides and rockfalls occur in the spring and following wet periods.

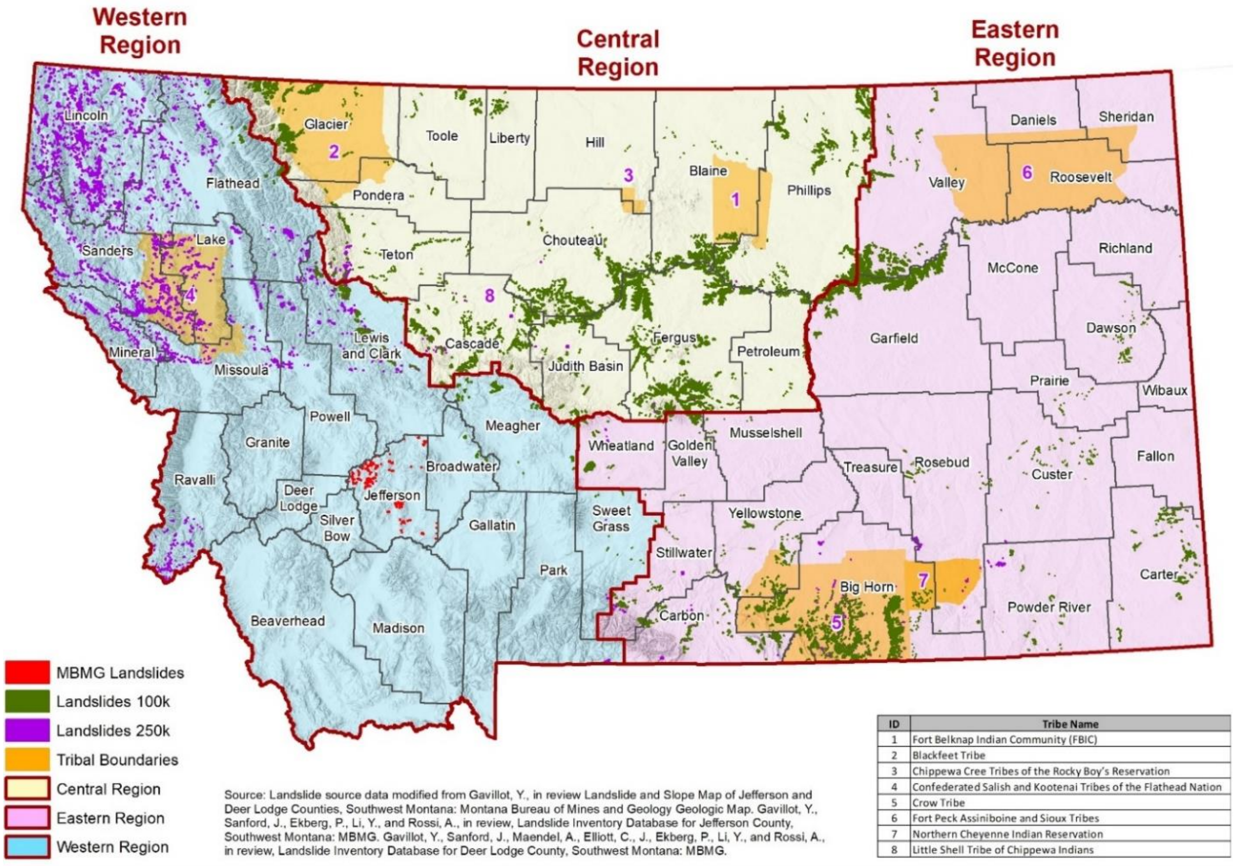
Large earthquakes, particularly in the rugged mountainous terrain of Western Montana, can trigger numerous and massive landslides. In fact, most of the 28 deaths caused by the 1959 Hebgen Lake earthquake were caused by a landslide that covered a campground and dammed the Madison River to a height of 220 feet, causing a lake to form within weeks (see Sections 4.2.7.3 and 4.2.10.3).

4.2.10.2 Geographical Area Affected

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. Additionally, slopes that have recently suffered wildfires are at increased risk for landslides due to the removal of slope stabilizing vegetation and root structures. Burn scars often see devastating landslides and debris flows following major wildfires. This process and the recent availability of relevant USGS hazard maps are discussed in the Flooding section, specifically 4.2.8.2.

Areas that are typically considered safe from landslides include areas that have not moved in the past, relatively flat-lying areas away from sudden changes in slope, and areas at the top of or along ridges

Figure 4-50 Montana Hazard Mitigation Planning Regions and Landslide Hazards

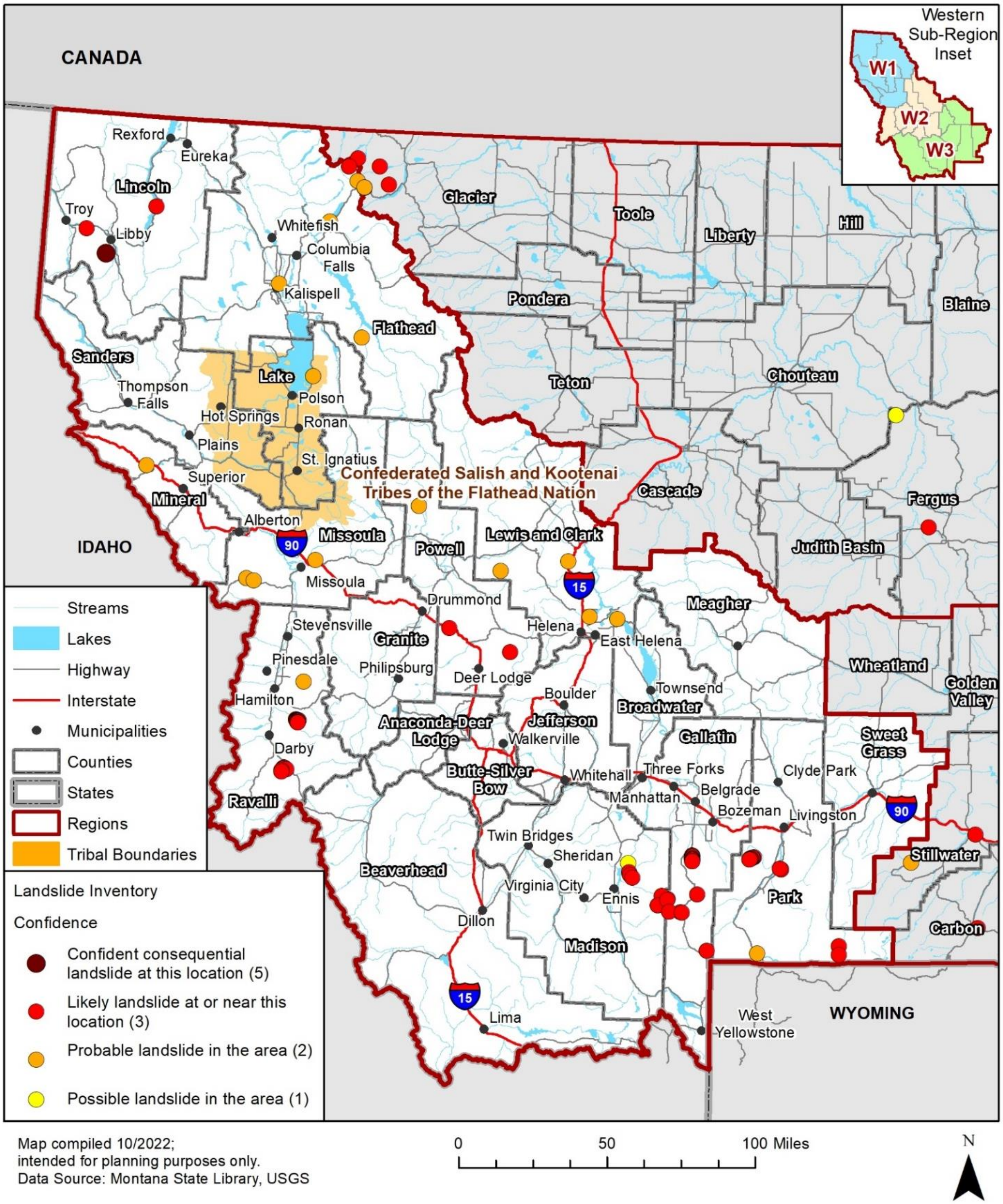


Source: Landslide source data modified from Gavillot, Y., in review Landslide and Slope Map of Jefferson and Deer Lodge Counties, Southwest Montana: Montana Bureau of Mines and Geology Geologic Map. Gavillot, Y., Sanford, J., Ekberg, P., Li, Y., and Rossi, A., in review, Landslide Inventory Database for Jefferson County, Southwest Montana: MBMG. Gavillot, Y., Sanford, J., Maendel, A., Elliott, C., J., Ekberg, P., Li, Y., and Rossi, A., in review, Landslide Inventory Database for Deer Lodge County, Southwest Montana: MBMG.

ID	Tribe Name
1	Fort Belknap Indian Community (FBIC)
2	Blackfeet Tribe
3	Chippewa Cree Tribes of the Rocky Boy's Reservation
4	Confederated Salish and Kootenai Tribes of the Flathead Nation
5	Crow Tribe
6	Fort Peck Assiniboine and Sioux Tribes
7	Northern Cheyenne Indian Reservation
8	Little Shell Tribe of Chippewa Indians

In certain areas of Montana landslides do occur. Over the years, several landslides have been dealt with by the State of Montana and in particular the Montana Department of Transportation (MDT). MDT has spent a lot of effort stabilizing landslides throughout the State. The confidence of landslides ranges from possible, probable, and likely in many areas throughout Montana's Western Region.

Figure 4-51 Landslide Inventory Confidence Montana Western Region



4.2.10.3 Past Occurrences

63 confidence markers exist for past landslides in the Western Region, more than the Central and Eastern Regions combined. Table 4-44 below lists the number of landslides recorded in Western Region counties

in recent years. Together, Ravalli and Park Counties account for 60% of all landslides recorded in the Western Region.

Table 4-44 Past Landslide Inventory in the Western Region

County	Number of Landslides
Ravalli	21
Park	16
Flathead	7
Madison	7
Lewis & Clark	4
Lincoln	3
Powell	3
Lake	1
Mineral	1
Total	**63**

Source: Montana State Library, USGS

Each of these events listed above are typically larger or more impactful landslides, which may occur much more sporadically. Smaller landslides, such as rockfalls or mudslides, may occur much more often throughout the Region on an almost annual basis. The Flathead County HMPC provided details on impacts of past events in their county, including a landslide which occurred in the Still Water State Forest in June 2022. There were roads washed out, damage to timber lands, additional costs travel to recreational locations due to road closures, and environmental impacts to rivers and streams. Impacts such as these are not necessarily unique to Flathead County and can be expected to occur in every county in the Region which experiences a landslide.

As mentioned in the introduction to this section, the largest landslide in the history of the State of Montana was triggered by the 1959 Hebgen Lake earthquake on August 17, 1959, near the border of Madison and Gallatin Counties. The earthquake measured 7.3 on the Richter scale (see Section 4.2.7.6) and caused a 40 million cubic yard landslide. The debris effectively dammed the Madison River to a height of 220 ft. and caused a lake to form immediately upstream. Heroic efforts by the US Army Corps of Engineers dug a spillway in the debris before the forming lake could overtop the new dam and cause it to fail. The lake remains to this day and is appropriately named Earthquake Lake. The debris unfortunately covered a campground in the middle of the night, killing 26 people. [3,4,5]

Table 4-45 provides information regarding past landslides in the Western Region of Montana. There has been two federally declared events within the project area from 1974 to present.

Table 4-45 Western Montana Disaster Declarations Involving Landslides

Date	Counties Affected	Comments
January 29, 1974 DR-417	Anaconda-Deer Lodge, Flathead, Lincoln, Mineral, Sanders	A disaster declaration was declared after severe storms, landslides, and flooding in the affected areas.
March 15, 1986 DR-761	Anaconda-Deer Lodge, Granite, Powell, Sanders	A disaster was declared after heavy rains, landslides, and flooding in the affected areas.

---

[3] Hadley, J. B. (1964). Landslides and related phenomena accompanying the Hebgen Lake earthquake of August 17, 1959. *U.S. Geological Survey Professional Paper 435-K*, p. 107-138.

[4] The 1959 Madison Slide, Part 1: A deadly consequence of the Hebgen Lake Earthquake, accessed 9/2024 at https://www.usgs.gov/observatories/yvo/news/1959-madison-slide-part-1-a-deadly-consequence-hebgen-lake-earthquake.

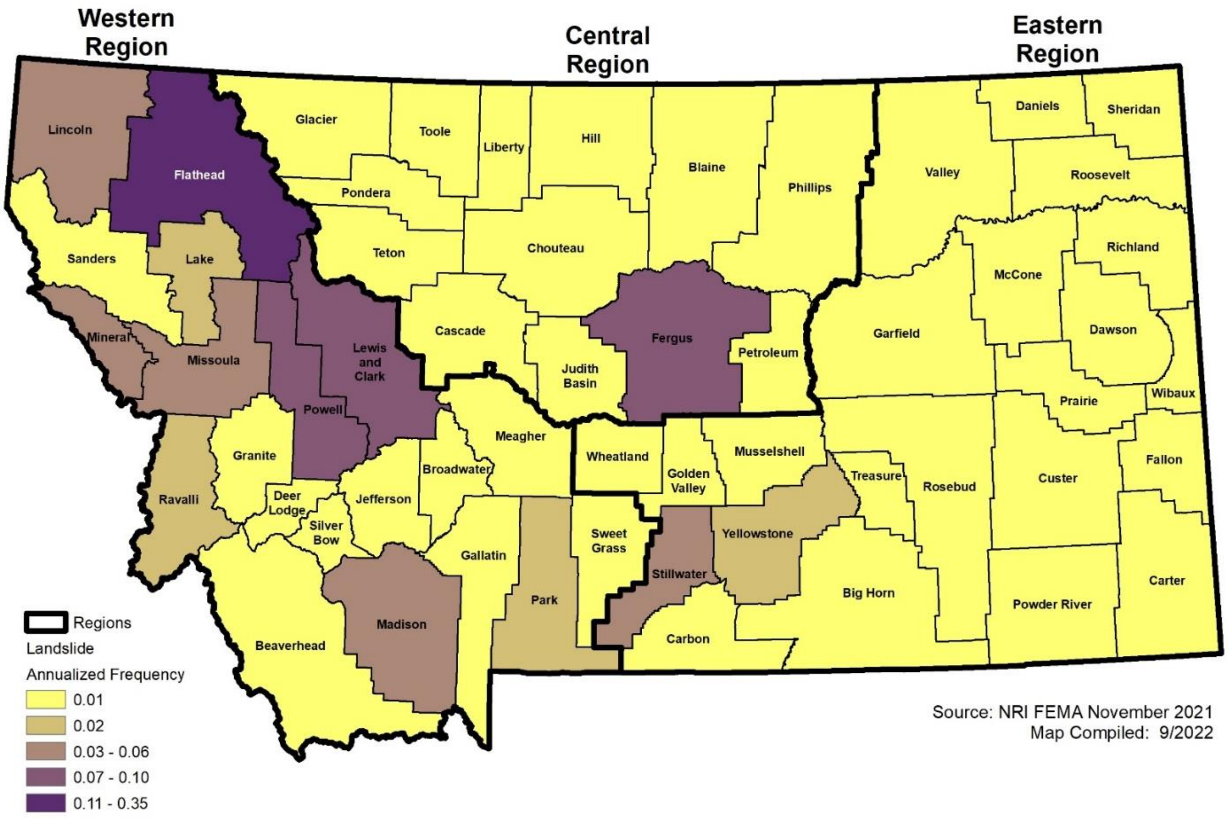
[5] The 1959 Madison Slide, Part 2: Recovery and remediation, accessed 9/2024 at https://www.usgs.gov/observatories/yvo/news/1959-madison-slide-part-2-recovery-and-remediation.

4.2.10.4 Frequency/Likelihood of Occurrence

Although complete historical landslide occurrence data is limited it can be assumed that these geological processes will continue to occur in Western Montana in the future. Many cases of this hazard do not affect any assets. From a hazard mitigation perspective, the frequency of landslide hazards that affect assets is rated as **occasionally** for the Western Region as a whole. Some variability in this rating exists within the region from county to county. Landslides occur most often during wet climate cycles or following heavy rains, but only in certain areas of the planning area. Heavy periods of precipitation or substantial development could have an influence on slope stability. Characteristically, there is a landslide/rockfall "season" that correlates with enhanced freeze-thaw phases and wetter weather in the spring and summer.

According to the NRI, landslides occur much more frequency in the central and northern reaches of the planning area, and in Madison County (Figure 4-52). Flathead County has the highest expected annualized frequency for landslides in the Western Region, followed by Powell and Lewis & Clark Counties.

Figure 4-52 NRI Annualized Landslide Frequency Montana Statewide



Source: NRI FEMA November 2021
Map Compiled: 9/2022

4.2.10.5 Climate Change Considerations

Landslides or debris flows can be triggered by climatic events, especially if intense rainfall and runoff events destabilize hillsides. It is presently unclear if total precipitation in Montana is more likely to decline or increase due to climate change. To date, climate change does not appear to have changed total precipitation either way. Current projections, confirmed by current observations documented in the 2021 Montana Climate Change and Human Health report, are for a seasonal shift in precipitation to increase in early spring and decrease in summer months (Section 4.2.6.5). The Fifth National Climate Assessment confirms that drought is increasing in Montana and is projected to cause a marginal increase in the frequency of drought of 10% by mid-century and 20% by the end of the century, even under moderate emissions scenarios. To date, no reliable information exists that indicates if and how climate change will affect landslide hazards.

Of greater significance, a profound climate-change caused increase in wildfire frequency and severity will likely cause a corresponding increase in fire scar-flooding and debris flows. See Sections 4.2.8.2 and 4.2.17.5 for more details on this scenario.

4.2.10.6 Potential Magnitude and Severity

Given the story of the earthquake-triggered landslide that that killed 26 people and formed a 220 ft. tall dam across the Madison River, forming what is now known as Earthquake Lake (see Section 4.2.10.3), it is difficult to overstate the potential magnitude and severity of landslides in the planning area. The NRI scores of risk index for landslide are among the highest scores of any hazard in the Western Region. Only cold wave and wildfire have a higher risk index score, and landslide is approximately even with earthquake.

Landslides can be classified using the Alexander Scale, shown in Table 4-46. The scale is predicated on landslide debris impacting the built environment. Based on the history the highest extent level expected within the planning area is level 5 (Very Serious), but this is likely to be isolated to limited areas in where maintenance is limited and wooden buildings, roofs, or porches are collapsed or disconnected from foundations.

Table 4-46 Alexander Scale for Landslide Scale Damage

Level	Damage	Description
0	None	Building is intact
1	Negligible	Hairline cracks in walls or structural members; no distortion of structure or detachment of external architectural details
2	Light	Buildings continue to be habitable; repair not urgent. Settlement of foundations, distortion of structure, and inclination of walls are not sufficient to compromise overall stability.
3	Moderate	Walls out of perpendicular by one or two degrees, or there has been substantial cracking in structural members, or the foundations have settled during differential subsidence of at least 6 inches; building requires evacuation and rapid attention to ensure its continued life.
4	Serious	Walls out of perpendicular by several degrees; open cracks in walls; fracture of structural members; fragmentation of masonry; differential settlement of at least 10 inches compromising foundations; floors may be inclined by one or two degrees or ruined by heave. Internal partition walls will need to be replaced; door and window frames are too distorted to use; occupants must be evacuated, and major repairs carried out.
5	Very Serious	Walls out of plumb by five or six degrees; structure grossly distorted; differential settlement has seriously cracked floors and walls or caused major rotation or slewing of the building [wooden buildings are detached completely from their foundations]. Partition walls and brick infill will have at least partly collapsed; roofs may have partially collapsed; outhouses, porches, and patios may have been damaged more seriously than the principal structure itself. Occupants will need to be re-housed on a long-term basis, and rehabilitation of the building will probably not be feasible.
6	Partial Collapse	Requires immediate evacuation of the occupants and the cordoning off of the site to prevent accidents with falling masonry.
7	Total Collapse	Requires clearance of the site.

Source: FEMA

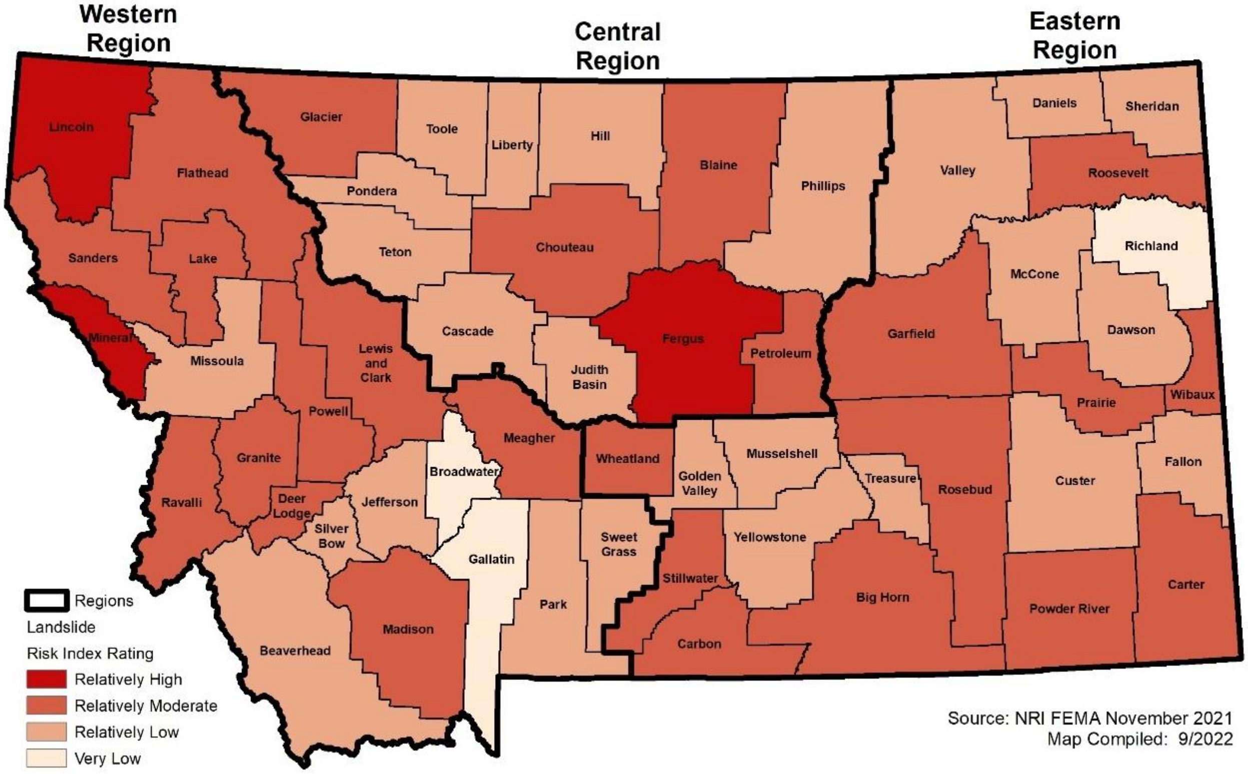
The severity of landslides or rockslides depends on the amount of material (soil, debris, or rocks) moves and where it stops moving (e.g. on roadway). Although the extent of the hazard is geographically small, the severity of landslides and rockfalls can be critical with potential to cause severe injuries, shutdown transportation corridors to critical infrastructure, and damage property.

4.2.10.7 Vulnerability Assessment

The landslide *Vulnerability Assessment* identifies, or at least discusses, *assets* that are more *likely to be exposed* to landslide hazards, *susceptible* to damage from that exposure, and the consequence exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with landslide hazards. *Likely to be exposed* indicates a presence in areas deemed to be especially likely to experience landslide hazards. *Susceptible* indicates a strong likelihood of damage from exposure to landslide hazards and is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is not considered a special concern for landslide hazards in the Western Region (see section titled *Climate Change Considerations*, above). However, debris flows related to fire scars are anticipated to increase due to climate change. That issue is considered further in the Section 4.2.8 *Flooding*. Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

Figure 4-53 illustrates the overall NRI risk index score for landslide hazards. Most of the Western Region is rated as relatively moderate to high. Lincoln and Mineral Counties are rated as having the highest relative risk for landslides overall. Flathead, Sanders, Lake, Powell, Lewis & Clark, Granite, Ravalli, Meagher, and Madison Counties are each rated as relatively moderate risk for landslides.

Figure 4-53 Risk Index Rating for Landslide by County



Source: NRI FEMA November 2021
Map Compiled: 9/2022

People

As the 1959 earthquake-triggered landslide showed, people are extremely susceptible to injury and death from landslide hazards. Fortunately, exposure to severe landslide hazards is extremely rare. Landslides typically result in property damage, not risk to human life. The 1959 event is apparently the only fatal landslide to have occurred in the state of Montana. On average, the vulnerability of people to landslide is low.

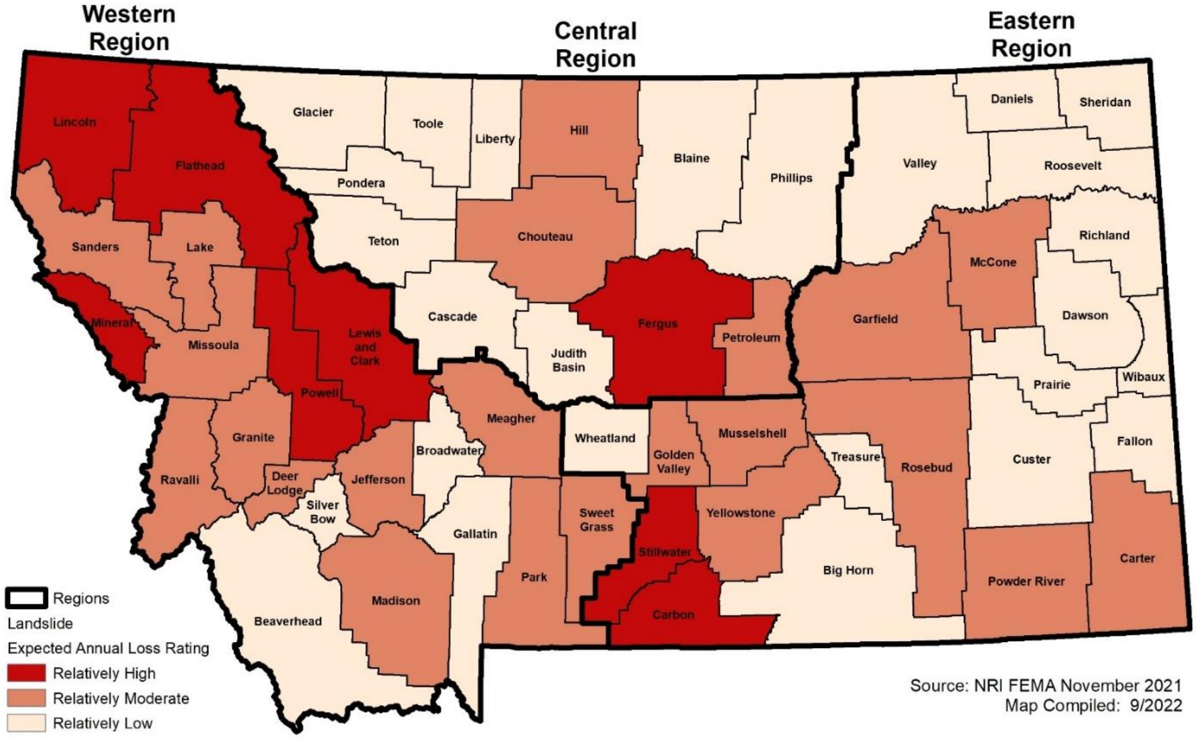
Property

Landslides directly damage engineered structures in two general ways: 1) disruption of structural foundations caused by differential movement and deformation of the ground upon which the structure sits, and 2) physical impact of debris moving downslope against structures located in the travel path.

Indirect hazards to property also exist. Landslides are also known to dam rivers. These dams can be dangerous for pooling water until the rising water either builds until the hydrostatic force on the dam wall bursts the dam or the rising water behind the dam overtops it, leading to a dam failure. Either way, a failed landslide-caused dam can cause extensive damage downstream.

The expected annual loss due to landslide for each county in the Western Region is shown in Figure 4-54.

Figure 4-54 NRI Expected Annual Loss Rating Montana Statewide



Source: NRI FEMA November 2021
Map Compiled: 9/2022

Critical Facilities and Lifelines

Transportation systems are usually the most vulnerable type of critical facility in the Western Region to landslide hazards. Residents and visitors alike are impacted when roads are blocked or damaged by these hazards. The impairment of transportation networks can cause secondary damage to essential services. Restoring roads following these hazards can be difficult and time consuming.

Linear, buried infrastructure is also vulnerable to landslide hazards. Extension, bending, and compression caused by ground deformation can break pipes and cables used for water, power, and communications infrastructure. This can lead to the dangerous disruption of services, including power, water and wastewater service, communications, and transportation. Damaged natural gas pipelines can cause fires. The direct and indirect impact of landslide hazards on lifelines can be much greater than the impact of individual building failures.

Economy

Economic losses can be direct, such as the destruction of a building, or indirect, such as lost wages and income from the loss of businesses that depend on that building. Tourism can also be disrupted. Relatively little information is available to judge the potential scale of economic impact from landslide hazards.

Historic and Cultural Resources

In general, historic structures would likely have similar levels of susceptibility to landslide hazards as all other property types. Historical buildings typically avoid exposure to landslide hazards simply by being located in relatively flat locations such as in towns.

Natural Resources

Landslides are a natural process that has shaped the natural environment. However, this hazard has the potential to permanently alter the natural landscape and impacts natural resources. Landslide effects on the environment and natural resources could be very destructive depending on the size of the landslide event and secondary/cascading effects from an event (e.g., rockfall). Additionally, rockfalls to rivers can cause blockages causing flooding, damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat. Also, hillsides that provide wildlife habitat can be lost for prolonged periods of time.

An earthquake caused landslide in 1959 had undeniable impacts on natural resources. It collapsed a mountainside and dammed the Madison River. This likely stopped flow down the Madison for weeks and created what is now known as Earthquake Lake.

Development Trends Related to Hazards and Risk

The effect of development on vulnerability to landslides is largely a function of how it affects the value of assets in high hazard areas. Western Montan has and continues to grow (Section 2.3). However, high hazard areas for landslides have not been delineated and it is unclear how much of that development has taken place in areas likely to be affected by landslides. Most high-hazard areas are in steep terrain that is typically remote. Most recent and projected development appears to be urban in character (Section 2.3). It is likely that development has and will continue to affect landslide vulnerability very little.

4.2.10.8 Risk Summary

Landslide is rated as a low significance hazard in the Western Region, though differences exist between jurisdictions (Table 4-47).

- An earthquake-triggered landslide led to the deadliest natural disaster in Montana’s history (Section 4.2.10.3)
- Landslide hazards are typically limited to steep terrain, commonly in remote locations.
- Landslide risk is highly variable in the Western Region; some areas have high NRI risk scores, some areas have low NRI risk scores (Sections 4.2.10.6)
- Within the Lincoln, Flathead, Powell, Mineral, and Lewis & Clark Counties, have an EAL rating due to landslides of relatively high. Sanders, Lake, Ravalli, Granite, Jefferson, Meagher, Madison, Park, and Sweet Grass Counties have relatively moderate expected annualized losses due to landslides.
- Transportation systems are usually the most vulnerable critical facility type in the Western Region.
- Related Hazards: Earthquake, Floods, Severe Summer Weather, Wildfire.

Table 4-47 Risk Summary Table: Landslide

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Low	N/A	N/A
Beaverhead	Low	City of Dillon, Town of Lima	N/A
Broadwater	Medium	City of Townsend	N/A
Butte-Silver Bow	Low	Town of Walkerville	N/A
CSKT	High	N/A	N/A
Flathead	Medium	Columbia Falls, Kalispell, Whitefish	Flathead has the greatest expected annual frequency. Estimated annual losses are also expected to be high in Flathead County
Granite	Low	Towns of Drummond and Philipsburg	None
Jefferson	Low	City of Boulder, Town of Whitehall	None
Lake	Medium	City of Polson, City of Ronan, Town of St. Ignatius	Risk and likelihood for future events is generally moderate in Lake County
Lewis and Clark	Medium	City of Helena, City of East Helena	Estimated annual losses are expected to be high in Lewis & Clark County
Lincoln	Low	City of Libby, City of Troy, Town of Eureka	Estimated annual losses are expected to be high in Lincoln County, as is the general RIs
Madison	Low	Town of Ennis, Town of Sheridan, Town Virginia City	None
Meagher	Low	City of White Sulphur Springs	N/A
Mineral	Medium	Town of Alberton, Town of Superior	Estimated annual losses are expected to be high in Mineral County, as is the general RIs
Park	Low	City of Livingston, Town of Clyde Park	None
Powell	Medium	City of Deer Lodge	Estimated annual losses are expected to be high in Powell County
Ravalli	Medium	City of Hamilton, Town of Darby, Town of Stevensville	Ravalli has seen the highest recorded number of suspected previous landslides
Sanders	Low	City of Thompson Fall, Town of Plains, Town of Hot Springs	None
Sweet Grass	Low	City of Big Timber	N/A

4.2.11 Severe Summer Weather

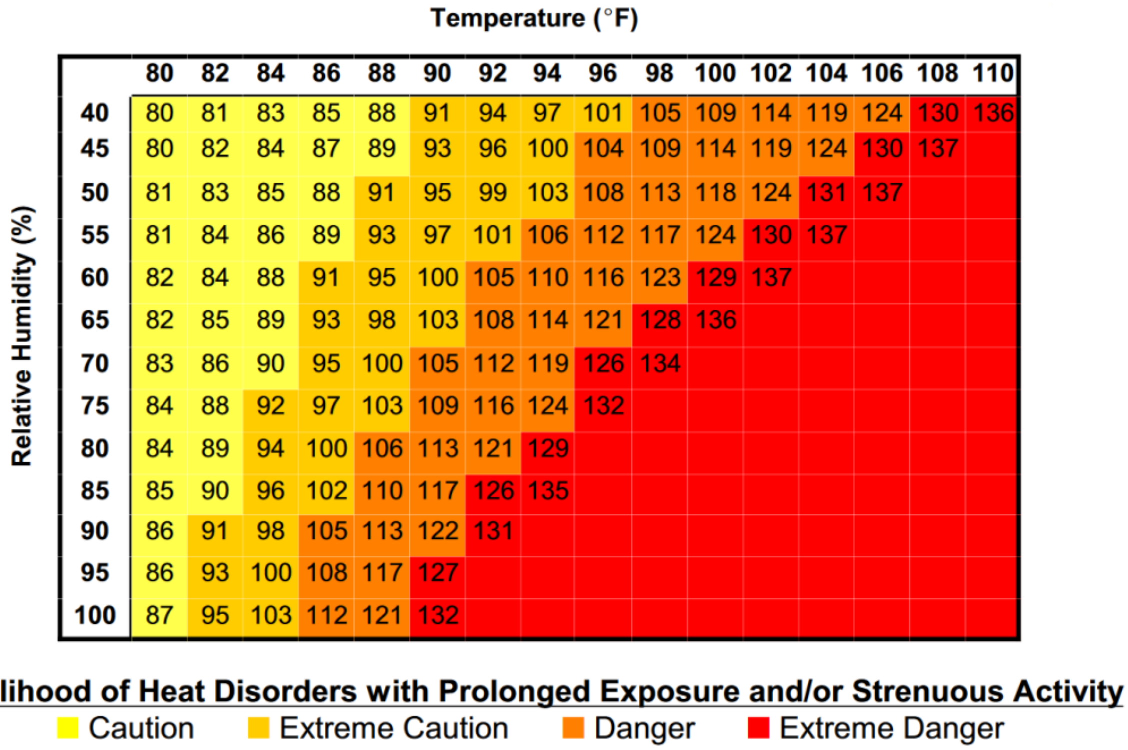
4.2.11.1 Hazard/Problem Description

For this plan, severe summer weather in Montana includes extreme heat events, hail, heavy rain, and lightning. A brief description of these weather phenomena is presented below. More information on thunderstorm winds, high winds, and tornadoes, which typically are associated with summer weather, can be found in the Tornadoes and Windstorms section of the plan.

Extreme Heat

Extreme heat occurs from a combination of high temperatures (significantly above normal) and high humidity. At certain levels, the human body cannot maintain proper internal temperatures and may experience heat stroke. The NWS heat index (Table 4-48) is a measure of what the temperature feels like to the human body when relative humidity is combined with the air temperature, in shade conditions. In most of the United States, extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. In extreme heat, evaporation is slowed and the body must work extra hard to maintain a normal temperature. This can lead to health impacts by overworking the human body. Extreme heat often results in the highest number of annual deaths among all weather-related hazards.

Table 4-48 NWS Heat Index and Potential for Health Effects



	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure and/or Strenuous Activity

🟨 Caution 🟨 Extreme Caution 🟧 Danger 🟥 Extreme Danger

Image adapted from https://www.weather.gov/ama/heatindex

Note: Heat index values shown here are for shady locations. Exposure to direct sunlight can increase these values by up to 15°F.

Hail

Hail forms when updrafts carry raindrops into extremely cold areas of the atmosphere where the drops freeze into ice. Hail falls when it becomes heavy enough to overcome the strength of the updraft and is pulled by gravity towards the earth. The process of falling, thawing, moving up into the updraft and refreezing before falling again may repeat many times, increasing the size of the hailstone. The severity of hail is often measured in inches and referred to by objects of similar size (see table below). Hailstones are usually less than two inches in diameter but have been reported much larger and may fall at speeds of up to 120 mph. Severe hail is classified as hail 1-inch in diameter or large. Hail is typically associated with thunderstorms and occurs in the summer months in the Western Region. Commonly reported descriptions of hail size are defined in Table 4-49.

Table 4-49 Hail Diameter and Common Description

Hail Diameter (inches)	Object Analog Reported
0.50	Marble, moth ball
0.75	Penny
0.88	Nickel
1.00	Quarter
1.25	Half dollar
1.50	Walnut, ping pong ball
1.75	Golf ball
2.00	Hen egg
2.50	Tennis ball
2.75	Baseball
3.00	Teacup
4.00	Softball
4.50	Grapefruit

Data attained from https://www.spc.noaa.gov/misc/tables/hailsize.htm

Heavy Rain

Heavy rain is typically associated with thunderstorm conditions and can result in flash flooding. Rainfall severity is typically measured in inches of rainfall or inches or rainfall per hour. In Western Montana, more than 0.1" of rain per hour is considered moderate, and more than 0.3" per hour is considered heavy rain. The reviewed history of heavy rain events in the Western Region of Montana mentions roads and ditches being flooded due to heavy rains, but there was no repeated location given in the dataset. On occasion, heavy rains and melting snow have been reported to cause ice jams and flash flooding. It is rarely reported that flash floods cause an accumulation of water in structures in the planning area.

Lightning

Lightning is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm and the earth's surface. When the buildup becomes strong enough, lightning appears as a "bolt." This visible electrical discharge produced by a thunderstorm can occur within or between clouds, between the cloud and air, between a cloud and the ground or between the ground and a cloud. Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is also less common. It frequently strikes away from the rain core, either ahead or behind the thunderstorm, and can strike 5-10 miles from the storm in areas that most people do not consider to be a threat. Lightning's electrical charge and intense heat can electrocute on contact, split trees, ignite fires, and cause electrical failures. The severity of lightning can be measured on a scale of lightning activity level (Table 4-50).

Table 4-50 Lightning Threat Levels

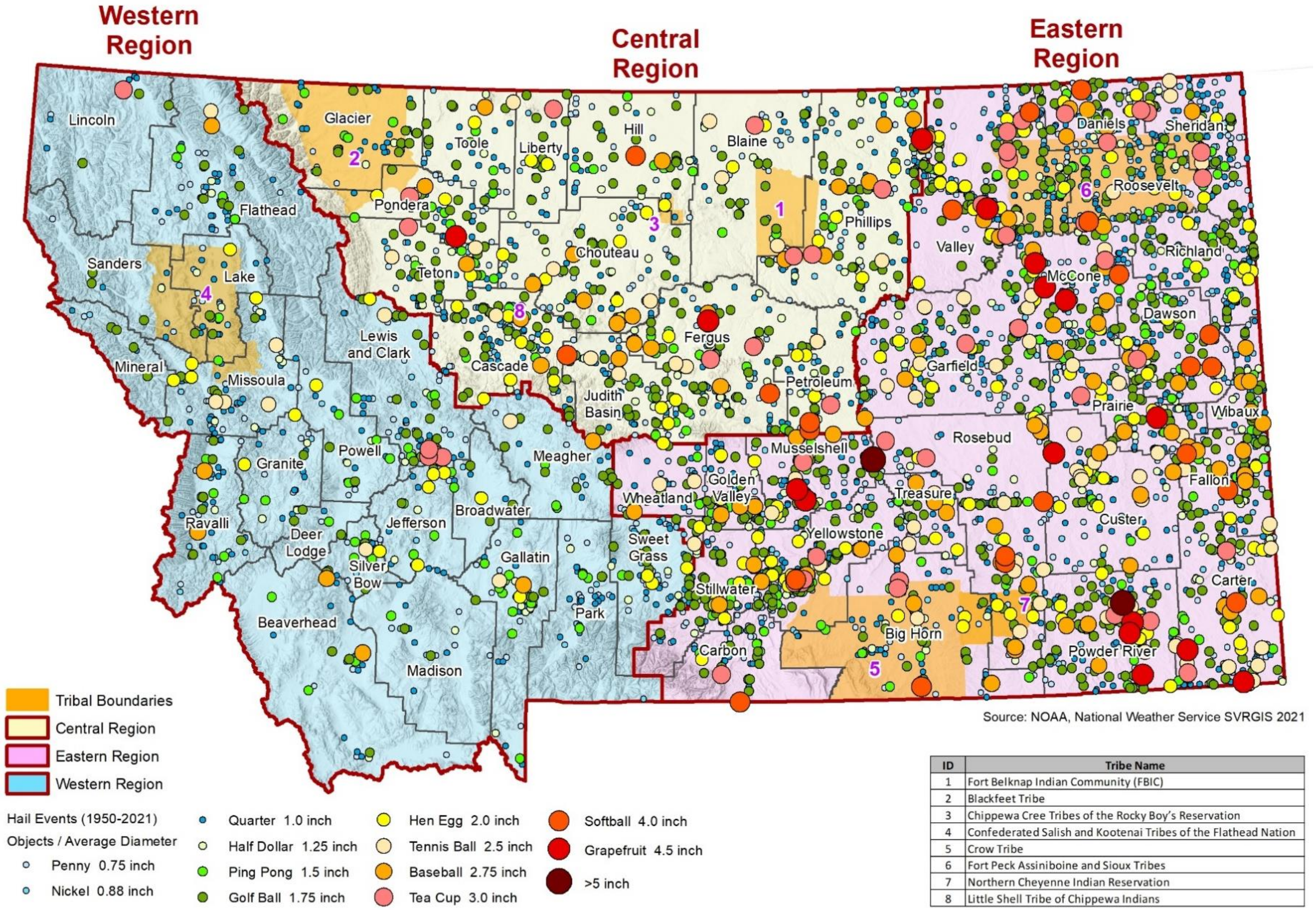
Lightning Threat Level	Threat Level Descriptions
Extreme	**"An Extreme Threat to Life and Property from Lightning."** • Within 12 miles of a location, a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of excessive CG lightning. • AND/OR...a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of frequent CG lightning. • AND/OR...a very high likelihood of CG lightning (or 80% to 90% thunderstorm probability), with storms capable of occasional CG lightning.
High	**"A High Threat to Life and Property from Lightning."** • Within 12 miles of a location, a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of excessive CG lightning. • AND/OR...a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of frequent CG lightning. • AND/OR...a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of occasional CG lightning.
Moderate	**"A Moderate Threat to Life and Property from Lightning."** • Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of excessive CG lightning. • AND/OR...a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of frequent CG lightning. • AND/OR...a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of occasional CG lightning.
Low	**"A Low Threat to Life and Property from Lightning."** • Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of frequent CG lightning. • AND/OR...a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of occasional CG lightning.
Very Low	**"A Very Low Threat to Life and Property from Lightning."** • Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of occasional CG lightning.
Non-Threatening	**"No Discernable Threat to Life and Property from Lightning."** • Within 12 miles of a location, environmental conditions do not support CG lightning.

Note:
- With cloud-to-ground (CG) lightning, every strike is potentially lethal
- Occasional - CG lightning at the rate of 1 to 3 flashes per minute
- Frequent - CG lightning at the rate of 4 to 11 flashes per minute
- Excessive - CG lightning rate of 12 flashes or more per minute

4.2.11.2 Geographical Area Affected

The geographic extent of summer weather is **Extensive**. The entire Western Region is vulnerable to experiencing severe summer weather, but there are regional variations apparent when looking at the frequency of events. Some types of hazards, such as extreme heat events, occur on a regional scale and typically impact several/all counties in the planning area at once. Other hazards, such as lightning, hail, and heavy rain, impact more local areas. Lightning tends to strike a single point and it is rare for lightning to strike people or property multiple times in one storm event. Hail and heavy rain generally occur in small pockets of an accompanying storm. Figure 4-55 below displays the hail history in the State of Montana.

Figure 4-55 Hail Events in Montana by Region (1955-2021)



ID	Tribe Name
1	Fort Belknap Indian Community (FBIC)
2	Blackfeet Tribe
3	Chippewa Cree Tribes of the Rocky Boy's Reservation
4	Confederated Salish and Kootenai Tribes of the Flathead Nation
5	Crow Tribe
6	Fort Peck Assiniboine and Sioux Tribes
7	Northern Cheyenne Indian Reservation
8	Little Shell Tribe of Chippewa Indians

Source: NOAA

4.2.11.3 Past Occurrences

The NCEI database was used to gather information on historic severe summer weather events in the Western Region of Montana. The NCEI data is a comprehensive list of oceanic, atmospheric, and geophysical data across the United States and aggregated by county and zone. It is important to note that weather events that occurred on Confederated Salish and Kootenai Tribes of the Flathead Nation is also included in the dataset tables down below. However, instead of individual records, tribal data records were grouped into the closest/nearest County.

The NCEI dataset contains information on hail events from 1955 to March of 2022, in addition to lightning, heavy rain, and excessive heat events from 1996 to March of 2022. Table 4-51 summarizes the data from NCEI. It is important to note that not all severe summer weather events get reported by the NCEI and losses are estimates, therefore, actual losses may be higher than those reported below. Based on this data, hail is the most frequently occurring and damaging severe summer weather event in the Western Region. Only lightning events have resulted in casualties. Excessive heat events had no reported damages in the NCEI dataset.

Table 4-51 Summary of Historic Summer Weather Events, 1955-March 2022

	Deaths	Injuries	Property Loss	Crop Loss	Days with Events	Total Events
Excessive Heat	0	0	$0	$0	4	9
Hail	0	0	$2,394,100	$210,100	368	897
Heavy Rain	0	0	$42,000	$0	51	110
Lightning	1	12	$492,000	$0	16	17
Total	1	12	$2,928,100	$210,100	439	1,033

Source: NCEI

There are variations in losses and frequency of hazards across the Western Region. According to the NCEI database, the counties of Sweet Grass, Lewis and Clark, and Flathead experienced significantly more hail events than the rest of the planning area. Lewis and Clark County also experienced the greatest number of reported heavy rain events in the planning area, followed by Beaverhead County. Seven counties have reported previous lightning events. The only county with documented excessive heat events is Flathead County. Table 4-52 and Figure 4-56 display the summary of total severe weather events by county.

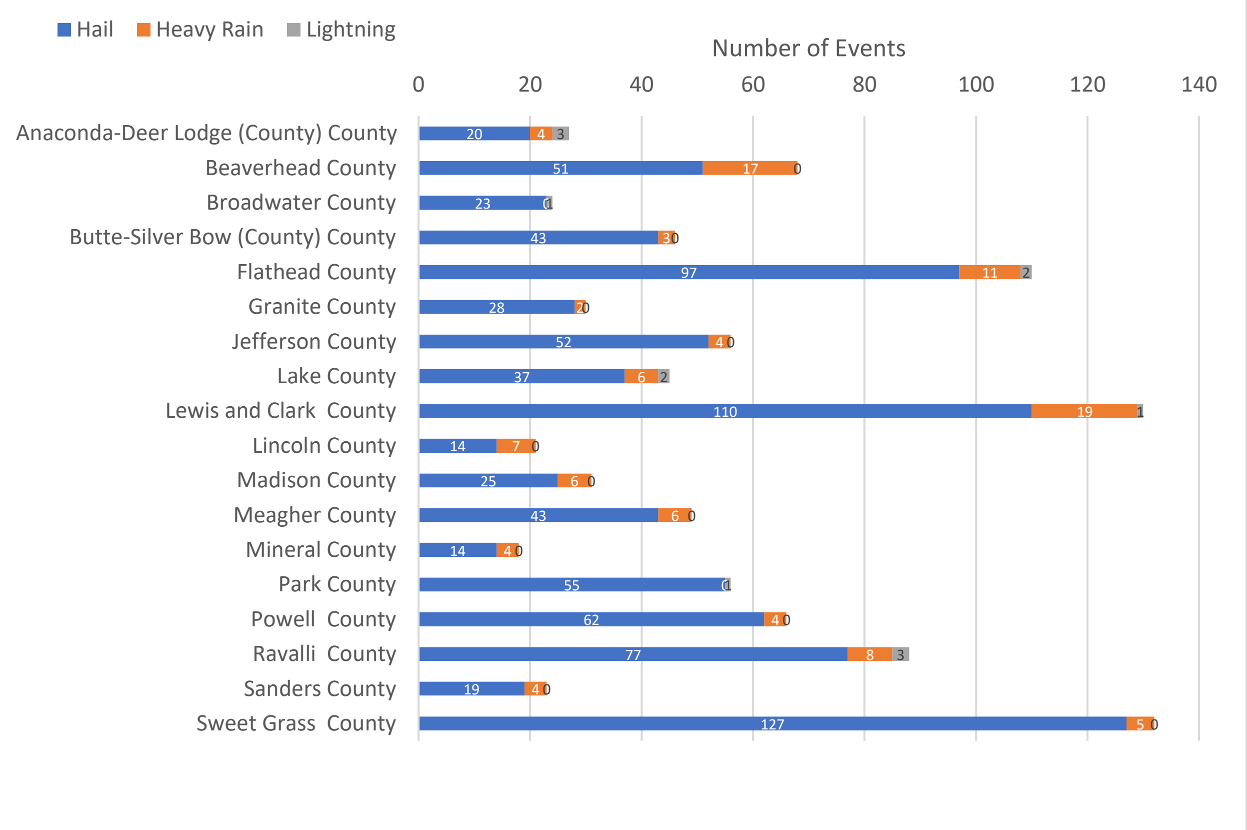
Table 4-52 Summary of Severe Summer Weather Events by County in the Western Region, 1955-March 2022

	Excessive Heat	Hail	Heavy Rain	Lightning
Beaverhead	0	51	17	0
Broadwater	0	23	0	1
Butte-Silver Bow	0	43	3	0
Flathead	1	97	11	2
Granite	0	28	2	0
Jefferson	0	52	4	0
Lake	0	37	6	2
Lewis and Clark	0	110	19	1
Lincoln	0	14	7	0
Madison	0	25	6	0
Meagher	0	43	6	0

	Excessive Heat	Hail	Heavy Rain	Lightning
Mineral	0	14	4	0
Park	0	55	0	1
Powell	0	62	4	0
Ravalli	0	77	8	3
Sanders	0	19	4	0
Sweet Grass	0	127	5	0
Total	**1**	**877**	**106**	**10**

Source: NCEI

Figure 4-56 Summary of Severe Summer Weather Events by County in the Western Region, 1955-March 2022



Source: NCEI, Chart by WSP

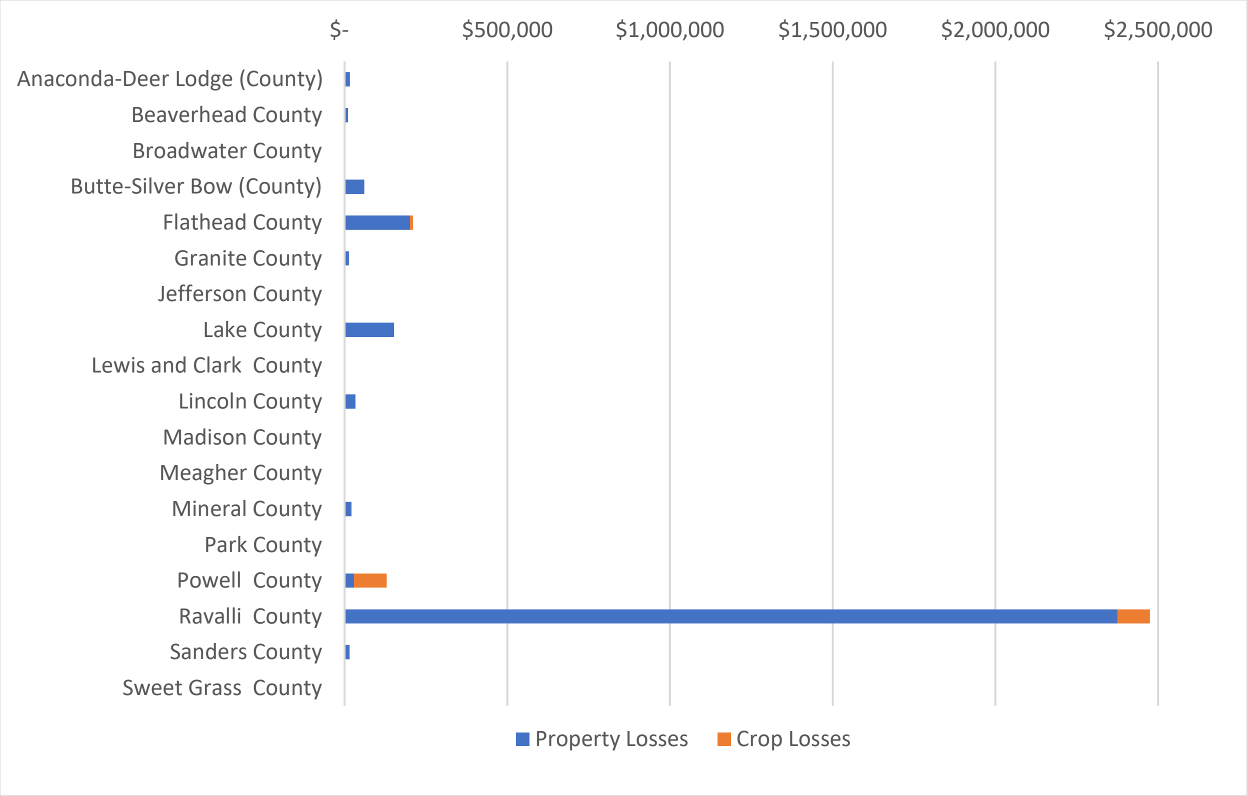
There are also variations between counties in the Western Region in terms of losses from severe summer weather events. A summary of losses reported by the NCEI dataset by county is displayed in Table 4-53 and Figure 4-57. Based on this data, Ravalli County has experienced the greatest property loss. Ravalli and Powell Counties have experienced the greatest crop loss from severe summer weather events. All crop losses and the majority of the property losses are due to hail events in the Western Region. There have also been 12 reported injuries due to lightning in the Western Region, and one death due to lightning in Broadwater County.

Table 4-53 Summary of Losses by County in the Western Region, 1955-March 2022

	Deaths	Injuries	Prop. Loss	Crop Loss
Beaverhead	0	0	$10,000	-
Broadwater	1	0	-	-
Butte-Silver Bow	0	0	$60,500	-
Flathead	0	0	$201,600	$8,600
Granite	0	0	$13,000	-
Jefferson	0	0	-	-
Lake	0	0	$152,000	-
Lewis and Clark	1	5	$2,000	-
Lincoln	0	0	$32,500	$1,500
Madison	0	0	-	-
Meagher	0	0	-	-
Mineral	0	0	$21,000	-
Park	0	3	-	-
Powell	0	0	$29,500	$100,000
Ravalli	0	1	$2,375,000	$100,000
Sanders	0	0	$15,000	-
Sweet Grass	0	0	-	-
Total	**1**	**9**	**$2,912,100**	**$210,100**

Source: NCEI

Figure 4-57 Summary of Severe Summer Weather Events by County in the Western Region, 1955-March 2022



Source: NCEI, Graph by WSP

The NCEI dataset reports details on several of the severe summer weather events in the Western Region:

- August 4, 2002 (Ravalli County): Supercell thunderstorm formed over the Bitterroot Valley near Hamilton and moved north through the valley, impacting the communities of Stevensville to Florence. Extensive damage to property and crops was caused by large hail up to golf ball size, and strong winds in the Stevensville area. Property damage was $2 million and crop damage was $100,000. State snowplows had to be called out to clear several miles of Highway 93 from Stevensville turnoff north towards Florence. Houses, garages, and farm outbuildings were damaged by falling trees, flying debris, hail, and wind. The hail stripped trees bare, smashed windows, dented cars, bruised and cut horses as well as blew fruit off trees.
- August 3, 2003 (Lewis and Clark County): Five people were injured by a lightning bolt; one adult suffered serious bruising and trauma.
- May 18, 2007 (Broadwater County): Lightning event associated with a cold front killed a man who was in a boat fishing on Canyon Ferry Reservoir.
- July 26, 2011 (Park County): Scattered thunderstorms moved across southern Park County during the late afternoon hours of Tuesday July 26, resulting in three people injured to different degrees.
- July 17, 2013 (Flathead County): A mid-level southwest 50 knot jet combined with high moisture and very warm temperatures provided the prime environment for strong supercells. These cells brought both severe wind and hail. The hail event resulted in $100,000 of property damage.

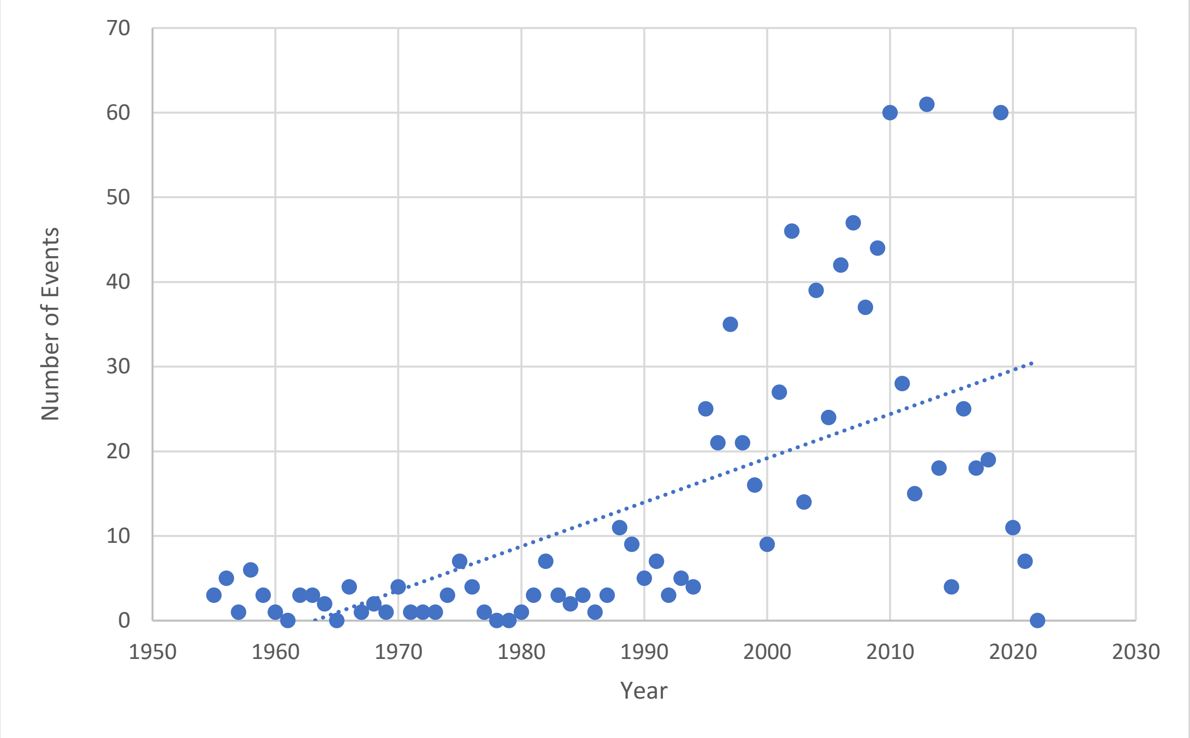
4.2.11.4 Frequency/Likelihood of Occurrence

The frequency of severe summer weather events in the Western Region is ranked as **Highly Likely** All counties in the planning area are likely to experience a severe summer hazard yearly. Since 1955, 1,033 severe summer weather events over 439 days have been recorded in the Western Region. As discussed above, there are variations in frequency and severity of damage from severe summer weather across the Western Region. The counties of Beaverhead, Park, and Sweet Grass were rated as a few counties in Montana with the highest exposure to severe weather in the 2018 State HMP. As shown above in the NCEI data demonstrated, Flathead, Lewis and Clark, and Sweet Grass Counties experience a higher frequency of reported events than the rest of the Counties in the Western Region.

A total of 897 hail events on 368 days have been recorded in the planning area over the course of 67 years, from 1955-2022. While there is some variation between counties in Western Region, all counties are likely to experience at least one hail event per year. Counties such as Broadwater and Granite averages less than one extreme hail event per year, while some counties, such as Sweet Grass and Lewis and Clark Counties, average more than one and sometimes two hail events per year. Figure 4-58 displays the trend of hail events by year in the Western Region, showing a generally increasing trend in the frequency of hail events from 1955 to 2021.

While all counties in the Western Region will experience lightning throughout the year, some counties have historically higher numbers of reported damaging lightning events than others. According to the NCEI dataset, Anaconda-Deer Lodge County and Ravalli County most frequently experience damaging lightning events, while many other counties have no recorded events. Moreover, while most counties in the planning area have a comparatively low number of recorded heavy rain and excessive heat events, this is more likely due to the fact the events were not reported to the NCEI dataset.

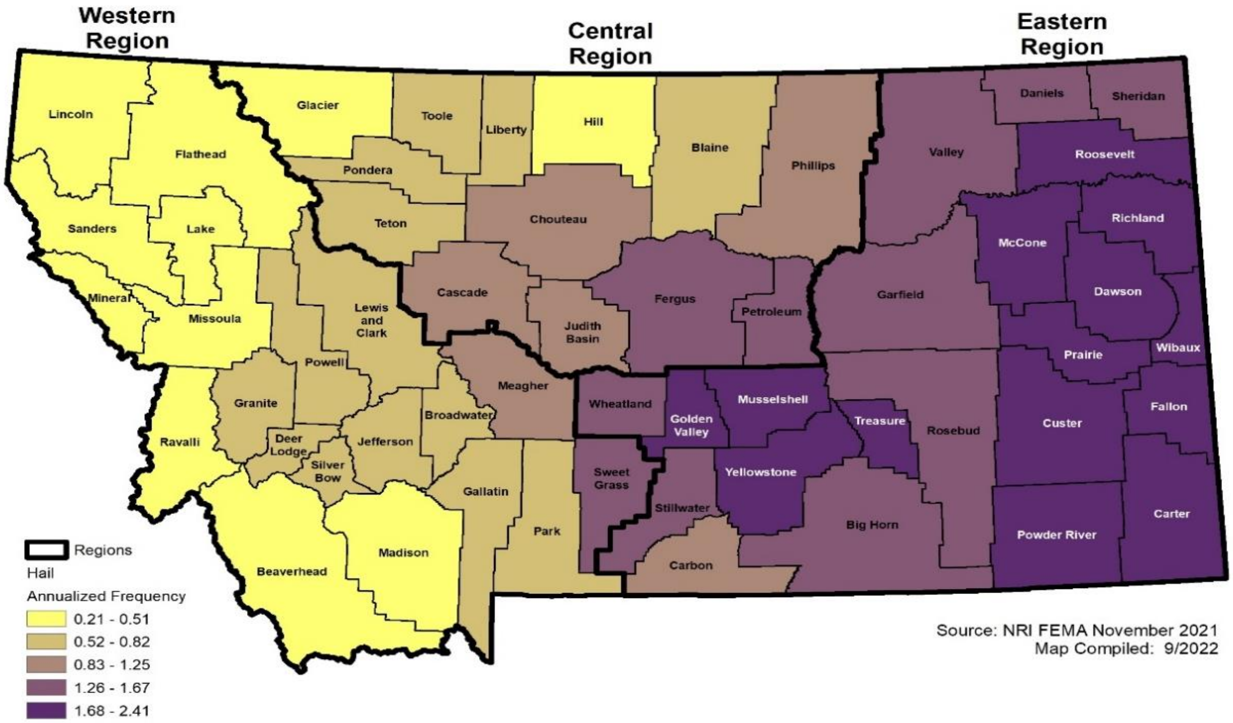
Figure 4-58 Hail Events by Year in the Western Region (1955-2021)



Source: NCEI, Chart by WSP

The figures below depict annualized frequency of hail and lightning at a county level based on the NRI. The mapping shows a trend towards increased likelihood in the southeastern portions of the Region.

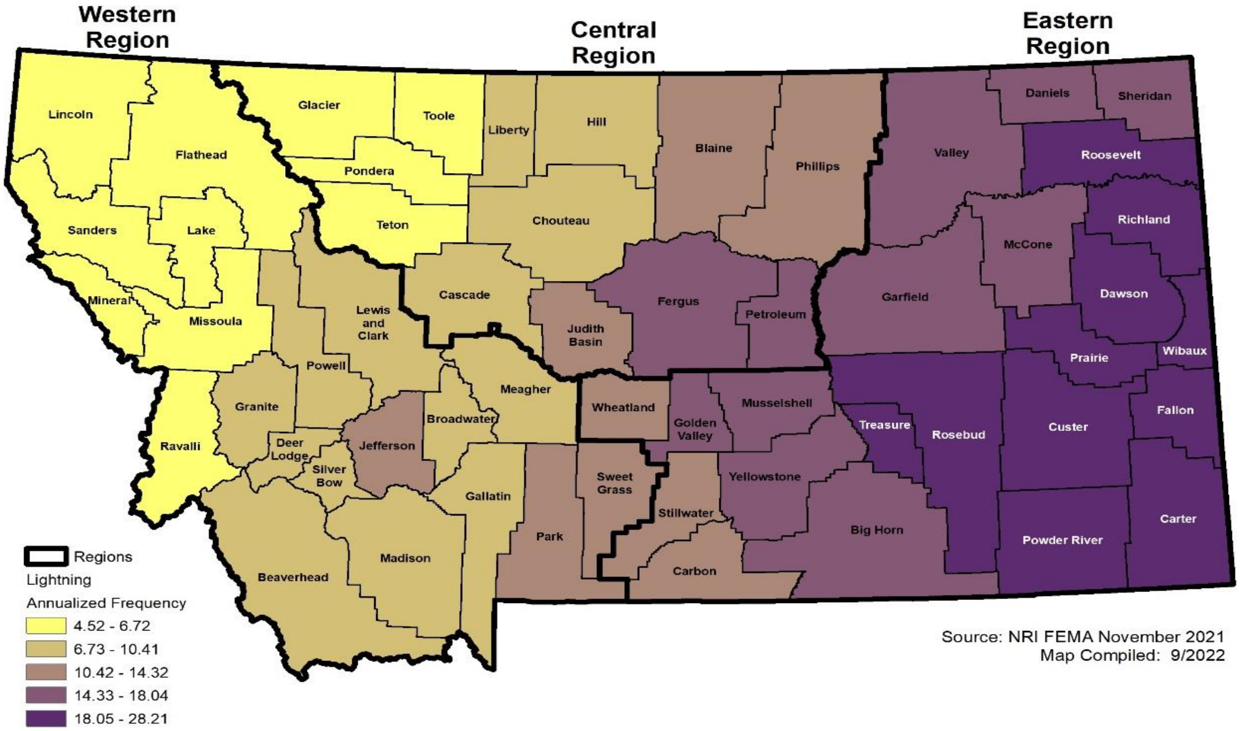
Figure 4-59 NRI Annualized Frequency of Hail Events by County



Source: NRI FEMA November 2021
Map Compiled: 9/2022

Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-60 NRI Annualized Frequency of Lightning Events by County



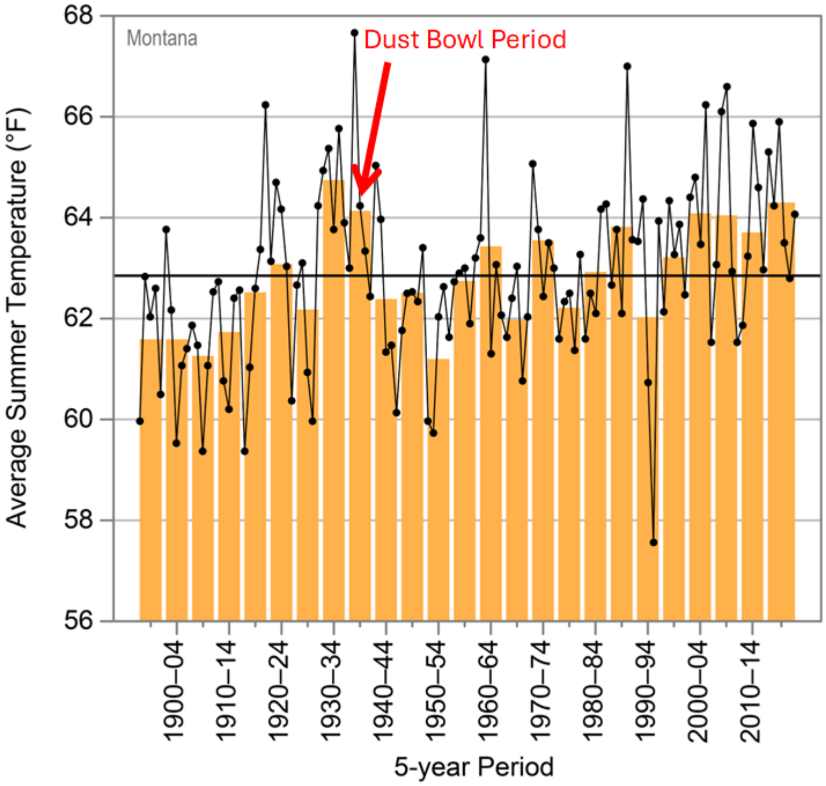
Source: NRI FEMA November 2021
Map Compiled: 9/2022

Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

4.2.11.5 Climate Change Considerations

The planning area is warming due to climate change and even conservative estimates indicate the trend will continue and even accelerate in the future. Increasing exposure to extreme heat is described as the greatest concern for human health in the 2021 Montana Climate Change and Human Health study. This study documented statewide average temperatures have increased 2-3 °F from the 65-year period from 1950-2015 and are projected to increase 4-6 °F by 2069 relative to average temperatures 1971-2000, roughly 85 years of warming. The Montana Climate Change and Human Health study provides state-wide estimates, but states that changes between climate divisions are slight. Seasonally, temperature increases were greatest in summer and winter (Figure 4-61), with August having the greatest average temperature increase in all climate divisions.

Figure 4-61 Observed Average Summer Temperature, 1895-2020



Dots represent summer average temperature for a specific year. Bars are 5-year averages of summer temperature.
Black horizontal line is the average summer temperature for all years, 1895-2020.
Figure adapted from: 2022 NOAA State Climate Summaries, Montana. https://statesummaries.ncics.org/chapter/mt/

Exposure to extreme heat will increase due to climate change, heat-related health impacts will increase, but it is useful to keep the situation in perspective; the fifth National Climate Assessment notes that extreme heat in the Northern Great Plains region remains modest relative to much of the country. The NRI rates the planning area as having a *relatively low* or *very low* risk of Heat Wave impacts for current conditions. Even under future warming scenarios, it appears unlikely the NRI ratings will change dramatically.

Hail is presently a relatively low impact hazard according to the National Risk Assessment and little is known about how it will be affected by climate change. The 2022 NOAA Climate Summary for Montana acknowledges that hail exists in Montana. The Fifth National Climate Assessment includes projections of large hail increasing in frequency and season length throughout the Northern Great Plains. The 2021

Montana Climate Change and Human Health report mentions hail three times, acknowledging it exists, that it can damage crops, and that the link between severe summer storms and climate change is not well understood or easily predicted, though there is a solid physics-based linkage between the two. Hail can be an extremely damaging hazard and the linkages with climate change are worthy of monitoring in future HMP updates.

To date, climate change has not increased the frequency or severity of heavy rain and it is unclear if it will in the future. Increasing rainfall intensity is a commonly cited impact of climate change. However, neither the 2021 Montana Climate Change and Human Health study, the Fifth National Climate Assessment, or NOAA's 2022 Climate Summary address rainfall (or hail) intensity directly. As described in Section 4.2.7 *Flooding*, subsection *Climate Change Considerations*, multiple sources document spring rainfall has increased slightly in total amount and/or is projected to increase substantially in the future. However, none of these sources document an observed or projected climate-change caused increase in heavy rainfall.

Lightning is another summer-weather hazard that is relatively modest in scale. The NRI rates counties in the planning area either *relatively low* or *very low* for lightning risk. There are presently no data or studies that document lightning is increasing in the planning area. Likewise, no projections exist to suggest the hazard is likely to increase or decrease in the future due to climate change. The 2022 NOAA Climate Summary acknowledges that lightning exists. The Fifth National Climate Assessment mentions lightning once, as a potential source of ignition for wildfire. The 2021 Montana Climate Change and Human Health study states both that lightning exists in the planning area and that it is a potential source of ignition of wildfire.

Potential impacts of severe summer weather hazards are discussed in the Vulnerability subsection of this hazard profile, as well as the impacts of population changes and development trends. Current variability in vulnerability by jurisdiction, based on existing conditions, is discussed in these sections and jurisdictional annexes. Due to the uncertainty with climate change on severe summer weather, it is not possible to define with further specificity the impacts and variability related to climate change on each jurisdiction within the Region. Future updates to this plan should revisit this topic as scientific knowledge progresses and note any trends that emerge.

4.2.11.6 Potential Magnitude and Severity

As mentioned in the 2018 State of Montana Hazard Mitigation Plan, severe summer weather can cause damage to buildings, homes, and other property but rarely cause death, serious injury, or long-lasting health effects. However, significant economic losses from property and crop damage, as well as several reported injuries and deaths, have occurred in the Western Region; therefore, severity of summer weather is ranked as **Critical** for the Western Region. The NWS reports that severe summer weather has caused $51.5 million in property damage and $26.3 million in crop damage over the past 60 years in the State of Montana. Eight deaths and 31 injuries were attributed to lightning strikes. Across the country, large hail results in nearly $1 billion in damage annually to property and crops. In the Western Region alone, one fatality, 12 injuries, $2,928,100 in property damages and $210,100 crop damages have been recorded since 1955.

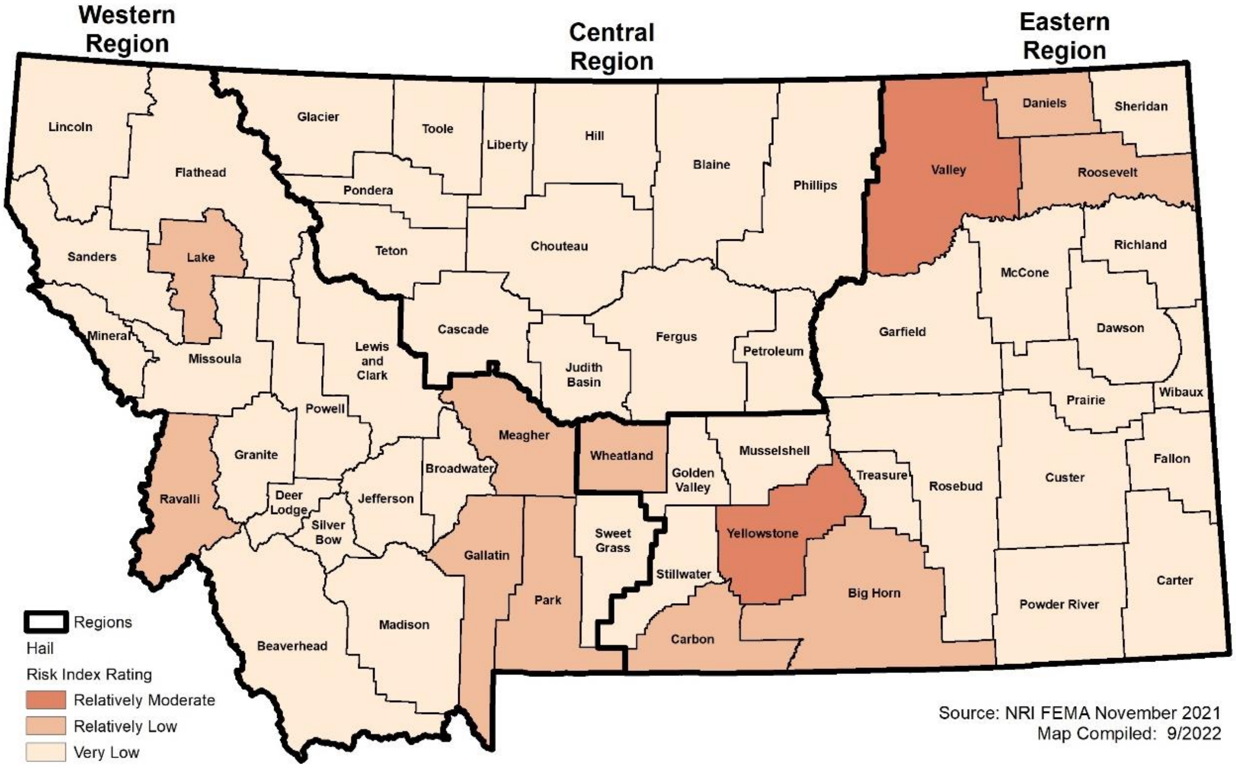
4.2.11.7 Vulnerability Assessment

The severe summer weather *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to severe summer weather hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with severe summer weather hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience those hazards. *Susceptible* indicates a strong likelihood of damage from exposure to severe summer weather hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is clearly increasing extreme heat hazards in the Western Region, there may be a marginal increase in vulnerability from this relatively minor

Western Region hazard. There is relative confidence that heavy rain is unaffected, and it is unknown if climate change is or ever will affect hail and lightning hazards in the Western Region (see section titled *Climate Change Considerations*, above). Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

The NRI risk index rating for counties in the Western Region for hail is shown in Figure 4-62 and for lightning in Figure 4-63. The risk index rating considers impacts to many types of assets and provides insight to the overall significance of hail and lightning hazards in jurisdictions throughout the Western Region. A deeper analysis of the vulnerability of each type of asset to all four severe summer weather hazards in Western Region jurisdictions is provided below.

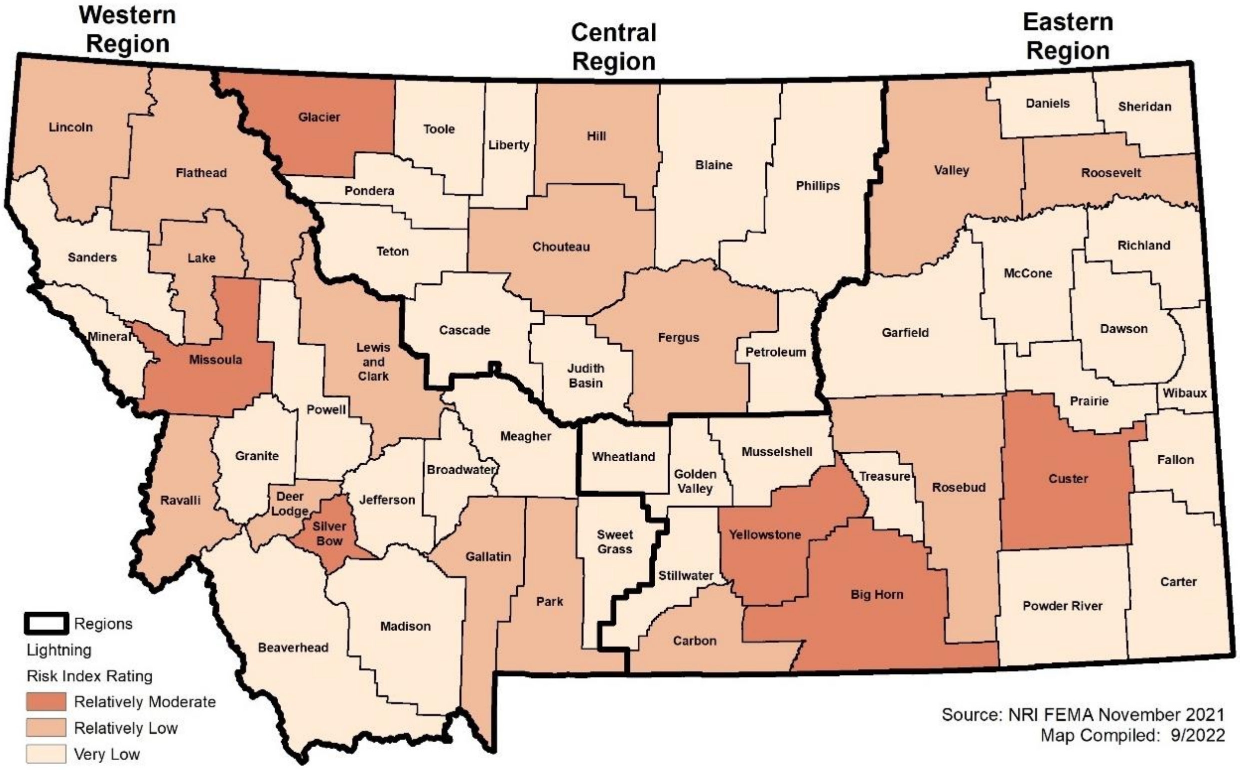
Figure 4-62 NRI Risk Index Rating for Hail



Source: NRI FEMA November 2021
Map Compiled: 9/2022

Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-63 NRI Risk Index Rating for Lightning



Source: NRI FEMA November 2021
Map Compiled: 9/2022

People

The entire Western Region is potentially exposed to extreme heat, hail, heavy rain, and lightening. People who live, work, or recreate outdoors and are unable to take shelter are exposed. Outdoor enthusiasts and agriculture workers are most likely to be caught outdoors and exposed. Young children playing outdoors are also a concern. Unhoused persons are more vulnerable to heavy rain, especially if they inhabit floodplain areas prone to flash flooding. Most of the planning participants noted that severe summer weather events do have greater impacts on their seniors, young children, outdoor workers, and individuals with health conditions.

All people are potentially susceptible to injury or possibly death from summer weather. Some groups, such as the elderly, young children, outdoor workers, and people with respiratory illnesses or weakened immune systems are typically the most susceptible to especially extreme heat, especially if they lack access to air conditioning or do not have adequate breaks for water and rest.

Property

Individual storms have a limited extent, but over time all outdoor property is likely to be exposed to heavy rain, extreme heat, and hail. Lightning typically strikes the highest objects in an area but can cause hazardous power surges that extend much further. Lightning strikes can also start fires. The secondary effects of fire are discussed in the section below titled *Wildfire*.

Some property is especially susceptible to damage. Houses and cars have a reputation for receiving expensive-to-repair damage from hail events. Electrical equipment is often susceptible to the effects of lightning far from the strike location. Lightning can cause power outages with potentially serious secondary effects.

Susceptibility of property to heat and heavy rain is less of a problem in the planning area. Heat can expand metal and cause problems with infrastructure. Heavy rain can damage foundations, especially where water is allowed to accumulate near a foundation rather than being channeled away. Secondary effects of heavy rain include flash flooding and are discussed in the section above titled *Flooding*. Despite the hazards of heat and heavy rain, there are no reported property damages from excessive heat or heavy rain in the planning area.

Critical Facilities and Lifelines

All infrastructure and critical facilities located outdoors are similarly exposed to heat and hail. Lightning typically strikes the highest objects in an area but can cause hazardous power surges that extend throughout electrical circuits.

Infrastructure can be susceptible to damage from extreme heat. Heat expands roadbuilding materials and can cause road surfaces to crack. Power infrastructure is especially susceptible to heat. Heat expands above-ground power lines, causing them to lengthen and sag. Sagging power lines are a well-known fire hazard and were at least partially at fault for recent catastrophic fires in California and Colorado. A mitigation technique in certain states is to simply turn off power distribution during these times. Heat also reduces the efficiency of power generation, transmission, and distribution. This happens at the same time that demand peaks due largely to the increased use of air conditioners. The result of this puts stress on the power delivery system. The full range of heat effects on power infrastructure is complex and far reaching.

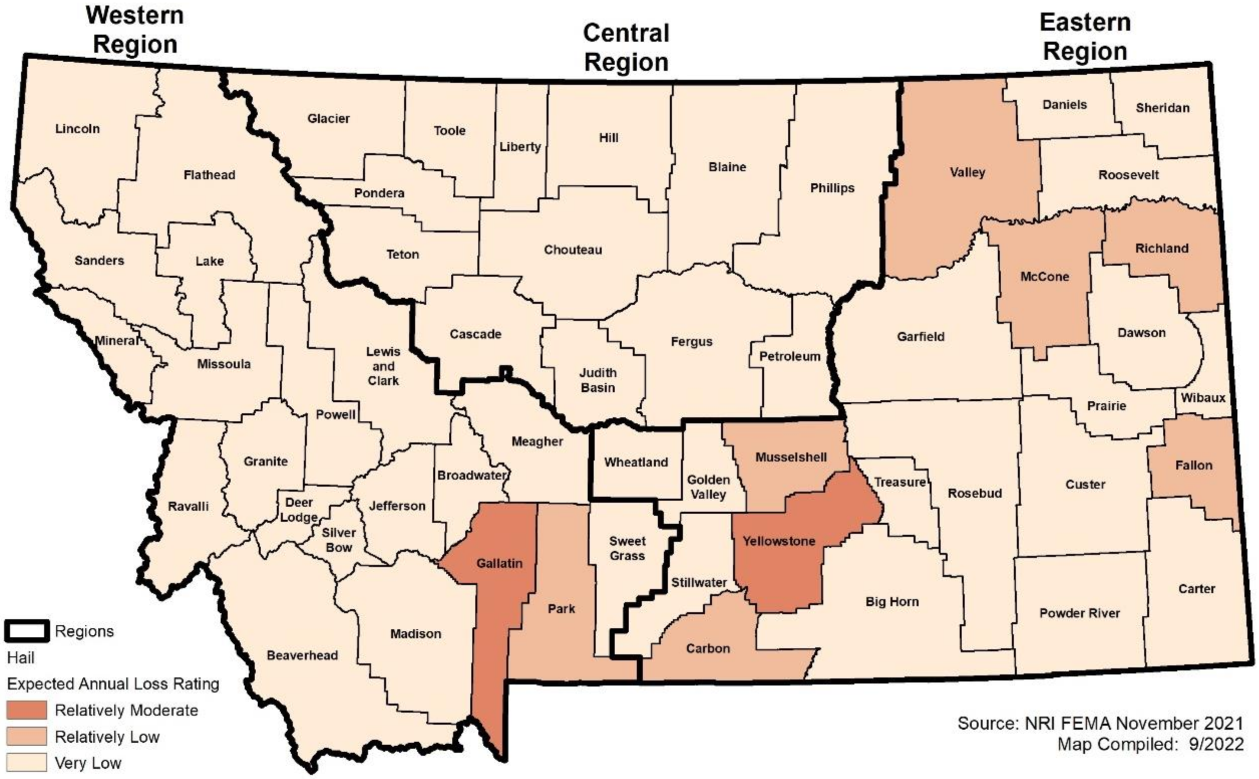
The use of roads is also susceptible to hail accumulation, which can clog stormwater drainage infrastructure and temporarily impair traffic.

Economy

The economy is vulnerable to direct and indirect impacts from severe summer weather. NCEI data show that severe summer weather, particularly hail damage to property, has resulted in direct economic losses in the Western Region (Table 4-51). Additional indirect losses also exist. For example, the 2018 State of Montana Hazard Mitigation Plan notes that increasing extreme temperature events will impact tourism in the future and reduce revenue from tourists.

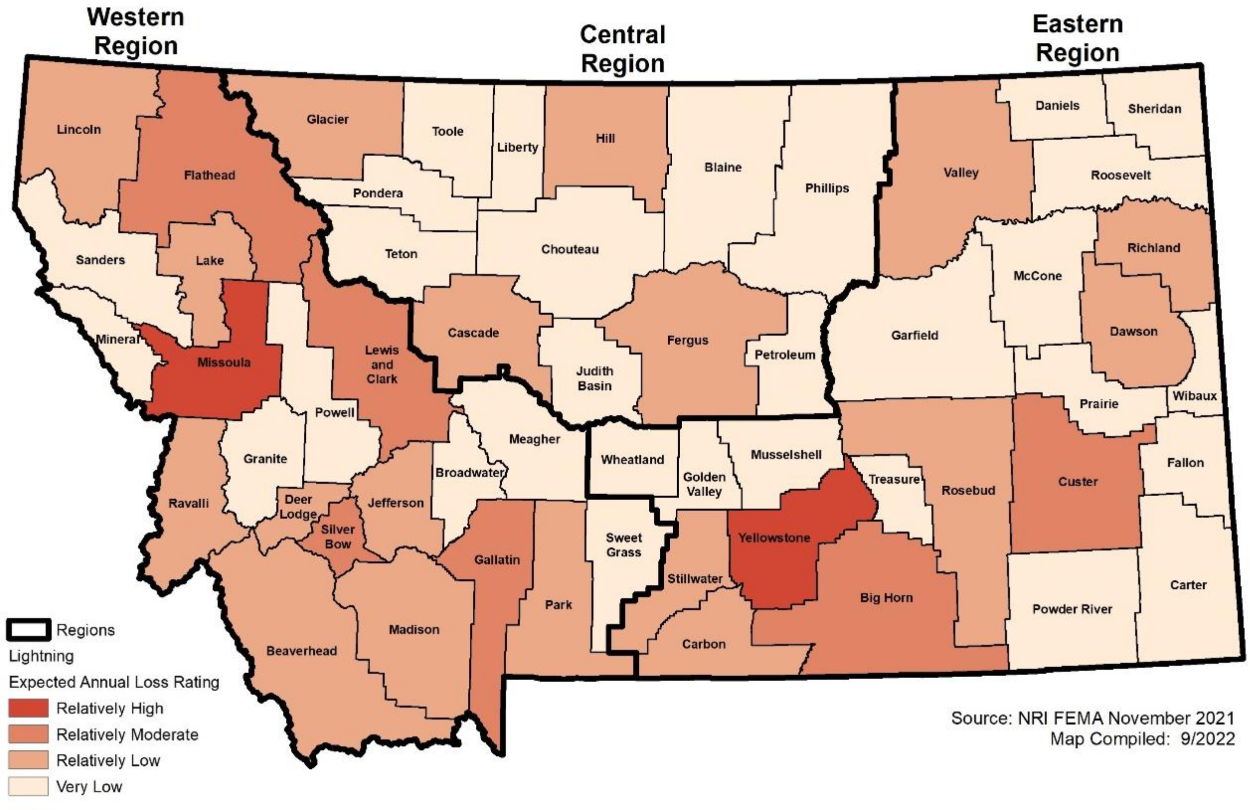
NRI ratings for the EAL show hail damage is largely concentrated in the southeast corner of the Western Region (Figure 4-64) and lightning losses are far more variable and spread across the region (Figure 4-65).

Figure 4-64 NRI Hail Expected Annual Loss Rating



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-65 NRI Lightning Expected Annual Loss Rating



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Historic and Cultural Resources

Historic and cultural resources are all exposed to severe summer weather. Susceptibility to damage from summer weather is variable. For example, severe summer weather in the form of lightning, heavy rain, and hail likely diminish the accessibility of outdoors cultural resources such as water-based recreation areas. Quantifying impacts such as these is very difficult, especially in terms of financial loss.

Historical structures, in particular, are susceptible to roof damage from hail to a similar degree as more modern structures. The magnitude of damage to historic and cultural resources from severe summer weather has not been quantified in the Western Region.

Natural Resources

Vegetation such as trees, crops, and waterways are all vulnerable to extreme heat events. Similarly, hail has been documented to cause significant crop damage in the planning area (Table 4-51) and is known to break branches off trees. The most significant crop damages reported by the NCEI occurred in Powell and Ravalli Counties. Lightning has also been documented to strike trees and cause fires, which can impact vegetation and crops.

Development Trends Related to Hazards and Risk

Growth and development in the Western Region have clearly increased the assets exposed to severe summer weather in the past decade and is expected to continue through 2040 (Section 2.3). Effects of development on the vulnerability to summer hazards have been especially significant in Gallatin and Broadwater Counties, which have grown by 37% and 29% from 2010-2021. Looking into the future, development effects on summer weather vulnerability are especially likely in Madison, Gallatin, Meagher, Ravalli, and Powell Counties, all of which are expected to grow by more than 20% from 2020-2040 (Table 2-1).

4.2.11.8 Risk Summary

Severe summer weather is rated as having **medium** significance to the Western Region (Table 4-1), though Lewis and Clark and Broadwater Counties rated it as having high significance (Table 4-54).

- Severe summer weather includes extreme heat, hail, heavy rain, and lightning.
- 83% of all direct damages of summer weather are caused by hail, either to property (76%) or crops (7%). Rooftops and vehicles are especially vulnerable to hail damage.
- 16% of direct damages are to property caused by lightning, commonly caused by power surges that damage electrical equipment.
- People most vulnerable to severe summer weather events are children, the elderly, individuals with pre-existing medical conditions, and outdoor workers/enthusiasts.
- The entire Western Region can be impacted by severe summer weather; therefore, the geographic extent is rated as **extensive.**
- The NCEI dataset recorded 439 days of severe summer weather events in the Western Region over the course of 67 years, from 1955 to March 2022. This averages roughly 6.6 days with events per year; therefore, the probability of future occurrence is ranked as **highly likely.**
- The NCEI data recorded one death, 12 injuries, $2,928,100 in property damages, and $210,100 in crop damages from severe weather events since 1955, therefore the potential magnitude is ranked as **moderate.**
- Related hazards: Drought, Wildfire. Wind & tornadoes.

Table 4-54 Risk Summary Table: Severe Summer Weather

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	N/A	None
Beaverhead	Medium	City of Dillon, Town of Lima	None
Broadwater	High	City of Townsend	None
Butte-Silver Bow	Medium	Butte-Silver Bow, Town of Walkerville	None
CSKT	Medium	Confederated Salish and Kooteani Tribes of the Flathead Reservation	None
Flathead	Medium	Columbia Falls, Kalispell, Whitefish	None
Granite	Medium	Towns of Drummond and Philipsburg	None
Jefferson	Medium	City of Boulder, Town of Whitehall	None
Lake	Medium	City of Polson, City of Ronan, Town of St. Ignatius	None
Lewis and Clark	High	City of Helena, City of East Helena	None
Lincoln	Medium	City of Libby, City of Troy, Town of Eureka	None
Madison	Medium	Town of Ennis, Town of Sheridan, Town Virginia City	None
Meagher	Medium	City of White Sulphur Springs	None
Mineral	Medium	Town of Alberton, Town of Superior	None
Park	Medium	City of Livingston, Town of Clyde Park	None
Powell	Medium	City of Deer Lodge	None
Ravalli	Medium	City of Hamilton, Town of Darby, Town of Stevensville	None
Sanders	Medium	City of Thompson Fall, Town of Plains, Town of Hot Springs	None
Sweet Grass	Medium	City of Big Timber	None

4.2.12 Severe Winter Weather

4.2.12.1 Hazard/Problem Description

According to the Montana State Hazard Mitigation Plan 2018 Update, severe winter weather presents one of the greatest threats to life of any hazard in Montana. Statistics on winter deaths are difficult to obtain, but nationwide there are on average 100 lives directly and indirectly lost to winter weather, more than lightning, hurricanes, or tornadoes. Winter storms are considered to be deceptive killers because most deaths are indirectly related to the storm. People die in traffic accidents on snow- or ice-covered roads, from hypothermia due to prolonged exposure to cold, and from heart attacks due to overexertion.

Winter storms may be categorized as blizzards, heavy snow, ice storms, winter storms, and winter weather. These storms vary in size and intensity and may affect a small part of the State or several states at once. The NWS Glossary defines common winter storm characteristics as follows:

Winter Storm:

A winter weather event that has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet, and ice) and meets or exceeds locally/regionally defined 12 and/or 24-hour warning criteria for at least one of the precipitation elements.

The NWS issues a Winter Storm Warning when conditions that can quickly become life threatening and are more serious than an inconvenience are imminent or already occurring. Heavy snows, or a combination of snow, freezing rain or extreme wind chill due to strong wind, may bring widespread or lengthy road closures and hazardous travel conditions, plus threaten temporary loss of community services such as power and water. Deep snow and additional strong wind chill or frostbite may be a threat to even the appropriately dressed individual or to even the strongest person exposed to the frigid weather for only a short period.

Blizzard:

The most dangerous of all winter storms is the blizzard. A blizzard means that the following conditions are expected to prevail for a period of 3 hours or longer:

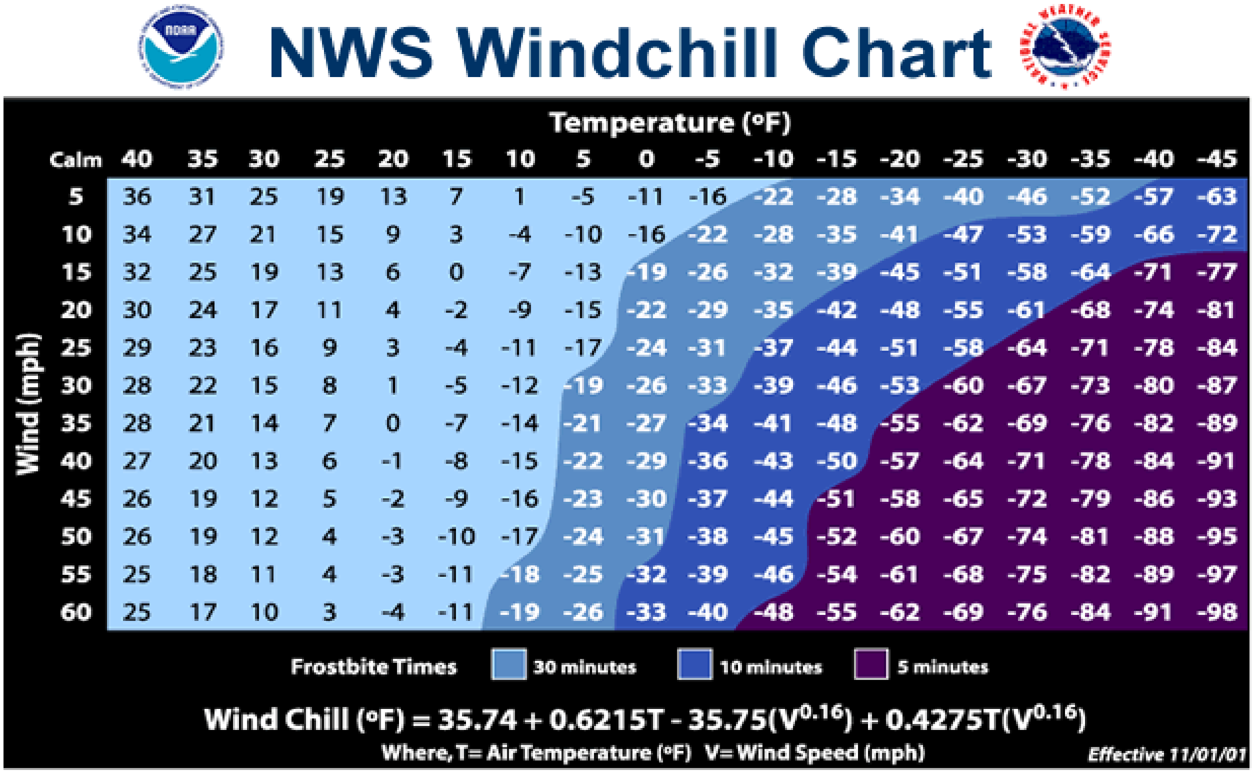
- Sustained wind or frequent gusts to 35 miles an hour or greater; and
- Considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than ¼ mile).

A blizzard warning is issued when winds of 35 miles an hour will occur in combination with considerable falling and/or blowing snow for at least 3 hours. Visibilities will frequently be reduced to less than 1/4 mile and temperatures are usually 20 degrees Fahrenheit or lower. The blizzard marks the upper extent of severe winter storms that could be experienced in Montana.

Cold/Wind Chill: Increased wind speeds accelerate heat loss from exposed skin, and the wind chill is a measure of this effect. No specific rules exist for determining when wind chill becomes dangerous. As a general rule, the threshold for potentially dangerous wind chill conditions is about -20°F.

In 2001, the NWS implemented an updated Wind Chill Temperature index (Table 4-55). 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.

Table 4-55 National Weather Service Wind Chill Chart



NWS Windchill Chart

Temperature (°F)

Wind (mph)

Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times ▨ 30 minutes ▨ 10 minutes ▨ 5 minutes

Wind Chill (°F) = $35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NWS

Heavy Snow: This generally means:

- Snowfall accumulating to 4" or more in depth in 12 hours or less.
- Snowfall accumulating to 6" or more in depth in 24 hours or less.
- In forecasts, snowfall amounts are expressed as a range of values, e.g., "8 to 12 inches." However, in heavy snow situations where there is considerable uncertainty concerning the range of values, more appropriate phrases are used, such as "...up to 12 inches..." or alternatively "...8 inches or more...”

NOAA's NCEI produces the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. As shown in Table 4-56, RSI is a regional index; a separate index is produced for each of the six NCEI climate regions in the eastern two-thirds of the nation. Montana is included in the Northern Rockies and Plains Region, along with Nebraska, North Dakota, Wyoming, and South Dakota.[6] RSI ratings from 1 to 5 are possible in Montana. RSI values for historical events are unavailable for the state of Montana or are ambiguous as to the geographic extent of storms in the northern Rockies and Plains states.

---

[6] The RSI is assigned according to methods outlined in:
Squires et al. (2014) The regional snowfall index. Bulletin of the American Meteorological Society, 95(12), 1835-1848.
For more information see https://www.ncei.noaa.gov/access/monitoring/rsi/.

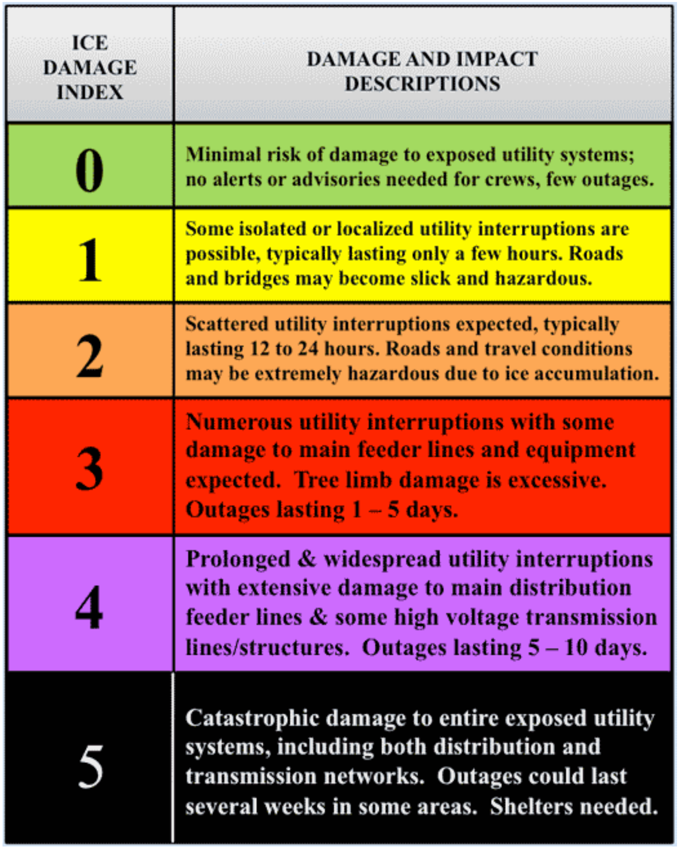
Table 4-56 Regional Snowfall Index (RSI) Ratings for Significant Snowstorms

Category	Description
1	Notable
2	Significant
3	Major
4	Crippling
5	Extreme

Ice Storm: An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous.

The severity of ice storms can be measured with the Sperry-Piltz Ice Accumulation (SPIA) Index (Table 4-57). The SPIA Index is a forecasting of ice accumulation and ice damage that uses various parameters that can help predict the projected extent of ice storms. Historical measurements of ice storms using the SPIA Index are unavailable.

Table 4-57 Sperry-Piltz Ice Accumulation Index



ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

Source: NWS

Winter Weather: A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria. A Winter Weather event could result from one or more winter precipitation types (snow, or blowing/drifting snow, or freezing rain/drizzle). The Winter Weather event can also be used to document out-of-season and other unusual or rare occurrences of snow, or blowing/drifting snow, or freezing rain/drizzle.

4.2.12.2 Geographical Area Affected

All counties in the Montana Western Region are impacted by severe winter weather; therefore, the geographic extent of severe winter storms is ranked as **Extensive**. Arctic cold fronts typically enter the State from the northeast and cross the Continental Divide, affecting the western portion of the State. Arctic fronts meeting wet maritime fronts often combine to cause heavy snowfall, which can occur in all parts of the State. The lowest temperatures are typically experienced in the northeast, whereas the heaviest snowfall most often occurs in the mountain regions. Extremely low temperatures are also common in jurisdictions located at high elevations in the Rocky Mountains.

4.2.12.3 Past Occurrences

Exposure to and impacts from six types of severe winter weather on the Western Region are summarized in Table 4-58. These severe winter weather events have been costly in terms of property loss and death and injuries. Statistically, one fatality occurs every year or two, an injury occurs nearly every year, and nearly $300 thousand of property loss occurs across the region. However, not all severe winter weather events are included in NCEI data and losses are likely higher than those reported in Table 4-58.

Table 4-58 Summary of Losses by Hazard in the Western Region, 1996 – March 2022

	Deaths	Injuries	Property Loss	Days with Events	Total Events
Blizzard	1	0	$460,000	33	64
Cold/Wind Chill	2	0	$1,400	61	117
Heavy Snow	2	4	$1,597,000	610	1,301
Ice Storm	2	0	$30,000	7	10
Winter Storm	4	1	$5,515,000	409	1,110
Winter Weather	4	14	$5,000	143	267
Total	**15**	**19**	**$7,608,400**	**1,263**	**2,869**

Source: NCEI; definitions of severe winter weather types are provided in Section 4.2.12.1.

NCEI data can be challenging to interpret at a county level. Data are presented in zones, rather than by county or tribal reservation. Zones commonly extend over county lines, and most or all counties contain more than one zone. 38 zones exist in the 20-county Western Region. Zone-level data in the Western Region are presented in Table 4-59 and Figure 4-66. 100% of the financial losses in the Western Region reported in NCEI data occurred in 12 zones (Table 4-60).

Table 4-59 Summary of Severe Winter Weather Events by Zone in the Western Region

Zone	Blizzard	Cold/ Wind Chill*	Heavy Snow	Ice Storm	Winter Storm	Winter Weather	Total
Absaroka / Beartooth Mountains (Zone)	0	0	0	0	21	0	**21**
Absarokee / Beartooth Mountains (Zone)	0	0	32	0	88	0	**120**
Bitterroot / Sapphire Mountains (Zone)	1	9	131	1	58	24	**224**

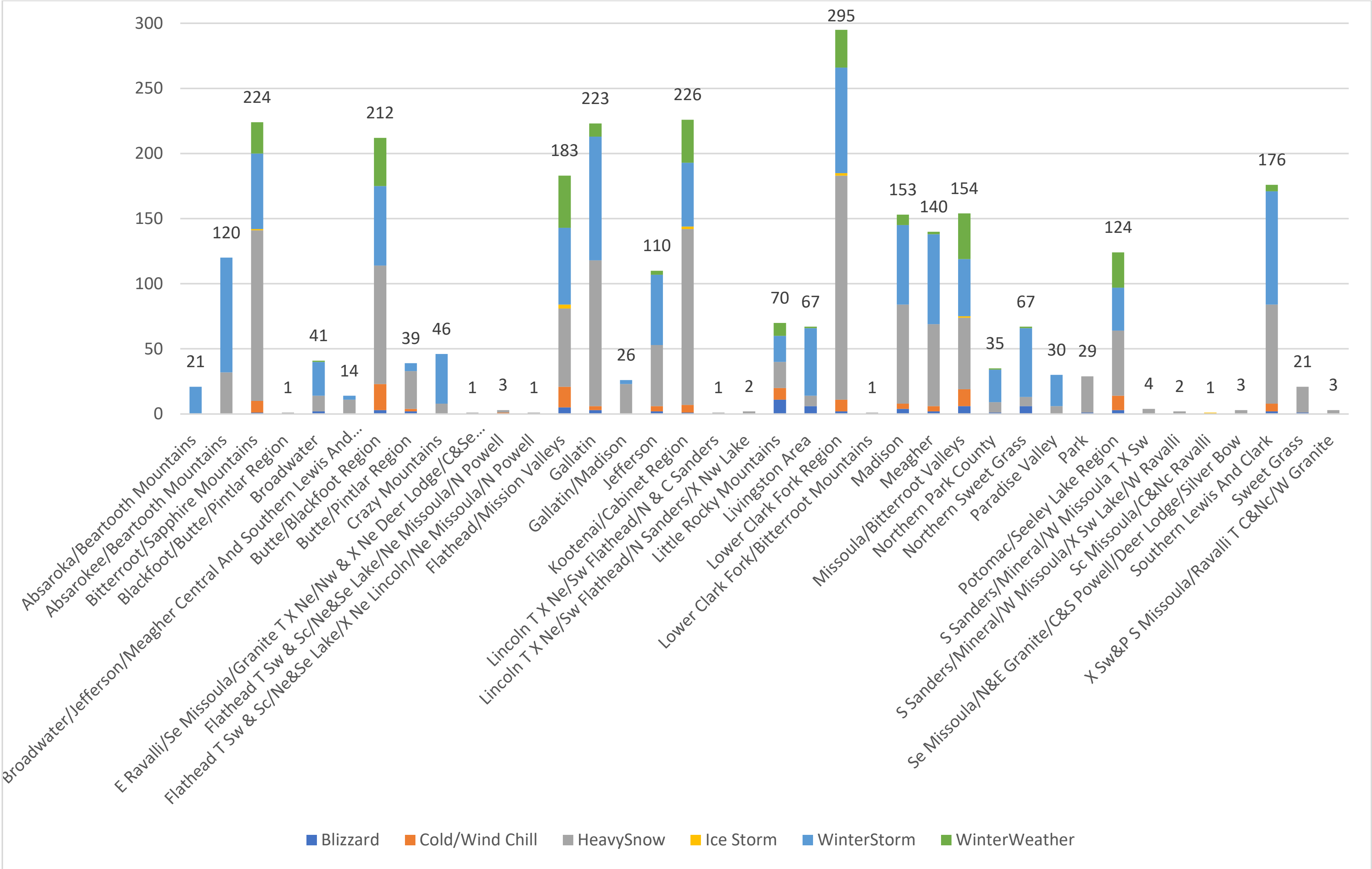
Zone	Blizzard	Cold/ Wind Chill*	Heavy Snow	Ice Storm	Winter Storm	Winter Weather	Total
Blackfoot/Butte/Pintlar Region (Zone)	0	0	1	0	0	0	**1**
Broadwater (Zone)	2	0	12	0	26	1	**41**
Broadwater/Jefferson/Meagher Central & Southern Lewis and Clark (Zone)	0	0	11	0	3	0	**14**
Butte / Blackfoot Region (Zone)	3	20	91	0	61	37	**212**
Butte / Pintlar Region (Zone)	2	2	29	0	6	0	**39**
Crazy Mountains (Zone)	0	0	8	0	38	0	**46**
E Ravalli/Se Missoula/ Granite T X Ne/Nw & X Ne Deer Lodge/C&Se & X Sw Powell/ X N Silver Bow (Zone)	0	0	1	0	0	0	**1**
Flathead T Sw & Sc/Ne&Se Lake/Ne Missoula/N Powell (Zone)	0	1	2	0	0	0	**3**
Flathead T Sw & Sc/Ne&Se Lake/X Ne Lincoln/ Ne Missoula/N Powell (Zone)	0	0	1	0	0	0	**1**
Flathead/ Mission Valleys (Zone)	5	16	60	3	59	40	**183**
Gallatin (Zone)	3	3	112	0	95	10	**223**
Gallatin/Madison (Zone)	0	0	23	0	3	0	**26**
Jefferson (Zone)	2	4	47	0	54	3	**110**
Kootenai/Cabinet Region (Zone)	1	6	135	2	49	33	**226**
Lincoln T X Ne/Sw Flathead/N & C Sanders (Zone)	0	0	1	0	0	0	**1**
Lincoln T X Ne/Sw Flathead/N Sanders/X Nw Lake (Zone)	0	0	2	0	0	0	**2**
Little Rocky Mountains (Zone)	11	9	20	0	20	10	**70**
Livingston Area (Zone)	6	0	8	0	52	1	**67**
Lower Clark Fork Region (Zone)	2	9	172	2	81	29	**295**
Lower Clark Fork/ Bitterroot Mountains (Zone)	0	0	1	0	0	0	**1**
Madison (Zone)	4	4	76	0	61	8	**153**
Meagher (Zone)	2	4	63	0	69	2	**140**
Missoula/ Bitterroot Valleys (Zone)	6	13	55	1	44	35	**154**
Northern Park County (Zone)	1	0	8	0	25	1	**35**
Northern Sweet Grass (Zone)	6	0	7	0	53	1	**67**
Paradise Valley (Zone)	0	0	6	0	24	0	**30**
Park (Zone)	1	0	28	0	0	0	**29**
Potomac / Seeley Lake Region (Zone)	3	11	50	0	33	27	**124**
S Sanders/Mineral/W Missoula T X Sw (Zone)	0	0	4	0	0	0	**4**
S Sanders/Mineral/W Missoula/X Sw Lake/W Ravalli (Zone)	0	0	2	0	0	0	**2**
Sc Missoula/	0	0	0	1	0	0	**1**

Zone	Blizzard	Cold/ Wind Chill*	Heavy Snow	Ice Storm	Winter Storm	Winter Weather	Total
C&Nc Ravalli (Zone)							
Se Missoula/N&E Granite/ C&S Powell/Deer Lodge/ Silver Bow (Zone)	0	0	3	0	0	0	**3**
Southern Lewis and Clark (Zone)	2	6	76	0	87	5	**176**
Sweet Grass (Zone)	1	0	20	0	0	0	**21**
X Sw&P S Missoula/Ravalli T C&Nc/W Granite (Zone)	0	0	3	0	0	0	**3**
Total	**64**	**117**	**1,301**	**10**	**1,110**	**267**	**2,869**

*This category includes both cold/wind chill events and extreme cold/wind events recorded in the NCEI database.

Source: NCEI

Figure 4-66 Summary of Severe Winter Weather Events by Zone in the Western Region



Source: NCEI, Chart by WSP

Table 4-60 Summary of Property Losses from Winter Weather Events by Zone in the Western Region

Zone	Total Property Damage ($)
Bitterroot / Sapphire Mountains (Zone)	3,000
Butte / Blackfoot Region (Zone)	113,500
Butte / Pintlar Region (Zone)	85,000
Flathead T Sw & Sc/Ne&Se Lake/X Ne Lincoln/Ne Missoula/N Powell (Zone)	200,000
Flathead/Mission Valleys (Zone)	5,431,400
Gallatin (Zone)	354,000
Gallatin/Madison (Zone)	10,000
Kootenai/Cabinet Region (Zone)	13,000
Little Rocky Mountains (Zone)	260,000
Lower Clark Fork Region (Zone)	66,000
Missoula / Bitterroot Valleys (Zone)	1,055,000
Potomac / Seeley Lake Region (Zone)	17,500
Total	**7,608,400**

Source: NCEI

The NCEI reports qualitative, descriptive details for especially significant severe winter weather events in the Western Region:

November 18, 1996: Record heavy snow event with wind, followed with areas of freezing rain throughout Western Montana. Two deaths occurred with this storm. A 39-year-old woman died near Troy in Lincoln County, when her car skidded on ice and collided with another car. Another woman died near Thompson Falls in Sanders County when her car rolled into a ditch. Superior in Mineral County declared a state of emergency when the storm caused severe power outages, with the area without power for 40 hours. As many as 13,000 people were without power on 11/19/96 south and west of Missoula as snow, ice and freezing rain caused trees to snap onto power lines and poles or caused lines to short-circuit. Ice also downed a 100,000-volt transmission line near Superior. Numerous roads were closed throughout the area with some schools also closed.

June 4, 2001: A late spring storm brought significant rain and snow to both west central and southwest Montana. As temperatures cooled after nightfall, the lower valleys began to see the rain change to snow. The 0.7 inches of snow measured at the NWS office in Missoula was a new record snowfall for the month of June, and only the second time in the past 100 years that measurable snow has been recorded in June. However, this paled in comparison to the 4 to 8 inches of snow that fell in the City of Missoula by the early morning hours of the 4th, with countless tree limbs down and widespread power outages reported by daybreak. Many streets in Missoula were closed due to the fallen debris, and the city was declared a disaster area by the mayor that afternoon. Many other locations throughout Missoula, Granite, Powell, and Silver Bow Counties faced similar problems, with portions of Highway 83 closed and emergency travel on Interstate 90 and U.S. Highway 12. This event resulted in $750,000 property damage.

June 4, 2001: 14 inches of snowfall was reported by spotter at the Montana State University campus in Bozeman. Numerous tree limbs and power lines were downed across town by the weight of the wet snow while automobile damage also occurred due to the falling tree limbs. Damage cost estimate based on a report in the newspaper stating that a total of $354, 000 in damage was done by snowstorm to the Bozeman area, including the City of Bozeman, Montana State University, Bozeman Public Schools, and Park Electric Cooperative.

January 7, 2004: Freezing rain turned to moderate snow over Flathead County causing numerous car accidents throughout the county from very slick roads. One fatality and six injuries were reported from automobile accidents to due icy roads.

December 12, 2008: Snowfall was estimated to be anywhere from 3 to 7 inches. The main impact came from strong east to northeast winds measured at sustained 20 mph gusting up to 40 mph. Visibility down to near zero was reported in many locations due to the blowing snow. Many area roads were closed, including Highway 35 between Polson and the junction with S-206 where many trees were blown down onto the road from strong winds. One person was killed on this road when a tree blew onto his vehicle. Two other vehicles were also damaged from falling trees. This event also resulted $200,000 of property damage.

November 24, 2015: Trained spotters reported between 3 to 5.8 inches of snow in Kalispell during the day, with drifts up to a foot and a half deep. Winds at the Glacier Park International Airport ASOS gusted to around 40 mph during the morning and afternoon, peaking at 41 mph in the late morning. Roads became very slick by the afternoon. Local law enforcement reported that snow and wind had caused over 60 vehicle accidents or slide-offs in the Flathead Valley. This event resulted in $120,000 of property damage.

February 8, 2018: Severe driving conditions occurred in the Flathead and Mission valleys the evening of the 8th through the morning of the 9th due to snow and blowing snow. A peak wind gust of 56 mph occurred at Glacier Park International Airport at 4:46 pm on the 8th during the evening commute with minor power outages also noted. This event resulted in $5 million of property damage.

April 28, 2019: Late Sunday morning April 28th, two fishing boats capsized on Upper Holter Lake in Southern Lewis and Clark County. The accident resulted in one fatality and sent five others to the hospital. Winter weather conditions may have played a role in the crash. Snow with gusty winds over 30 mph were reported in the area that morning.

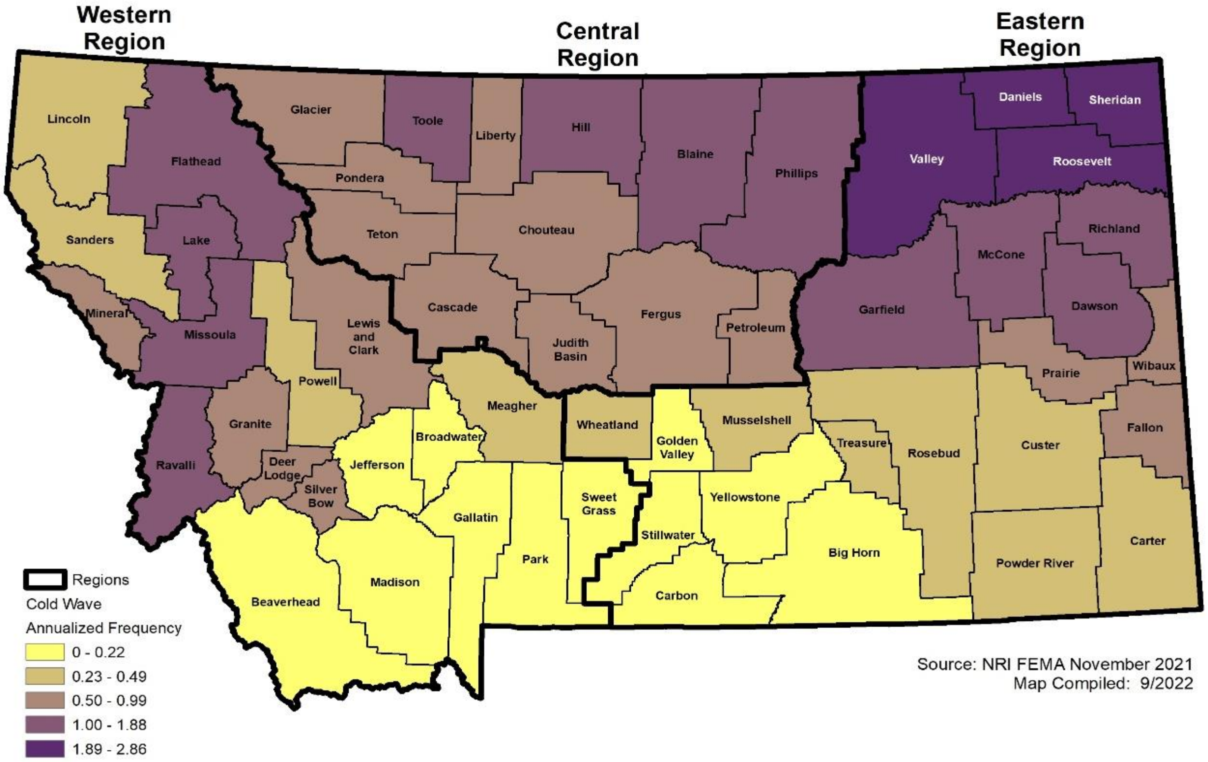
4.2.12.4 Frequency/Likelihood of Occurrence

The frequency of severe winter weather in the Western Region is ranked as **Highly Likely**. Severe winter weather occurs an average of 39 days each year in the Western Region, including blowing and drifting snow, extreme cold, hazardous driving conditions, and utility interruption.

The NRI does report the frequency of hazardous winter weather at a county level for cold (Figure 4-67) and winter weather (Figure 4-68). Cold weather is far more common in the northern two-thirds of the Western Region, while the frequency of winter weather is highly variable and spread across the region. The most frequent winter weather occurs in Gallatin, Ravalli, Mineral, and Lewis & Clark Counties.

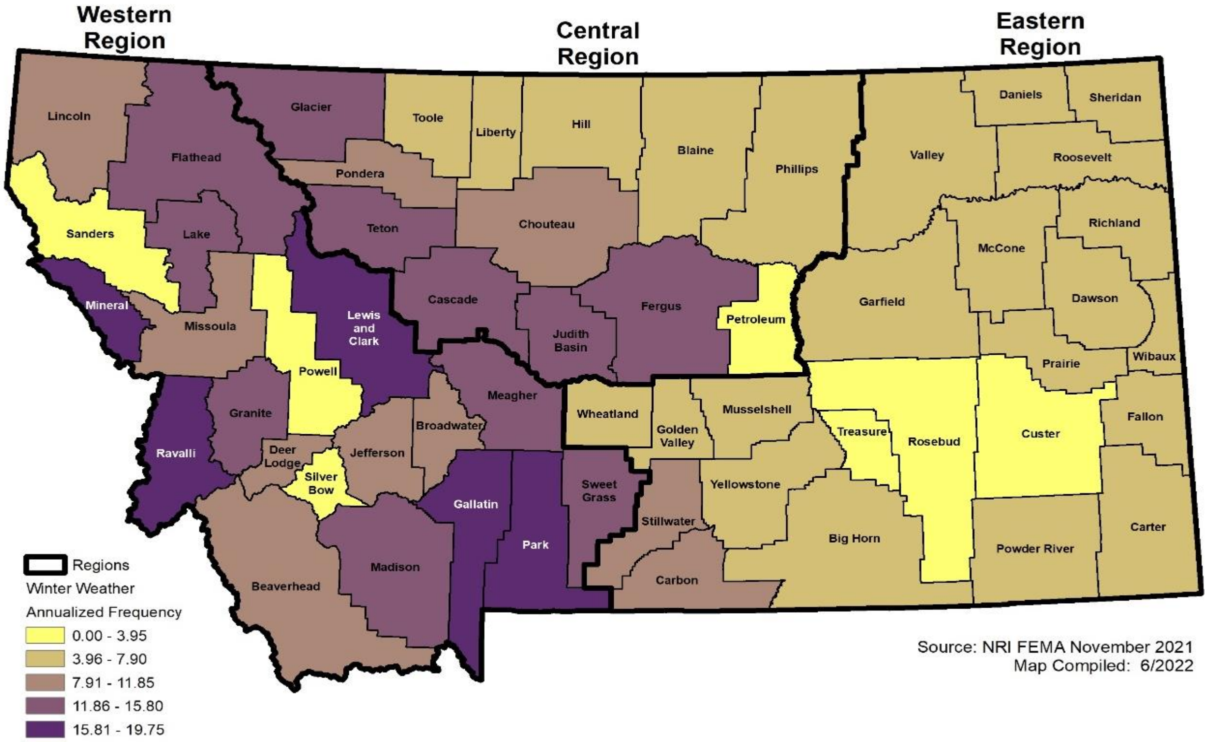
Annual days of severe winter weather from 1996 – March 2022 is shown in Figure 4-69. The seasonality of severe winter weather over the same time period is shown in Figure 4-70.

Figure 4-67 NRI Annualized Frequency of Cold Events by County



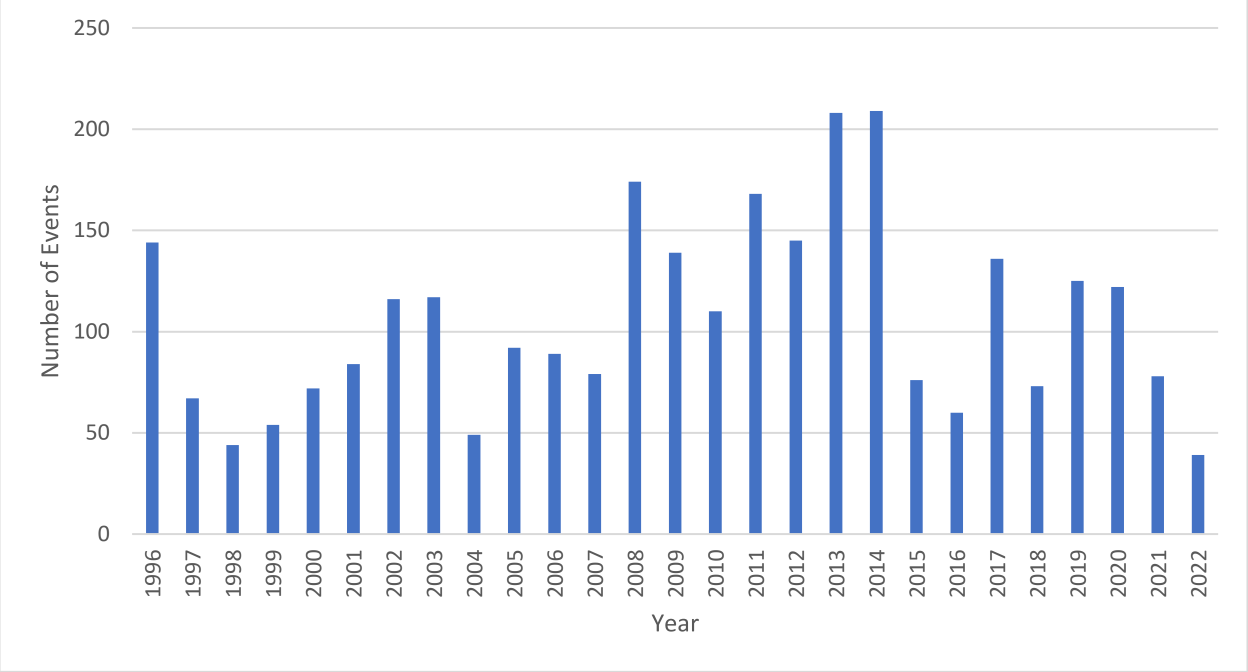
Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-68 NRI Annualized Frequency of Winter Weather Events by County



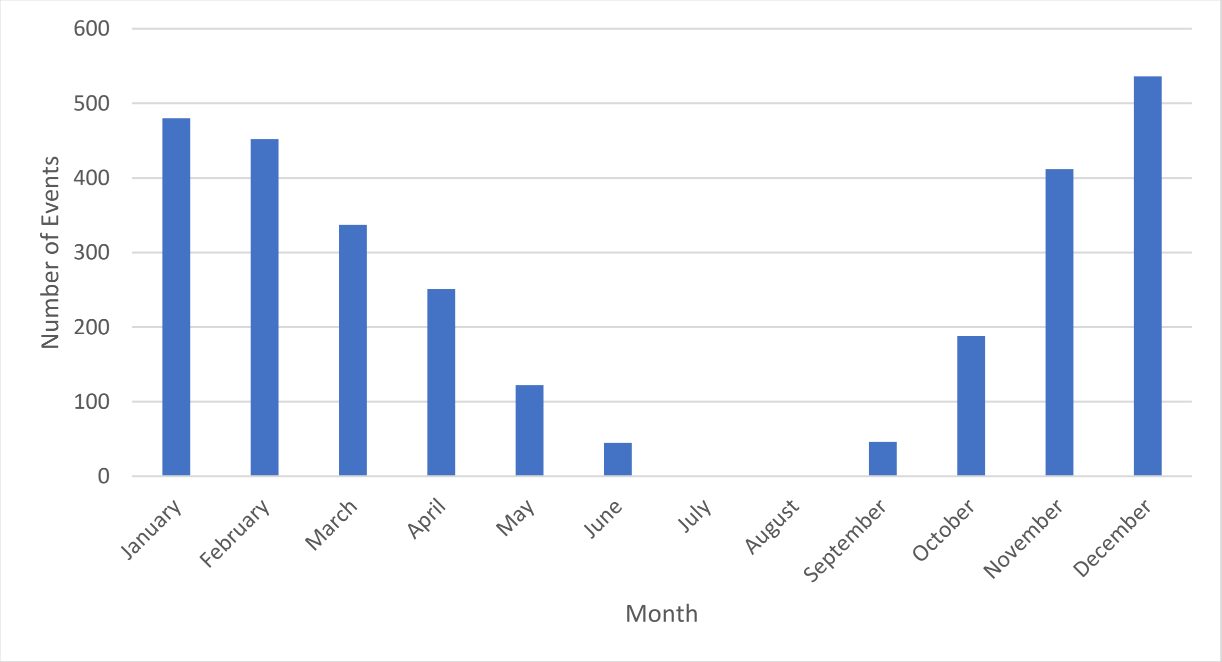
Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-69 Winter Weather Events in the Western Region (1996-2022)



Source: NCEI, Chart by WSP

Figure 4-70 Winter Weather Events in the Western Region (1996-2022)



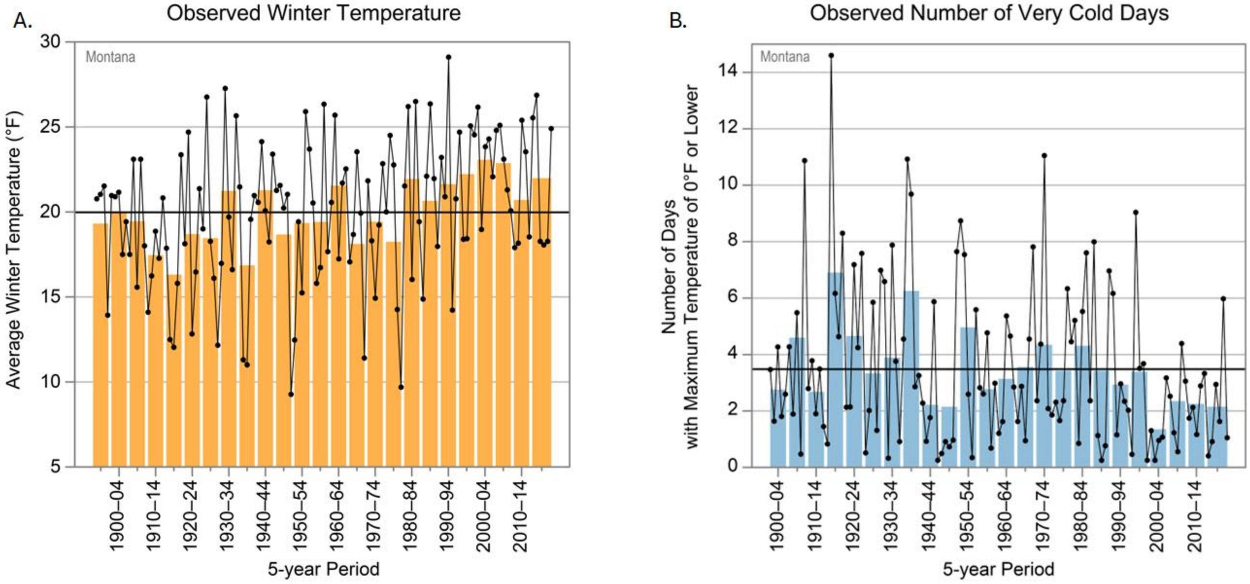
Source: NCEI, Chart by WSP

4.2.12.5 Climate Change Considerations

The 2021 Climate Change and Human Health in Montana report documents that annual average temperatures have increased in Montana 2-3 ^{o}F since 1950 in both summer and winter. This is greater than most of the U.S. due to the mid-continent location of the state. This trend is expected to continue and by mid-century the Montana Climate Assessment anticipates Montana will be 4.5-6.0 °F warmer than it was from 1971-2000. Precipitation has not changed significantly, but the 2021 Montana Climate Change and Human Health report anticipates precipitation to increase slightly, perhaps an inch/year, mostly from March-May.

With regard to winter weather, NOAA's 2022 National Climate Assessment documents that average winter temperatures in Montana have increased, with a striking reduction in the observed number of very cold days, especially in the last 20 years (Figure 4-71). Both the Montana Climate Assessment and NOAA reports anticipate the number of cold days will continue to decline. Recent academic research also indicates the frequency of blizzards are on the decline in Montana, including a dramatic reduction in the number of blizzards in 2011-2020 relative to 2000-2010 (Browne and Chen 2023)[7].

Figure 4-71 Winter Temperature Observations in Montana



Dots represent annual average temperature (A.) and the number of days with a high temperature of 0°F or lower (B.).
Bars are 5-year averages (both A. and B.).
Black horizontal line is the average summer temperature for all years, 1895-2020.
Figure adapted from: 2022 NOAA State Climate Summaries, Montana. https://statesummaries.ncics.org/chapter/mt/

Due to the relatively coarse resolution of climate change effects on severe winter weather, it would be speculative to make judgements on differences between each jurisdiction within the region. Future updates to this plan should revisit this topic as scientific knowledge progresses.

4.2.12.6 Potential Magnitude and Severity

The 2018 Montana State Hazard Mitigation Plan explains that the magnitude of severe weather is measured by the severity of the event and the resulting damage. Winter storms are generally slow in developing and advance notice often lessens their effects on the population. Severe winter weather that results in loss of life, extended road closures, long-term power outages, or significant isolation problems represent high-magnitude weather events for Montana. Routine damages to property are largely due to frozen pipes. Collapsed roofs from snow loads are not common due to the low percent moisture in typical snow loads.

---

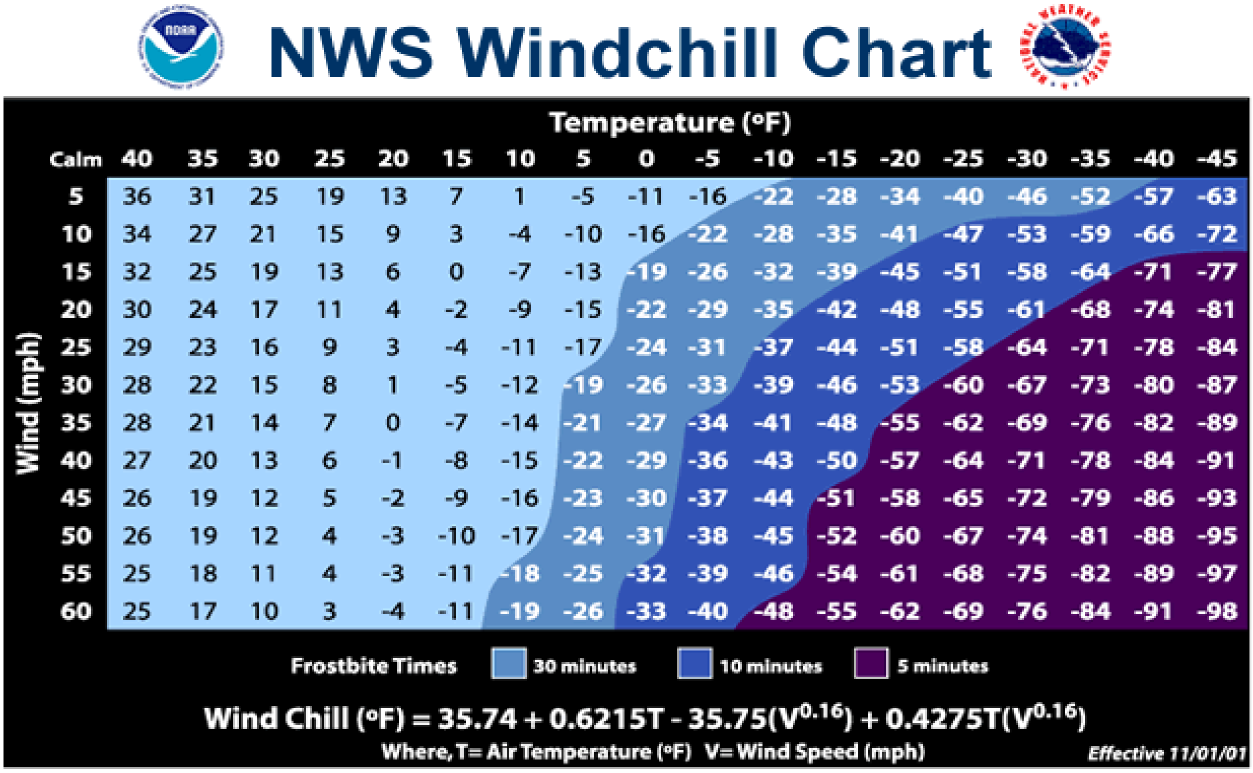
[7] Browne, A., & Chen, L. (2023). Investigating the occurrence of blizzard events over the contiguous United States using observations and climate projections. *Environmental Research Letters*, *18*(11), 114044.

In the Western Region, millions of dollars have been lost in property damage, in addition to the loss of life and several injuries, most of which occurred from a transportation accident due to severe winter weather.

On July 7, 2001, a disaster declaration was issued in the Western Region due to severe winter storms. In the Western Region, the NCEI reported 15 deaths, 19 injuries, and $7.6 million in property losses; therefore, the magnitude of severe winter weather is ranked as **Critical**.

In 2001, the NWS implemented an updated Wind Chill Temperature Index (Table 4-61). 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.

Table 4-61 National Weather Service Wind Chill Chart



NWS Windchill Chart

Temperature (°F)

Wind (mph)	Calm 40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times ▨ 30 minutes ▨ 10 minutes ▨ 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

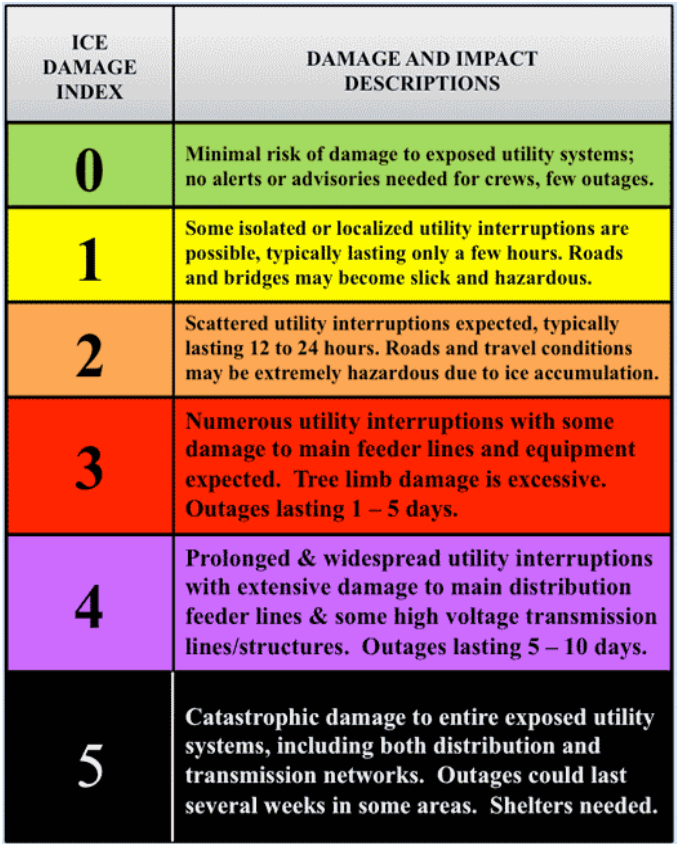
Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NWS

The severity of ice storms can be measured with the Sperry-Piltz Ice Accumulation (SPIA) Index, shown in Table 4-62. The SPIA Index is a forecasting of ice accumulation and ice damage that uses various parameters that can help predict the projected extent of ice storms. Historical measurements of ice storms using the SPIA Index are unavailable.

Table 4-62 Sperry-Piltz Ice Accumulation Index



ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

Source: NWS

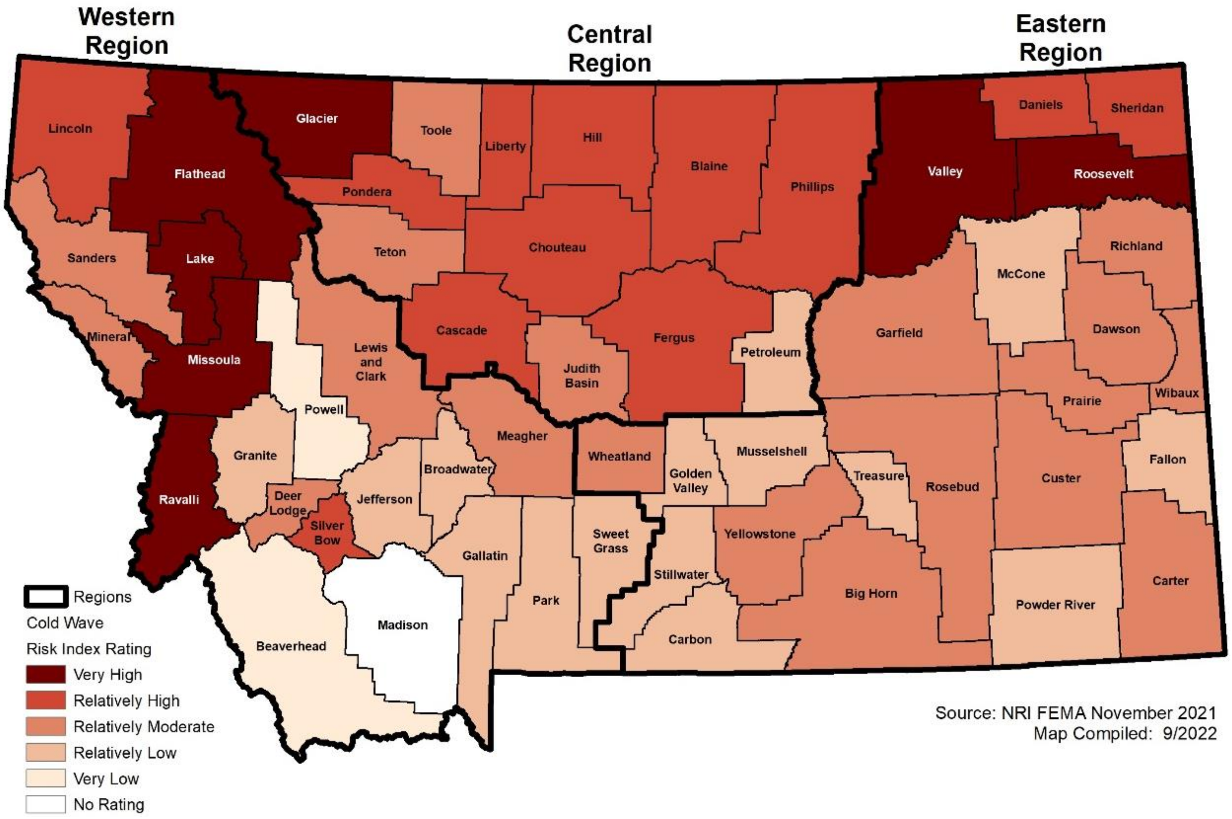
Winter storms and blizzards can result in multiple injuries and illnesses; major or long-term property damage that threatens structural stability; and/or interruption of essential facilities and services for 24-72 hours. This can include property damage, local and regional power and phone outages, and closures of streets, highways, schools, businesses, and nonessential government operations. People can also become isolated from essential services in their homes and vehicles. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter weather include hypothermia and the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly and contribute to high ground water tables and seepage into foundations. High snow loads also cause damage to buildings and roofs.

4.2.12.7 Vulnerability Assessment

The severe winter weather *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to severe winter weather hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with severe winter weather hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience severe winter weather hazards. *Susceptible* indicates a strong likelihood of damage from exposure to severe winter weather hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. The gradually diminishing number of extremely cold days (Figure 4-71) is considered in the future of vulnerability to this specific hazard (see Section 4.2.12.5 Climate Change Considerations). Future plan updates will reevaluate the advancing understanding of how climate change will affect other severe winter weather hazards. Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

The NRI risk index ratings for cold (Figure 4-72) and winter weather (Figure 4-73) are provided below. Risk of cold weather impacts is noticeably concentrated in the northern end of the planning area, while winter weather risk is variable, but spread across the planning area. Lake County in particular received the highest risk rating in both categories. The risk index rating considers impacts to many types of assets and provides insight to the overall significance of severe winter weather hazards in jurisdictions throughout the Western Region. A deeper analysis of the vulnerability of each type of asset to severe winter weather hazards in Western Region jurisdictions is provided below.

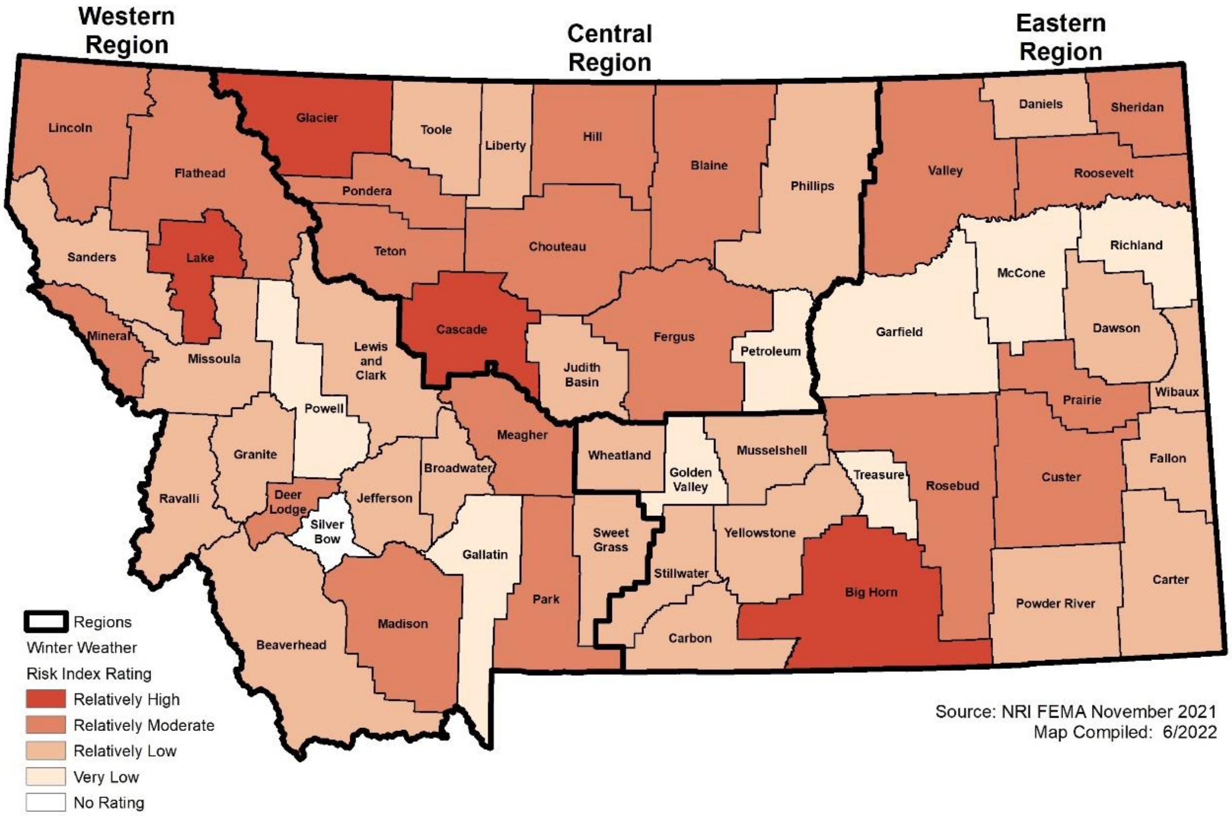
Figure 4-72 NRI Risk Index Rating for Cold



Source: NRI FEMA November 2021
Map Compiled: 9/2022

Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-73 NRI Risk Index Rating for Winter Weather



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

People

People are susceptible to severe winter weather hazards. However, these hazards are well known to impact residents in this part of the country and people are largely well adapted to them. Major problems typically only occur during record snowfalls and extended periods of below-zero temperatures. However, some populations are notably susceptible to the indirect effects of winter-storm associated utility interruption, freezing pipe damage, and either the cost or physical toll related to snow removal. Given the population is adapted to winter weather; most individuals avoid travel during inclement weather conditions.

Individuals who depend on electricity are also vulnerable during blackouts caused by severe winter weather. People without appropriate shelter or who work outside are more vulnerable to cold-related illnesses. The NCEI reports 15 fatalities and 19 injuries occurred in the Western Region between 1996 and March 2022, attributed to all six classes of winter weather reported (Table 4-58).

Property

All property located outdoors is exposed to severe winter weather events. Accumulation of snow and ice on roofs can cause collapse, especially on old or poorly constructed facilities. Ice storms can coat the exterior of a facility and can cause superficial damages. Prolonged cold can cause significant damages to poorly insulated facilities. In this regard, frozen pipes can extend damage indoors. The NCEI reported property losses in the Eastern Region were primarily due to blackouts caused by downed powerlines and poles, which are costly to repair and lead to secondary impacts to buildings, such as the loss of heat and frozen pipes. Damage to cars from winter-weather related automobile crashes was also a major cause of property damage. Communities in the Eastern region that have experienced recent development may report that new structures are better able to withstand severe winter weather as new construction is built to current code and roof loads are better designed to withstand greater snow loads.

Critical Facilities and Lifelines

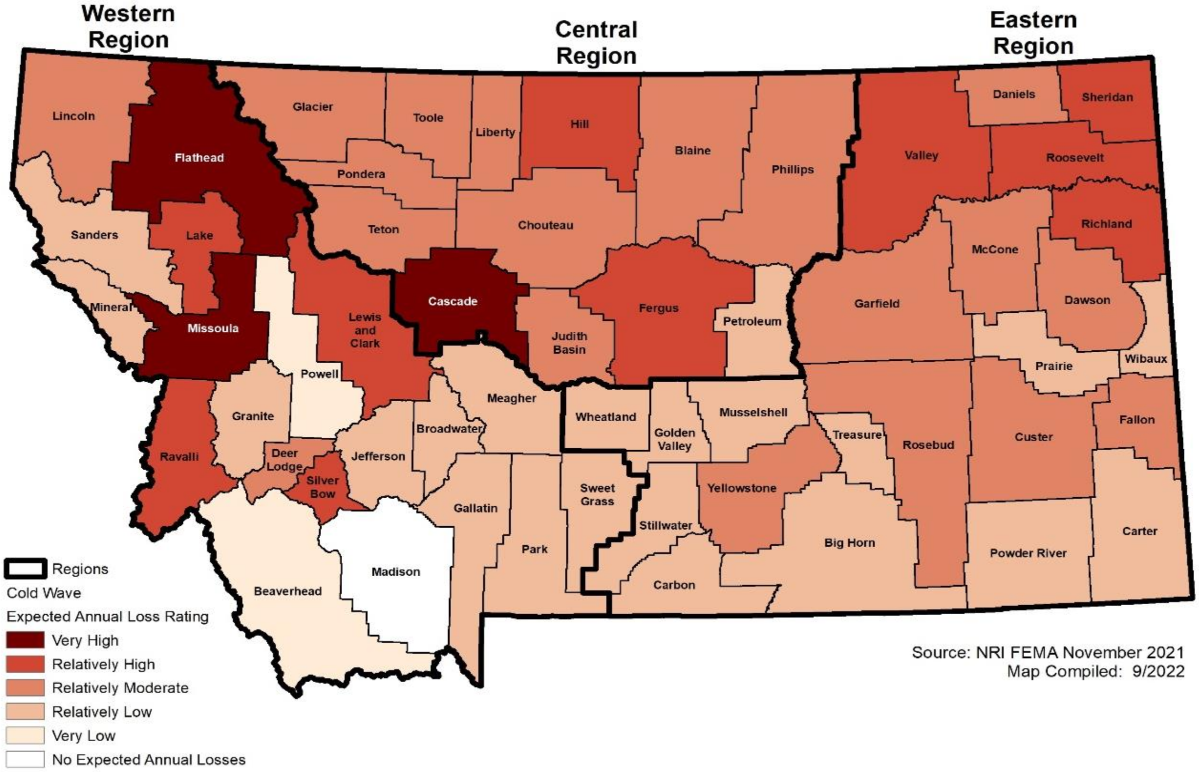
The safe and efficient flow of traffic is susceptible to extreme winter weather. Roads can become difficult or impossible to travel and automobile crashes are more frequent during extreme winter weather. These problems can isolate many people and create a dangerous situation for stranded motorists. Additionally, overhead power lines are susceptible to damage from the accumulation of snow and ice. This can cause power outages that lead to a dangerous loss of heat or electricity needed to operate medical equipment, all during periods likely to be extremely cold and possibly windy. NCEI data document Glacier Park International Airport was impacted by severe winter weather events several times. Future similar events may continue to impact the airport, causing flight delays or even airport shutdown.

Economy

The economy is susceptible to extreme winter weather hazards. Examples include lower economic activity due to business interruptions associated with poor road conditions. Indirectly, power outages can cause very costly impacts, particularly due to frozen pipes. The NCEI reported $7.6 million in property losses in the Western Region.

NRI ratings for expected annual loss due to cold waves as shown in Figure 4-74 and winter weather in Figure 4-75. For cold waves, Flathead and Missoula Counties are rated as very high. A few counties surrounding the center of the Region are also rated as relatively high. The rest of counties are rated as relatively moderate/low and very low. For winter weather, most counties are rated as relatively moderate. Counties of Sanders, Powell and Granite are rated as very low, and Madison is rated as no expected losses. The EAL calculation considers agriculture value exposed, annualized frequency of events, and historical loses.

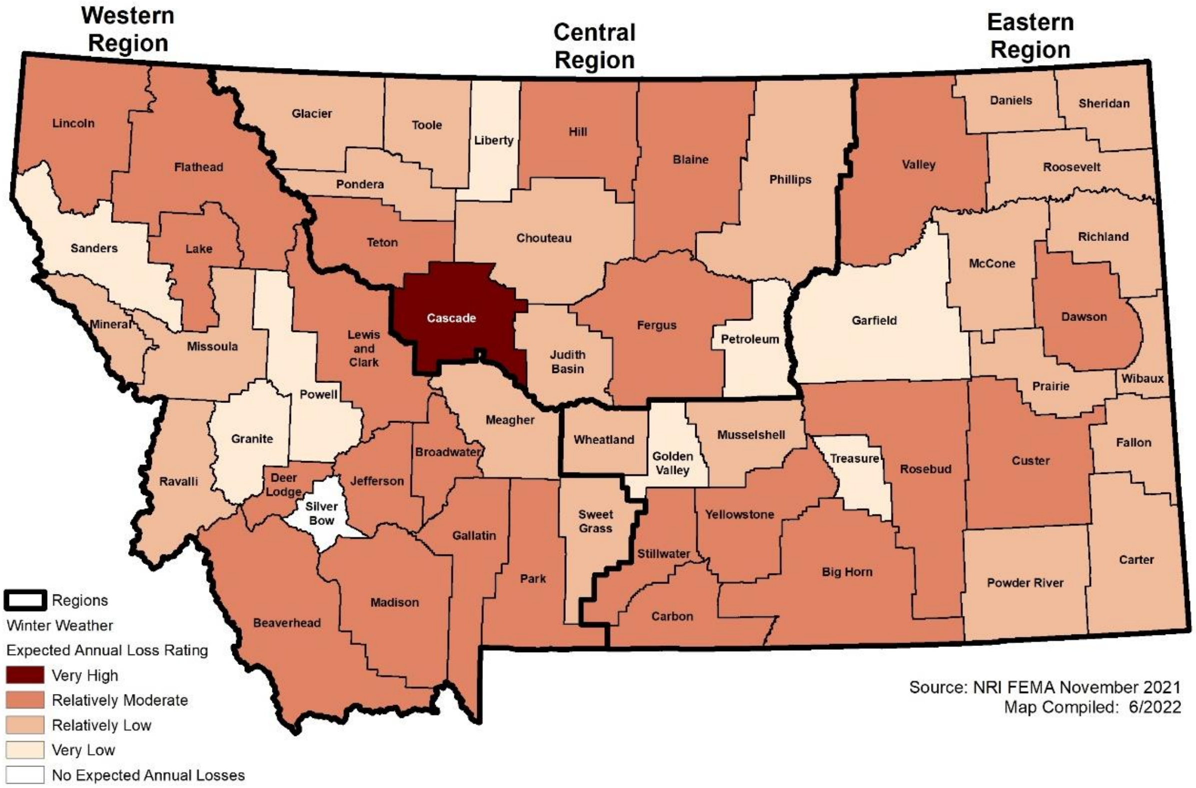
Figure 4-74 NRI Expected Annual Loss Rating from Cold Waves



Source: NRI FEMA November 2021
Map Compiled: 9/2022

Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-75 NRI Expected Annual Loss Rating from Winter Weather



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Historic and Cultural Resources

Historic and cultural resources are somewhat susceptible to extreme winter weather. Historic buildings, in particular, are unlikely to be insulated to the standard common to new construction. This leads to less protection for property and people inside the buildings from extreme cold temperatures and wind, greater susceptibility to damage from power outages, and increased probability of damage to or caused by frozen pipes.

Natural Resources

Trees, landscaping, and crops can be damaged due to prolonged periods of extreme cold weather and the accumulation of snow and ice. Trees that break due to the weight of snow and ice have also been reported in the NCEI dataset.

Development Trends Related to Hazards and Risk

In the past 10 years, Gallatin and Broadwater Counties grew by 37% and 29%, respectively (Table 2-1). Seven counties in the Western Region are expected to grow an additional 20% or more between 2020 and 2040, including Madison (57%), Gallatin (38%), Meagher (37%), Ravalli (26%), Powell (22%). Missoula (20%), and Flathead (20%) Counties (Table 2-2). There is no doubt that development is increasing vulnerability to winter weather by increasing the value of assets in the planning area. In some cases, such as with new buildings, susceptibility of new development is less susceptible to damage to severe winter weather than existing assets. But that pattern does not hold true in other cases, such as with people migrating to the area from warm climates that are less familiar with coping with winter weather, especially driving.

4.2.12.8 Risk Summary

In summary, severe winter weather hazards are rated **medium** significance for the Western Region (Table 4-1), though Lewis & Clark County rated these hazards as low significance (Table 4-63). Key points with regard to severe winter weather risk are provided below, followed by a summary of variations in risk by jurisdiction (Table 4-63). Annexes specific to each county and tribe in the Western Region provide additional analysis of local conditions, where they diverge from what is presented here for the entire planning area.

- People who are dependent on electricity and populations who work outdoors or in transportation are most vulnerable to severe winter weather events. People who do not have appropriate shelter or who live in homes without proper insulation from winter weather, such as homeless populations and those in mobile homes, are most vulnerable to winter weather.
- Power outages and poor road conditions are likely impacts of severe winter storms. Power outages lead to many problems, especially the loss of heat and frozen pipes. Car crashes due to severe winter weather hazards are a significant cause of damage.
- These events can impact anywhere in the planning region; therefore, the geographic area is rated as **extensive.**
- Despite a gradual decline in the frequency of extreme cold likely due to climate change, severe winter weather hazards remain common throughout the planning area and the probability of these hazards is rated as **highly likely.**
- Despite severe winter weather causing 15 deaths from 1996 to March 2022, the magnitude of this hazard is rated as **moderate.**
- Related hazards: Extreme Temperatures, Windstorms, Transportation Accidents.

Table 4-63 Risk Summary Table: Severe Winter Weather

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	N/A	N/A
Beaverhead	Medium	City of Dillon, Town of Lima	None
Broadwater	Medium	City of Townsend	None
Butte-Silver Bow	Medium	Butte-Silver Bow City, Town of Walkerville	None
CSKT	Medium	Confederated Salish and Kooteani Tribes of the Flathead Reservation	None
Flathead	Medium	Columbia Falls, Kalispell, Whitefish	Flathead County experiences the coldest weather in the Region.
Granite	Medium	Towns of Drummond and Philipsburg	None
Jefferson	Medium	City of Boulder, Town of Whitehall	None
Lake	Medium	City of Polson, City of Ronan, Town of St. Ignatius	None
Lewis and Clark	Low	City of Helena, City of East Helena	Lewis and Clark have a higher likelihood of winter weather events in the Region.
Lincoln	Medium	City of Libby, City of Troy, Town of Eureka	None

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Madison	Medium	Town of Ennis, Town of Sheridan, Town Virginia City	None
Meagher	Medium	City of White Sulphur Springs	None
Mineral	Medium	N/A	Mineral County has a higher likelihood of winter weather events in the Region.
Park	Medium	City of Livingston, Town of Clyde Park	Park County has a higher likelihood of winter weather events in the Region.
Powell	Medium	City of Deer Lodge	
Ravalli	Medium	City of Hamilton, Town of Darby, Town of Stevensville	Ravalli County has a higher likelihood of weather events in the Region.
Sanders	Medium	City of Thompson Fall, Town of Plains, Town of Hot Springs	None
Sweet Grass	Medium	City of Big Timber	None

4.2.13 Human Conflict

4.2.13.1 Hazard/Problem Description

Human conflict includes terrorism, active shooters, and civil unrest. Descriptions of these hazards are presented below:

Terrorism

The FBI defines terrorism, domestic or international, as the unlawful use of force or violence against persons or property to intimidate or coerce a government or civilian population in furtherance of political or social objectives. The U.S. State Department designates 72 groups as Foreign Terrorist Organizations around the world. There is no similar list of domestic terrorist groups. The Global Terrorism Database (GTD) maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism lists 241 groups known or suspected of carrying out terrorist attacks on U.S. soil since 1970.

Incidents involving weapons of mass destruction (WMDs) are a special subset of terrorism and mass violence incidents. Such incidents may involve CBRNE weapons with the potential to cause high numbers of injuries or fatalities.

Historically explosives have been the most common terrorist weapon, accounting for 51% of all attacks since 1970. Hazard impacts are typically instantaneous; secondary devices may be used, lengthening the duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive. Effects are generally static other than cascading consequences and incremental structural failures. Some areas could experience direct weapons' effects: blast and heat; others could experience indirect weapons' effects.

Biological terrorism is the use of biological agents against persons or property. Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point of line sources such as munitions, covert deposits and moving sprayers. Biological agents vary in the amount of time they pose a threat. They can be a threat for hours to years depending upon the agent and the conditions in which it exists.

Another type of biological attack is agroterrorism, directed at causing societal and economic damage through the intentional introduction of a contagious animal disease or fast-spreading plant disease that affects livestock and food crops and disrupts the food supply chain. Such an attack could require the agriculture industry to destroy livestock and food crops, disrupt the food supply both nationally and globally, and could also affect consumer confidence in the food supply resulting in tremendous economic damage for potentially an extended period.

Chemical terrorism involves the use or threat of chemical agents against persons or property. Effects of chemical contaminants are like biological agents. Radiological terrorism is the use of radiological materials against persons or property. Radioactive contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers or by the detonation of a nuclear device underground, at the surface, in the air or at high altitude.

Active Shooter

The FBI defines an active shooter as one or more individuals actively engaged in killing or attempting to kill people in a populated area. Implicit in this definition is the shooter's use of one or more firearms. The "active" aspect of the definition inherently implies the ongoing nature of the incidents, and thus the potential for the response to affect the outcome. Typically, active shooters are not interested in taking hostages or attaining material gain, and frequently are not even interested in their own survival. Unlike organized terrorist attacks, most active shooter incidents are carried out by one or two individuals. School shootings are a special subset of active shooter incidents.

The U.S. Department of Homeland Security notes that "in most cases, active shooters use firearms(s) and there is no pattern or method to their selection of victims…situations are unpredictable and evolve quickly…and are often over within 10 to 15 minutes." However, the presence or suspected presence of secondary devices can lengthen the duration of the event until the attack site is determined to be clear. Although this definition focuses on an active shooter, the elements remain the same for most active threat situations.

Civil Unrest

The federal law defines civil disorder, or civil unrest, as "any public disturbance involving acts of violence by assemblages of three or more persons, which causes an immediate danger of or results in damage or injury to the property or person of any other individual" (18 U.S. Code 232). FEMA noted that civil unrest can be triggered by a variety of reasons, including "disputes over exploitation of workers, standard living conditions, lack of political representation, poor health care and education, lack of employment opportunities, and racial issues" (FEMA, 1993).

4.2.13.2 Geographical Area Affected

Although human conflict events can occur anywhere in the Region, individual events will typically only impact localized cities. Past events indicate that the reported terrorist attack and civil unrest events in the Western Region have been concentrated to 14 major cities in the Region listed below, 10 of which are participating in the planning process. Therefore, geographic extent of these events is rated as **Limited**.

Butte-Silver Bow County
- Butte

Flathead County
- Columbia Falls
- Kalispell
- Whitefish

Lake County
- Arlee

Lewis and Clark County
- Helena

Lincoln County
- Eureka
- Libby

Park County
- Livingston

Ravalli County
- Hamilton

Acts of terrorism are typically a pre-meditated, targeted attack on a specific place or group such as religious or ethnic groups or sites of significant economic, strategic, military, or cultural significance. Consequently, areas of higher risk include densely populated cities and counties and military facilities. Large venue events, such as a sporting event attended by tens of thousands of people might be considered a desirable target. Again, such events typically occur in densely populated areas since those areas can provide the infrastructure support (hotels, eateries, etc.) for large numbers of people. Even a small-scale terrorist incident in one of these locations would likely cause cascading impacts to the communities in Western Montana. Like terrorist attacks, active shooter incidents most frequently occur in high-population areas. The FBI report Active Shooter Incidents, 20-Year Review 2000-2019 found that 29% of active shooter incidents in the U.S. occur in businesses open to pedestrians, 15% in open spaces, 13% in schools (Pre-K-12), and 12% in businesses closed to pedestrians.

Civil unrest, such as protests and demonstrations, can also occur anywhere. The 2020 George Floyd protests occurred in cities across the United States and even extended to other counties across the world. Highly populated cities are more likely to see large protests that can turn violent and result in property damage and death. Protests can also be localized to a single city or organization.

4.2.13.3 Past Occurrences

Terrorism

The GTD catalogues more than 200,000 domestic and international terrorist attacks from 1970 to 2020. Table 4-64 displays a list of the GTD reported seven events that have occurred in the State of Montana since 1970. Of the seven terrorist attack events reported in Montana, three occurred in the Western Region planning area in Flathead and Lewis and Clark Counties. These events are listed in the table below:

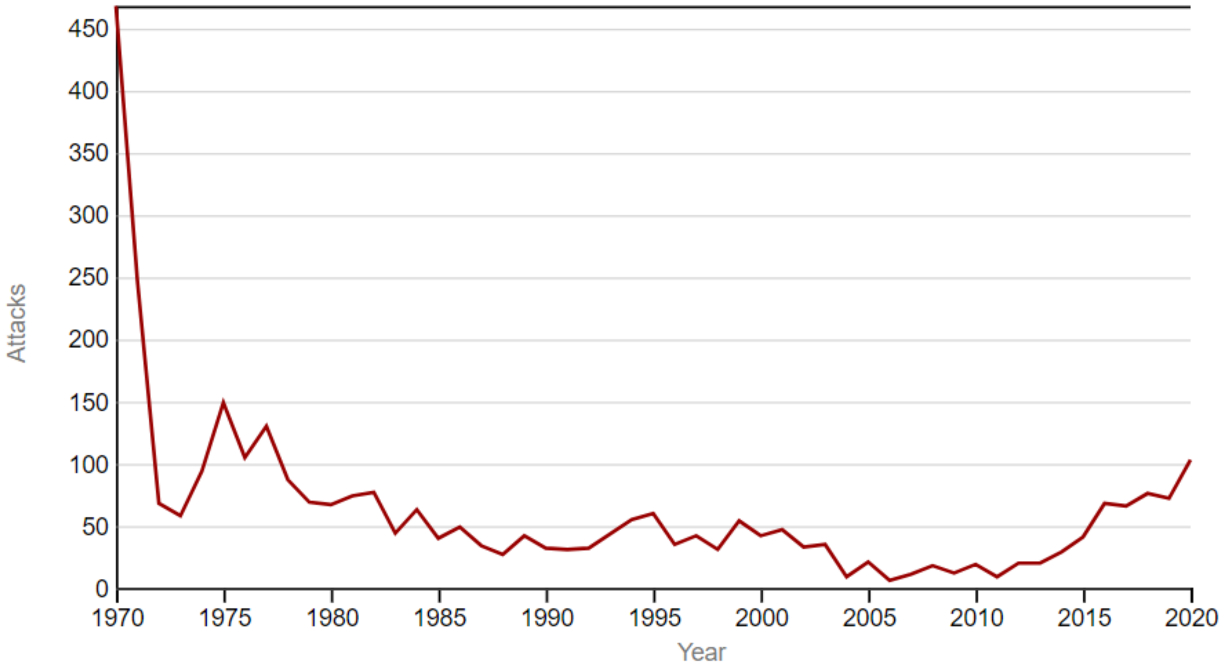
Table 4-64 Terrorist Attacks in the State of Montana 1970-2020

Date	City	County	Perpetrator Group	Fatalities	Injuries	Target Type
2017-05-16	Three Forks	Gallatin	Anti-Police extremists	2	5	Police
1997-04-02	Bozeman	Gallatin	Anti-Abortion extremists	0	0	Abortion Related
1994-10-11	Kalispell	Flathead	Anti-Abortion extremists	0	0	Abortion Related
1994-01-00	Helena	Lewis and Clark	Anti-Abortion extremists	0	0	Abortion Related
1992-01-18	Helena	Lewis and Clark	Anti-Abortion extremists	0	0	Abortion Related
1987-04-19	Missoula	Missoula	Aryan Nation (suspected)	0	0	Police
1970-03-15	Billings	Yellowstone (Eastern Region)	Unknown	0	0	Police

Source: GTD 1970-2020

As shown in Figure 4-76, GTD data shows that there was an overall decreasing trend in the number of terrorist attacks from 1970 to 2005. However, since 2010, there has been an uptake in the number of terrorist attacks in the United States once again.

Figure 4-76 Terrorist Attacks on U.S. Soil, 1970-2020



Source: GTD, https://www.start.umd.edu/gtd/

The increase in attacks over the last decade has been driven primarily by domestic, not international, terrorism. A domestic terrorist attack is a terrorist attack in which victims "within a country are targeted by a perpetrator with the same citizenship as the victims" (*Predicting Malicious Behavior: Tools and Techniques for Ensuring Global Security*). A recent report by the Center for Strategic and International Studies records 980 domestic terrorist attacks in the U.S. since 1994, with sharp growth over the last 10-15 years. Figure 4-77 shows the increase in domestic terrorist attacks from 1994-2021 broken down by the ideology of the attacker. As shown in the chart, the rise in domestic terrorist attacks since 2015 has been largely driven by violent far-right groups.

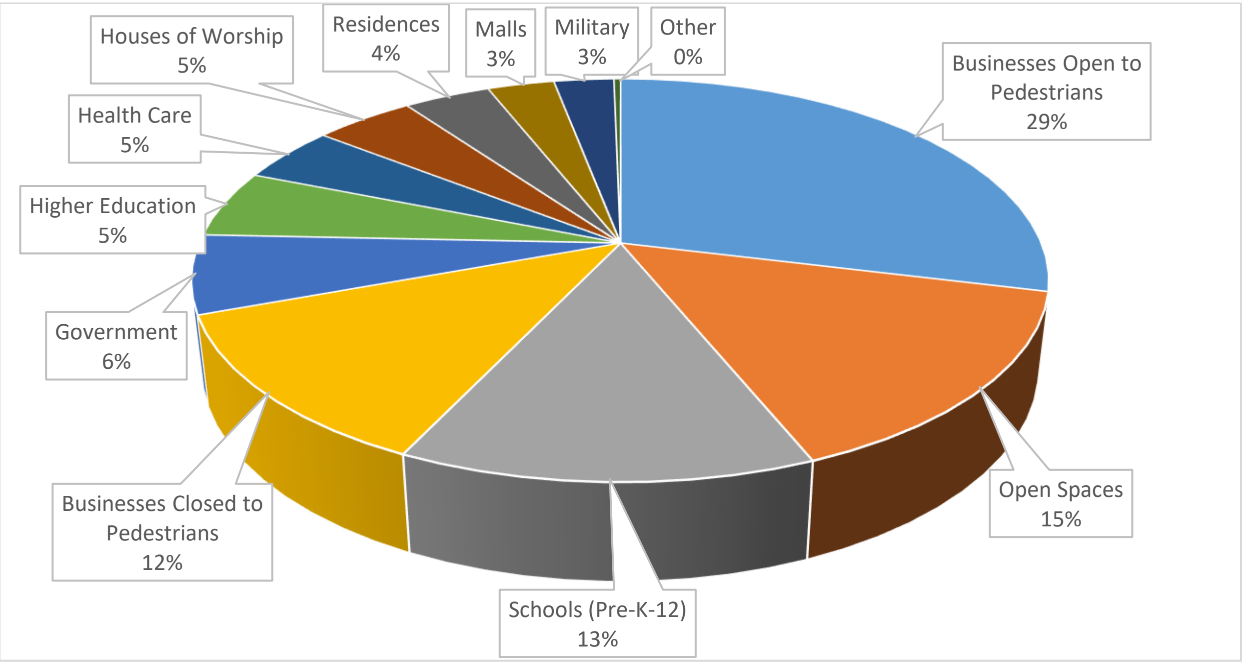
Figure 4-77 Domestic Terrorist Attacks in the U.S., 1994-2021

Source: Center for Strategic and International Studies

Active Shooters

The FBI reported 434 active shooter incidents from 2000-2021 in the United States: 333 of these events occurred between 2000-2019 and were reported in the FBI 20-year active shooter review. Figure 4-78 shows the location of where these incidents took place. The FBI reported an additional 40 incidents in 2020 and 61 incidents in 2021. While none of these 434 incidents took place in the State of Montana, trends from past events can be used to predict the likelihood of future events.

Figure 4-78 Active Shooter Incident Locations, 2000-2019

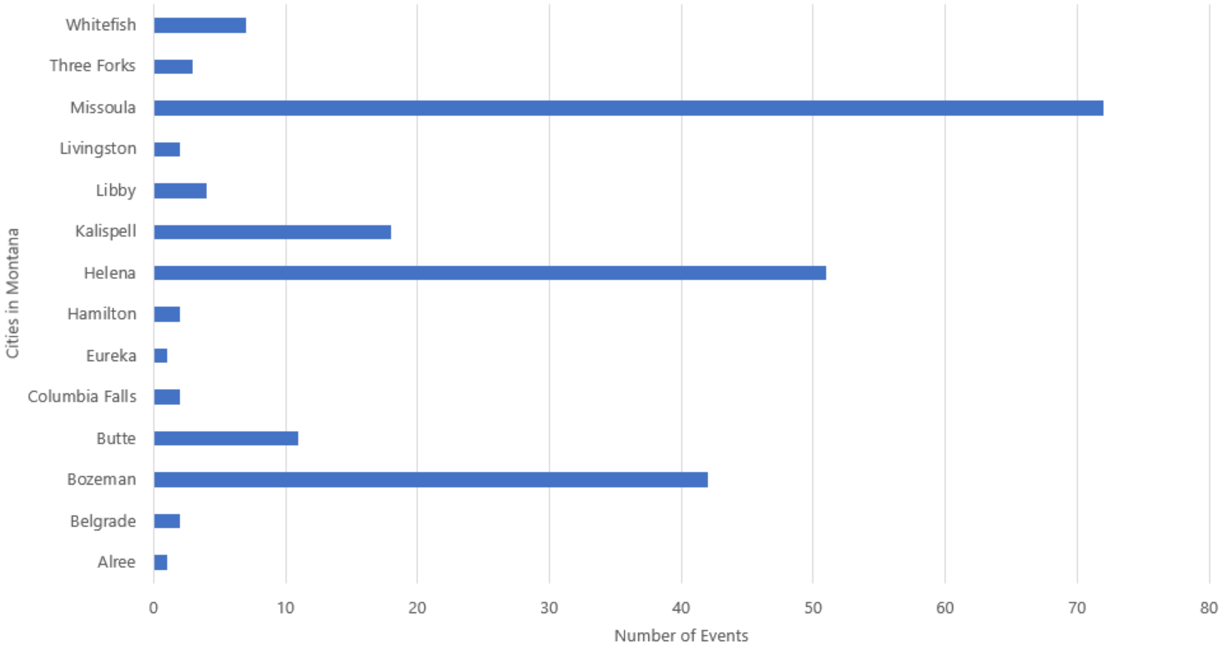


Source: FBI report Active Shooter Incidents, 20-Year Review 2000-2019

Civil Unrest

Count Love is an open-source database containing a comprehensive list of U.S. protests from January 20th, 2017, to January 21st, 2021. The dataset reported 27,270 protests across 4,042 cities in the United States. In Montana alone, 293 protests were reported across the State: 221 in the Western Region, 49 in the Eastern Region, and 23 in the Central Region. Of the Western Region counties participating in this plan, the City of Helena in Lewis and Clark County and the City of Kalispell in Flathead County have experienced the greatest number of protest events. Figure 4-79 below displays the number of documented protest events by city in the Western Region. Count Love reported a total of 59,620 attendees in the Western Montana protest events.

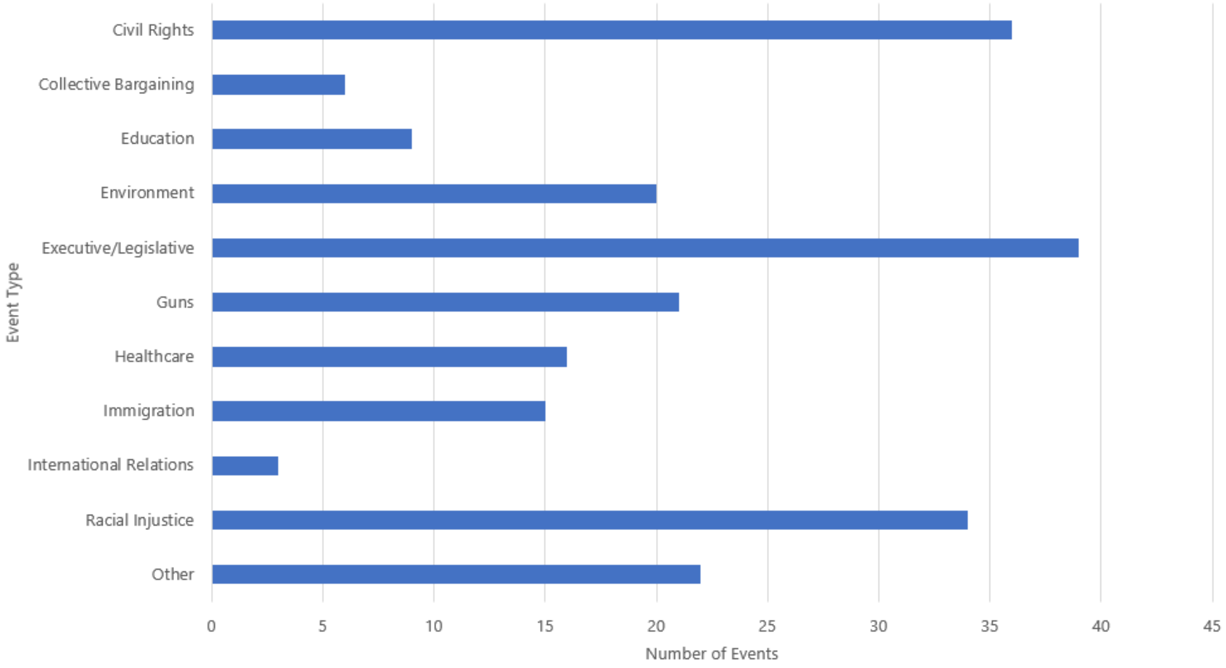
Figure 4-79 Protests in the Western Region by City, Jan. 2017 – Jan. 2021



Source: https://countlove.org/

The dataset also reported on the types of protest events. Figure 4-80 indicates that executive/legislative protests are the most common type of protest in the Western Region. Executive and legislative protests include the March for Truth, a nationwide protest calling for an investigation into President Trumps campaign administration and Russia, Tax Day, Supreme Court Nomination, and Town Hall protests. Civil rights protests, such as Women's March, Pride, Anti-Abortion, and Anti-LGBTQ protests were the second most common type of protest in the Western Region, with racial injustice protests as a close third. Gun protests encompass both gun-rights/second amendment protection protests and gun regulation protests. Other protest events include protests for Animal Welfare, Custody, Jewish Community, Local Development, March for Science, State Budget, Tobacco Tax, Unsolved Murder, Veterans Affairs.

Figure 4-80 Protests in the Western Region by Event Type, Jan. 2017 – Jan. 2021



Source: https://countlove.org/

4.2.13.4 Frequency/Likelihood of Occurrence

The probability of a terrorist attack, active shooter attack, and civil unrest can be difficult to quantify, largely due to different definitions and data collection methods. In Montana, seven terrorist attacks have been reported in the State since 1970, six of which took place in the Western Region. The FBI recorded 434 active shooter incidents from 2000-2021 in the United States, none of which occurred in the State of Montana. While both terrorist attack and active shooter attacks are rare in Montana, civil unrest is a more common occurrence. Over the course of 4 years from 2017-2021, 221 protest events were recorded in the Western Region of Montana. This averages out to about 55 protests per year in the Western Region, however, these protests are generally peaceful, and no deaths or injuries were reported due to protests in the Western Region. Based on these past events, the likelihood of these events is **Likely**.

4.2.13.5 Climate Change Considerations

Climate change has the potential to impact terrorism and civil unrest in the future. Extreme weather has been known to worsen social tensions, poverty, and hunger. Social instability and global conflict brought on by climate change could result in an increase in the number of both domestic and international terrorist attacks and civil unrest. While it is unlikely that climate change will have a significant impact on human conflict in the Western Region of Montana, if conditions continue to worsen, it is possible in the future.

4.2.13.6 Potential Magnitude and Severity

The severity of these incidents can be measured in multiple ways including length of incident, fatalities, casualties, witnesses, and number of perpetrators. Although an active threat may only directly impact one specific piece of infrastructure (e.g., a school, theater, or concert venue), it indirectly impacts the community in many ways, including ongoing closures for investigation, local and national media logistics, VIP visits, mental health concerns, need for additional support services, avoidance of similar infrastructure, and subsequent impacts to businesses. The psychological impact is often much worse than the direct impacts and can continue to affect a community for years. Thus, the overall significance of this hazard is **Critical**.

Terrorism

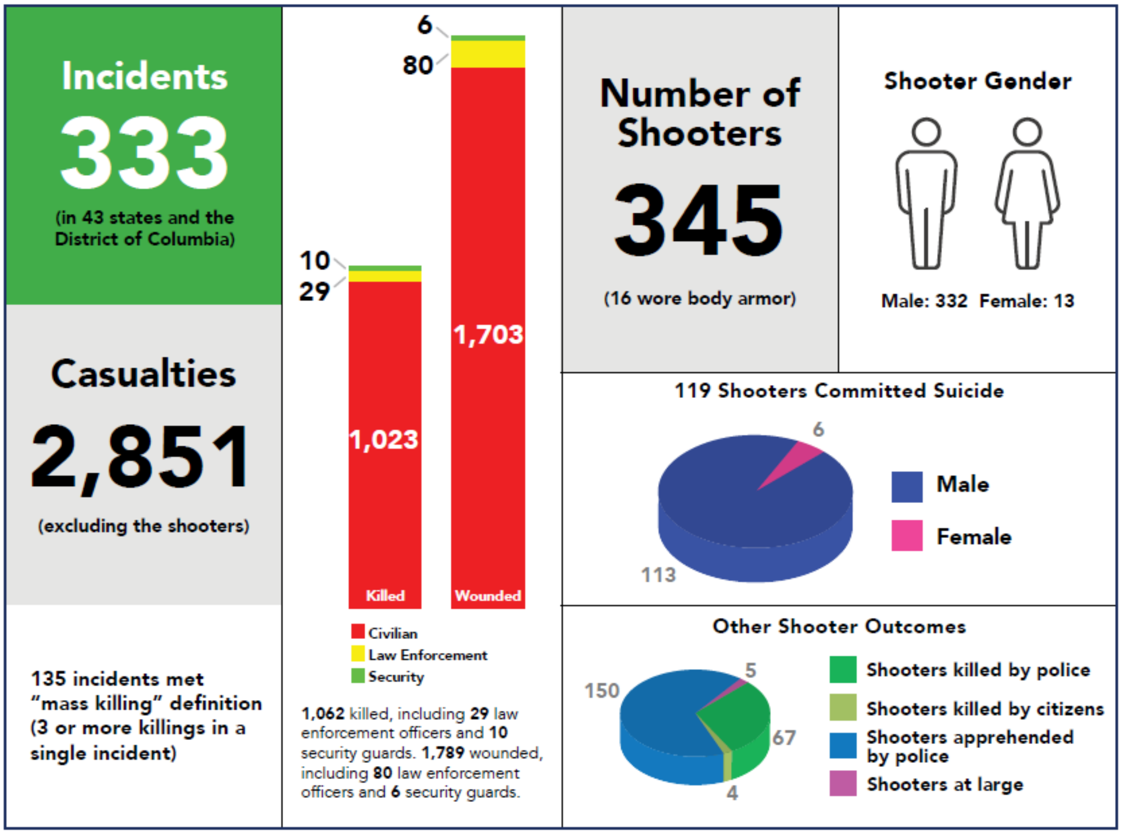
The GTD catalogues more than 200,000 terrorist attacks between 1970 and 2020 (the most recent year the GTD has analyzed). Those incidents averaged roughly one fatality and five injuries per incident. However, this data is to a large extent skewed by a handful of deadly attacks. These five attacks account for 64% of the fatalities and 87% of the injuries from terrorist attacks in the U.S.:

- The September 11, 2001, attacks on New York and Washington, DC, which killed 1,385 and injured 10,878 – more than all other terrorist attacks in the U.S. since 1970 combined.
- The October 1, 2017, shooting at the Route 91 Harvest Festival concert in Las Vegas, Nevada, which killed 59 and wounding 851.
- The April 4, 2013, Boston Marathon Bombing killed three and injured 264.
- The April 19, 1995, bombing of the Murrah Federal Building in Oklahoma City, killing 168 and injuring 650.
- The September–October 1984 salmonella food poisoning attack in Dalles, Oregon, which sickened 751 people.

Active Shooter

Figure 4-81 summarizes the outcomes of 333 active shooter incidents in the U.S. from 2000-2019 studied by the FBI. Casualties for active shooter incidents vary widely, with 2,851 casualties from 333 incidents, averaging over 8 deaths per incident.

Figure 4-81 Active Shooter Incident Outcomes, 2000-2019



135 incidents met "mass killing" definition (3 or more killings in a single incident)

1,062 killed, including 29 law enforcement officers and 10 security guards. 1,789 wounded, including 80 law enforcement officers and 6 security guards.

Source: FBI report Active Shooter Incidents, 20-Year Review 2000-2019

Civil Unrest

Civil unrest resulting in large-scale protests and demonstrations can have significant impacts to people and infrastructure in a community. The U.S. Crisis Monitor is a database to facilitate efforts in tracking, preventing, and mitigation political violence in America in partnership with the Armed Conflict Location and Event Data Project (ACLED). The U.S. Crisis Monitor reported that in 2020, 11 people in the United States were killed while participating in political demonstrations and another 14 died in incidents linked to political unrest. Property damage, such as broken windows and vandalism, are also commonly reported during violent protests in the United States.

4.2.13.7 Vulnerability Assessment

People

Most terrorist attacks are primarily intended to kill and injure as many people as possible. Physical harm from a firearms attack or explosive device is not completely dependent on location, but risk is greater in areas where higher numbers of people gather. If a biological or chemical agent were released indoors, it could result in exposure to a high concentration of pathogens, whereas an outdoors release could affect many more people but probably at a lower dose. Symptoms of illness from a biological or chemical attack could go undetected for days or even weeks. Local healthcare workers may observe a pattern of unusual illness or early warning monitoring systems may detect airborne pathogens. People could also be affected by an attack on food and water supply. In addition to impacts on physical health, any terrorist attack would likely cause significant stress and anxiety.

Similarly, most active shooters primarily target people, attempting to kill or injure large numbers of individuals. The number of injuries and fatalities are highly variable, dependent on many factors surrounding the attack including the location, the number of type of weapons used, the shooter’s skill with weapons, the amount of people at the location, and law enforcement response time. Psychological effects of the incident, on not only victims and responders but also the public, may last for years. Civil unrest and large political demonstrations can also result in death or injuries to protestors, responders, and community members.

Property

The potential for damage to property is highly dependent on the type of attack. Terrorist attacks involving explosives or other weapons, may damage buildings and infrastructure. For most attacks, impacts are highly localized to the target of the attack, although attacks could potentially have much broader impacts. Active shooter incidents rarely result in significant property damage, although crime scene measures may deny the use of targeted facilities for days after the incident. Civil unrest can result in damaged property such as broken windows, vandalisms, damaged vehicles, stolen property, and fires.

Critical Facilities and Lifelines

Impacts to critical infrastructure would depend on the site of the attack. Short or long-term disruptions in operations could occur, as well as gaps in continuity of business or continuity of government, depending on who the victims of the attack are, and whether a continuity plan is in place. While active shooter incidents rarely cause major property damage directly, indirect effects can be significant, such as the loss of critical facilities for days or weeks due to crime scene concerns. Terrorists could disrupt communication and electric systems through cyber-attacks. Additionally, terrorism, active shooter incidents, and civil unrest can result in a drain on first responder resources and personnel for days to weeks following the incident.

Economy

Active shooter or terrorist incidents could have significant economic impacts. Specific examples could include short-term or permanent closing of the site of the attack. Another economic impact could be caused by general fear – as an example, an attack in a crowded shopping center could cause potential patrons to avoid similar places and disrupt economic activity. Potential economic losses could include cost of repair or replacement of damaged facilities, lost economic opportunities for businesses, loss of food supplies, disruption of the food supply chain, and immediate damage to the surrounding environment.

As an extreme example, after the September 11, 2001, terrorist attacks in New York and Washington the U.S. stock market lost $1.4 trillion, the Gross Domestic Product of New York City lost an estimated $27 billion, and commercial air travel decreased by 20%.

Historic and Cultural Resources

Terrorists have been known to target sites with historic or cultural significance. Civil unrest and protests also frequently target historically or politically significant areas, such as capital buildings, which can be damaged during a civil unrest event if a protest turns violent. Additionally, active shooters can target cultural significant areas if the motive is for religious or political reasons.

Natural Resources

Generally, active shooter incidents would not have an impact on the natural environment. Agro-terrorism or chemical terrorism could result in significant damage to the environment in areas near the attack. These events can pollute the environment and cause nearby plants and animals to get sick or die. Contaminated material that gets into the air or water supply can affect humans further away from the incident site.

Development Trends Related to Hazards and Risk

The link between increased development and terrorist attacks is uncertain at best. Many terrorist attacks have targeted larger metropolitan areas, so a larger population could potentially make public events more attractive targets. Population growth and development could expose more people and property to the impacts of an explosive or other large-scale attack.

Depending on the motivation behind the attack, incidents will most likely be focused on so-called “soft targets.” Protective design of buildings can reduce the risk of an active shooter incident, and if one occurs, can mitigate, or reduce the impacts and number of potential victims.

4.2.13.8 Risk Summary

In summary, the human conflict hazard has an overall **Medium** significance for the Region. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

- There were no recorded incidents of active shooters in the Western Region, however, there were three terrorist attacks since 1970 in the planning area and 221 recorded civil unrest cases across the Region from 2017-2020; therefore, the ranking of frequency for human conflict is rated as **Likely**.
- Based on potential for death, injury, and significant damage to critical infrastructure and property, magnitude is ranked as **Critical**.
- Although human conflict events can occur anywhere in the Region, individual events will typically only impact localized cities. Past events indicate that these events in the Western Region have been limited to 14 major cities in the Region, 10 of which are in the planning area; therefore, geographic extent of these events is rated as **Limited**.
- Impacts on people from human conflict include injury and death, as well as psychology damage from being in an incident.
- Impacts on property include vandalism, theft, and damage. Total destruction of property is possible in the case of an extreme terrorist attack.
- Significant economic damages are possible in the case of a significant terrorist attack due to repairs and business closures.
- In a severe human conflict case, it would be possible for significant disruption of critical facilities including loss of power, transportation interruptions, and disruption of first responders.

- Of the 14 major cities in the Western Region that have been reported to experience human conflict events, the City of Missoula (not participating in this plan) had the greatest frequency of events. In the planning area, the City of Helena and the City of Kalispell experienced the greatest number of events when compared to other cities in the planning area. This is likely due to both cities having a large population and the City of Helena being the capital city of Montana.
- Related Hazards: Cyber-attack.

Table 4-65 Risk Summary Table: Human Conflict

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	N/A	N/A
Beaverhead	Medium	City of Dillon, Town of Lima	None
Broadwater	Low	City of Townsend	N/A
Butte-Silver Bow	Medium	Town of Walkerville	N/A
CSKT	Medium	N/A	N/A
Flathead	Medium	Columbia Falls, Kalispell, Whitefish	While all three jurisdictions have experienced protest events, Kalispell has seen the greatest frequency of events and a terrorist attack event
Granite	Medium	Towns of Drummond and Philipsburg	None
Jefferson	Medium	City of Boulder, Town of Whitehall	None
Lake	Medium	City of Polson, City of Ronan, Town of St. Ignatius	None, the only protest event in the County occurred in Arlee
Lewis and Clark	Medium	City of Helena, City of East Helena	The City of Helena has seen historic protest and terrorist attack events, while East Helena has not
Lincoln	Medium	City of Libby, City of Troy, Town of Eureka	Libby and Eureka have documented historic protest events, but not the City of Troy
Madison	Medium	Town of Ennis, Town of Sheridan, Town Virginia City	None
Meagher	Medium	City of White Sulphur Springs	N/A
Mineral	Low	N/A	N/A
Park	Medium	City of Livingston, Town of Clyde Park	The City of Livingston has documented historic protest events, but the Clyde Park has not
Powell	Medium	City of Deer Lodge	N/A
Ravalli	Low	City of Hamilton, Town of Darby, Town of Stevensville	The City of Hamilton has experienced historic protest events
Sanders	Medium	City of Thompson Fall, Town of Plains, Town of Hot Springs	None
Sweet Grass	Medium	City of Big Timber	N/A

*Rocky Boy's Reservation

4.2.14 Tornadoes & Windstorms

4.2.14.1 Hazard/Problem Description

Tornadoes

Tornadoes are one of the most destructive types of severe weather. According to the 2018 SHMP, a tornado is a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm.

Until 2006, tornadoes were categorized by the Fujita scale based on the tornado's wind speed. The Enhanced Fujita (EF) Scale was implemented in place of the Fujita scale and began operational use on February 1, 2007. The EF scale has six categories from zero to five representing increasing degrees of damage. It was revised to better align wind speeds closely with associated storm damage. It also adds more types of structures as well as vegetation, expands degrees of damage, and better accounts for variables such as differences in construction quality. The EF-scale is a set of wind estimates based on damage. It uses three-second estimated gusts at the point of damage. These estimates vary with height and exposure. Forensic meteorologists use 28 damage indicators and up to 9 degrees of damage to assign estimated speeds to the wind gusts. Table 4-66 describes the EF-scale ratings versus the previous Fujita Scale used prior to 2007 (NOAA 2007).

Table 4-66 The Fujita Scale and Enhanced Fujita Scale

Fujita Scale	Derived		Operational EF Scale			
F Number	Fastest ¼ mile (mph)	3-second gust (mph)	EF Number	3-second gust (mph)	EF Number	3-second gusts (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Source: NWS
Notes: EF = Enhanced Fujita; F = Fujita; mph = Miles per Hour

Windstorms

Windstorms are the most common type of severe weather. Often accompanying severe thunderstorms (convective windstorms), they can cause significant property and crop damage, threaten public safety, and disrupt utilities and communications. Straight-line winds are generally any wind not associated with rotation and in rare cases can exceed 100 miles per hour (mph). The NWS defines high winds as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration. Windstorms are often produced by supercell thunderstorms or a line of thunderstorms that typically develop on hot and humid days. According to the 2018 State of Montana HMP, high winds can occur with strong pressure gradients or gusty frontal passages. These winds can affect the entire State with wind speeds of more than 75-100 mph.

For this hazard, three different classifications of windstorms were analyzed: high winds, strong winds, and thunderstorm winds. The most significant distinction between high winds and thunderstorm winds in the NCEI dataset is that high winds are most frequently reported in the winter months (December, January, and February) and are recorded on a zonal scale, whereas thunderstorm winds are most reported in the summer months (June, July, and August) and recorded on a local county or city scale. Strong winds are another type of windstorm, which originates from thunderstorms and are any wind exceeding 58 mph. Strong winds are the least frequently documented category of wind in the Western Region. Despite these differences, the wind speeds and associated impacts from these winds are comparable.

Wind speed is also rated on the Beaufort wind scale (Table 4-67). The Beaufort wind scale is particularly useful for estimating wind speed in the absence of instrumentation. This HMP update uses the aforementioned NCEI wind speed classifications and data to evaluate wind hazard extent.

Table 4-67 Beaufort Wind Scale

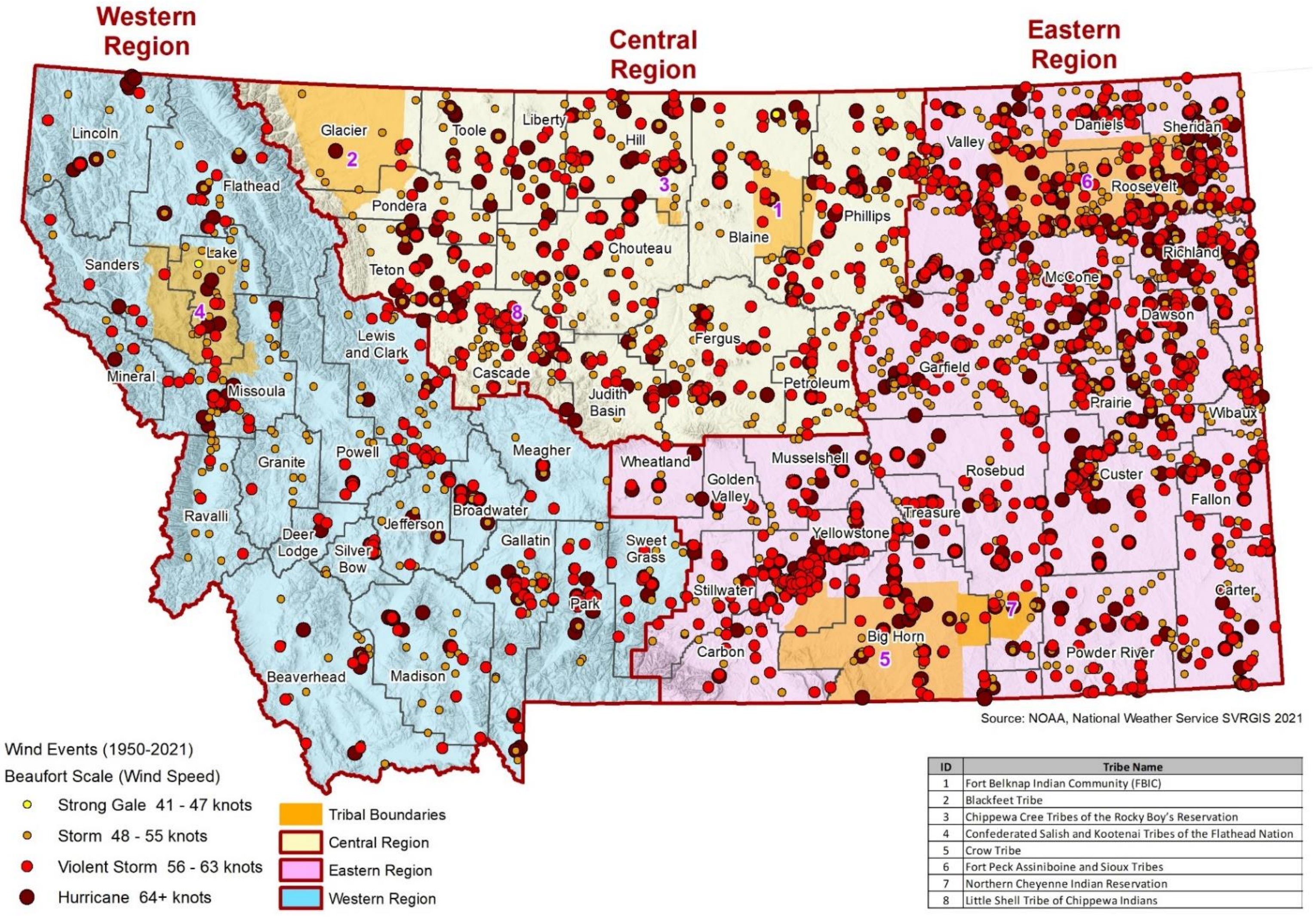
Force	Speed (mph)	Description
0	0-1	Calm
1	1-3	Light Air
2	4-7	Light Breeze
3	8-12	Gentle Breeze
4	13-18	Moderate Breeze
5	19-24	Fresh Breeze
6	25-31	Strong Breeze
7	32-38	Near Gale
8	39-46	Gale
9	47-54	Severe Gale
10	55-63	Storm
11	64-72	Violent Storm
12	72-83	Hurricane

Source: NWS

4.2.14.2 Geographical Area Affected

The spatial extent rating for both tornadoes and wind hazards is **extensive**. Windstorms and tornadoes can occur anywhere in the Western Region. Violent storm wind events have occurred in every county of the Western Region (Figure 4-82). Tornadoes have occurred in every county except Lincoln and Mineral Counties (Figure 4-83), though future tornadoes certainly could happen in these locations.

Figure 4-82 Wind Events in Montana by Region 1955-2021

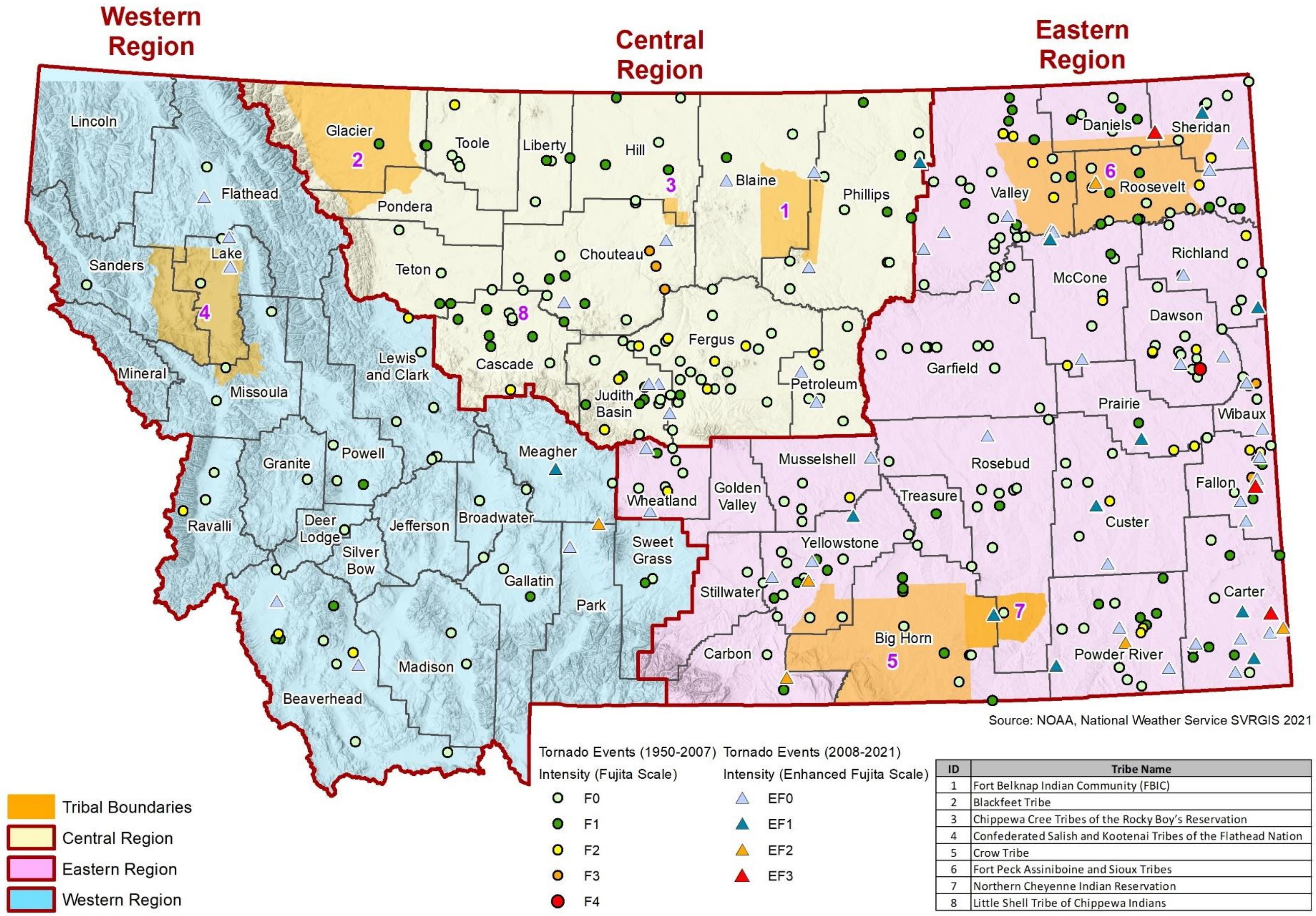


Source: NOAA, National Weather Service SVRGIS 2021

ID	Tribe Name
1	Fort Belknap Indian Community (FBIC)
2	Blackfeet Tribe
3	Chippewa Cree Tribes of the Rocky Boy's Reservation
4	Confederated Salish and Kootenai Tribes of the Flathead Nation
5	Crow Tribe
6	Fort Peck Assiniboine and Sioux Tribes
7	Northern Cheyenne Indian Reservation
8	Little Shell Tribe of Chippewa Indians

Source: NOAA

Figure 4-83 Past Tornado Events in Montana by Region (1950-2021)



ID	Tribe Name
1	Fort Belknap Indian Community (FBIC)
2	Blackfeet Tribe
3	Chippewa Cree Tribes of the Rocky Boy's Reservation
4	Confederated Salish and Kootenai Tribes of the Flathead Nation
5	Crow Tribe
6	Fort Peck Assiniboine and Sioux Tribes
7	Northern Cheyenne Indian Reservation
8	Little Shell Tribe of Chippewa Indians

Source: NOAA

4.2.14.3 Past Occurrences

The NCEI database was used to gather information on historic severe summer weather events in the Western Region of Montana. The NCEI data is a comprehensive list of oceanic, atmospheric, and geophysical data across the United States and aggregated by county and zone. It is important to note that tornado and wind events that occurred on Confederated Salish and Kootenai Tribes of the Flathead Nation is also included in the dataset tables down below. However, instead of individual records, tribal data records were grouped into the nearest County. The NCEI uses unique methods of recording various hazards. High wind and strong wind are recorded by zone rather than by county and these datasets begin in 1996. Thunderstorm wind is recorded by county and the dataset starts in 1955. Tornadoes are also recorded by county and the dataset begins in 1950. All these datasets contain information up to March 2022.

The NCEI database reported 2,218 windstorm events and 42 tornado events, causing $15.0 million and $2.9 million in losses, respectively (Table 4-68). Windstorm and tornado hazards each caused one fatality, while wind hazards caused 27 of the 28 total injuries attributed to these hazards in the Western Region. NCEI data do not contain losses from unreported events and may double-count losses of the same event that are reported in multiple counties. Nevertheless, NCEI data are compiled using transparent, consistent methods across jurisdictions and are the best available for hazard mitigation planning purposes.

Table 4-68 Summary of Losses by Hazard in the Western Region, 1996-March 2022

	Deaths	Injuries	Property Loss	Crop Loss	Days with Events	Total Events
High Wind	1	9	$4,597,200	$216,900	621	**1,478**
Strong Wind	0	0	$2,431,350	$86,900	45	**75**
Thunderstorm Wind	1	18	$7,654,000	$36,000	412	**728**
Tornadoes	0	1	$2,931,060	$0	41	**42**
Total	**2**	**28**	**$17,613,610**	**$339,800**	**1,119**	**2,323**

Source: NCEI

As described in Section 4.2.11.3, NCEI data are reported in zones rather than counties and can be challenging to interpret at a county level. NCEI data can be used to judge variability in wind hazards across the Western Region (Table 4-69 and Figure 4-84). High winds are the most common type of windstorm event overall, and the Southern Rocky Mountain Front Zone experiences high wind events more than twice as often as any other zone in the planning area.

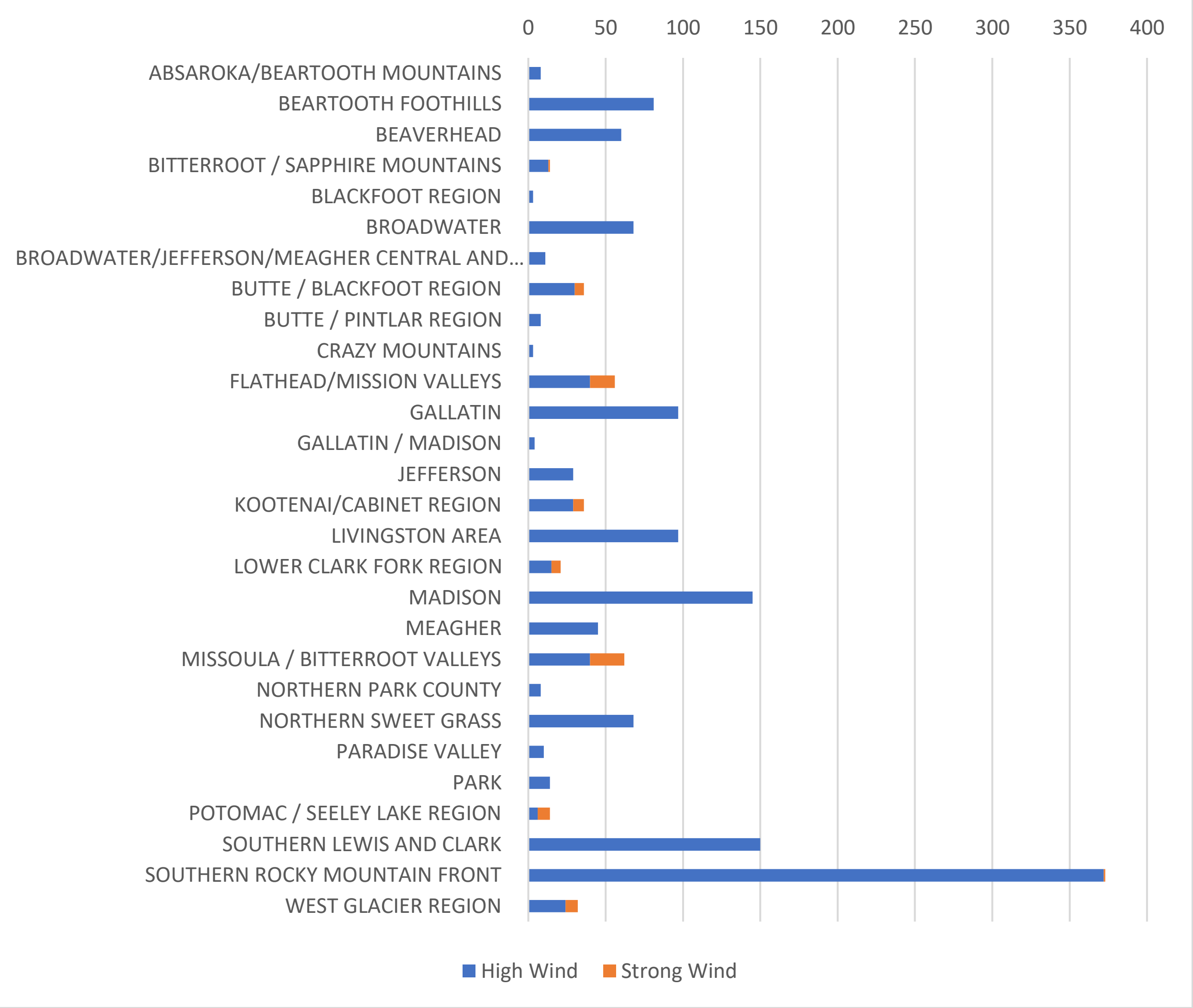
Table 4-69 Total High Wind and Strong Wind Events by Zone, 1996-March 2022

Area	High Wind	Strong Wind	Total
Absaroka / Beartooth Mountains	3	0	**3**
Absarokee / Beartooth Mountains	5	0	**5**
Beartooth Foothills	81	0	**81**
Beaverhead	60	0	**60**
Bitterroot / Sapphire Mountains	13	1	**14**
Blackfoot Region	3	0	**3**
Broadwater	68	0	**68**
Broadwater / Jefferson / Meagher / Western and Southern Lewis and Clark	9	0	**9**
Broadwater/Jefferson/Meagher Western and Southern Lewis and Clark	2	0	**2**
Butte / Blackfoot Region	30	6	**36**

Area	High Wind	Strong Wind	Total
Butte / Pintlar Region	8	0	**8**
Crazy Mountains	3	0	**3**
Flathead/Mission Valleys	40	16	**56**
Gallatin	97	0	**97**
Gallatin / Madison	4	0	**4**
Jefferson	29	0	**29**
Kootenai/Cabinet Region	29	7	**36**
Livingston Area	97	0	**97**
Lower Clark Fork Region	15	6	**21**
Madison	145	0	**145**
Meagher	45	0	**45**
Missoula / Bitterroot Valleys	40	22	**62**
Northern Park County	8	0	**8**
Northern Sweet Grass	68	0	**68**
Paradise Valley	10	0	**10**
Park	14	0	**14**
Potomac / Seeley Lake Region	6	8	**14**
Southern Lewis and Clark	150	0	**150**
Southern Rocky Mountain Front	372	1	**373**
West Glacier Region	24	8	**32**
Total	**1,478**	**75**	**1,553**

Source: NCEI

Figure 4-84 Total High Wind and Strong Wind Events by Zone (1996 to March 2022)



Source: NCEI, Chart by WSP

Like high wind and strong wind, there are variations between counties in the Western Region regarding thunderstorm wind and tornado events (Table 4-70). Park County experienced the greatest number of thunderstorm wind events and Beaverhead County experienced the greatest number of tornado events. In total, there were 728 thunderstorm wind events since 1955 and 42 tornado events since 1950 in the Western Region.

Table 4-70 Total Thunderstorm Wind and Tornado Wind Events by County, 1996-March 2022

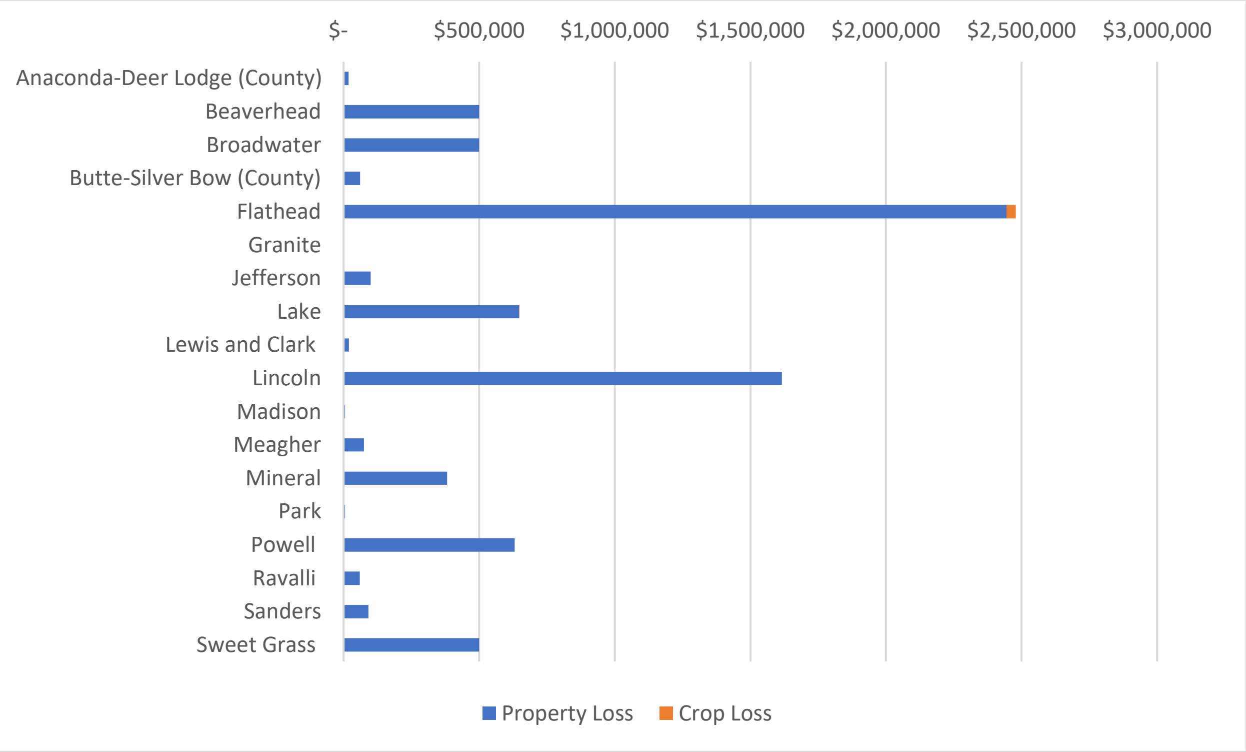
County	Thunderstorm Wind	Tornadoes
Beaverhead Co.	66	12
Broadwater Co.	30	1
Deer Lodge Co.	10	1
Flathead Co.	62	4
Granite Co.	14	2
Jefferson Co.	25	0
Lake Co.	43	3

County	Thunderstorm Wind	Tornadoes
Lewis And Clark Co.	84	4
Lincoln Co.	36	0
Madison Co.	31	2
Meagher Co.	20	3
Mineral Co.	16	0
Park Co.	144	2
Powell Co.	24	2
Ravalli Co.	44	3
Sanders Co.	24	1
Silver Bow Co.	25	0
Sweet Grass Co.	30	2
Total	**728**	**42**

Source: NCEI

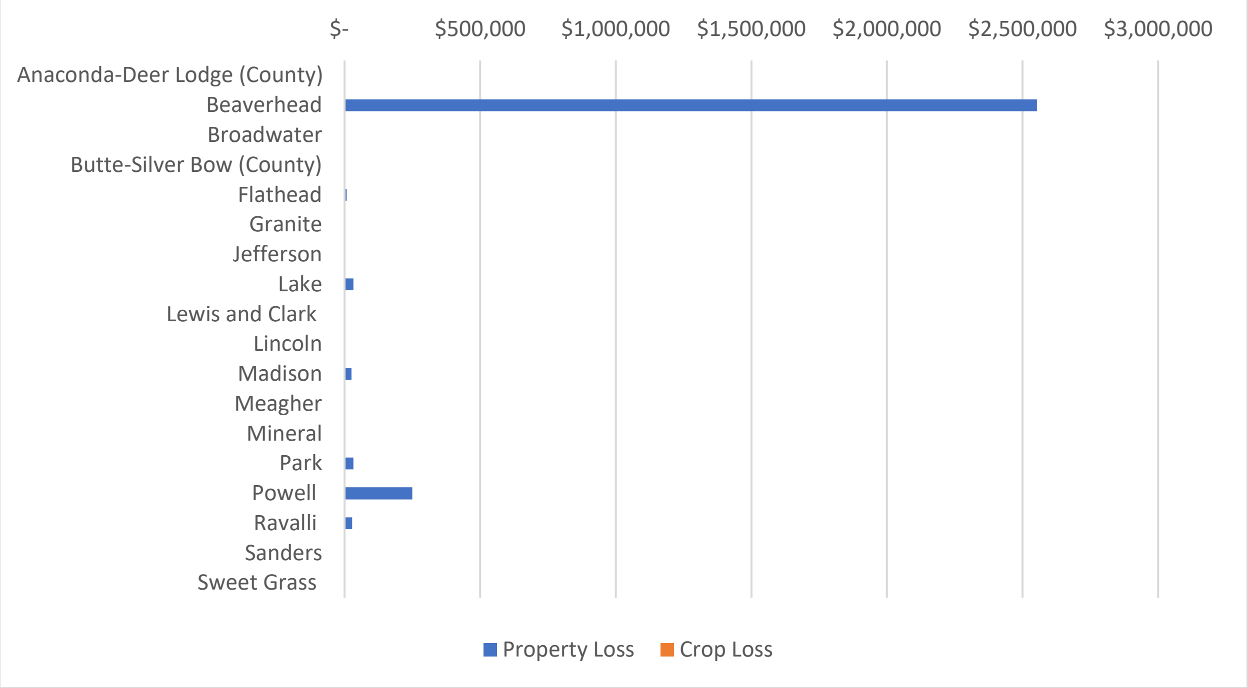
Flathead and Lincoln Counties experience far greater losses thunderstorm than other counties in the planning area (Figure 4-85). Beaverhead County experienced more than 10 times greater loss from tornado hazards than any other county in the planning area (Figure 4-86).

Figure 4-85 Total Losses from Thunderstorm Wind by County, 1996-March 2022



Source: NCEI, Chart by WSP

Figure 4-86 Total Losses from Tornadoes by County, 1996-March 2022



Source: NCEI, Chart by WSP

The NCEI also provides qualitative written summaries for especially significant events in the Western Region:

- **June 6, 1976:** A tornado event happened in Beaverhead County. The event resulted in $2.5 million of property damage.
- **July 2, 2010:** At approximately 3:45pm to about 3:52pm, a supercell thunderstorm produced a tornado with surrounding microburst damage. This occurred about 15 miles northeast of Wilsall over the foothills of the Crazy Mountains in Park County. Thousands of trees were damaged, including large trees that were uprooted or snapped off at the base. Trees as large as three to four feet in diameter were uprooted and/or snapped. EF-2 scale damage with estimated wind speeds up to 120 mph was determined with this tornado. According to NCEI, this event resulted in 32,500 of property damage.
- **July 21, 1997:** This event majorly impacted the City of Libby in Lincoln County. Microburst from a thunderstorm caused widespread damage. Wind gusts estimated at least 80 mph caused 2 injuries as trees fell on houses and through to people inside. Trees and power poles were also snapped off or uprooted. Almost every street in the town was blocked by fallen trees. Marble sized hail also fell. Damage to the public sector included blocked roads, damages to the city water system and system as well as an elementary school. Loss to the private sector included damaged homes and vehicles. The Red Cross estimated 20 homes with major damage and 70 with minor damage within the City of Libby city limits. Four insurance companies estimated damage to be at $1.5 million.
- **May 31, 2020:** This event impacted Flathead County. Widespread high winds were reported as a line of thunderstorms, in the form of a squall line, moved north-northeastward across the Region. While wind gusts of 50 to 60 miles per hour were common, a person from the public in Kila reported a measured peak wind gust of 78 miles per hour, and the ASOS at Glacier Park International Airport recorded a peak wind gust of 69 miles per hour. Numerous trees were either snapped in half or uprooted, which resulted in over 200 power outages and 37,000 customers without power. Several

houses and vehicles were destroyed as trees fell onto them. Highway 2 and Montana Highway 83 were both covered by fallen trees for a time. This event resulted in $450,000 and caused one injury.

4.2.14.4 Frequency/Likelihood of Occurrence

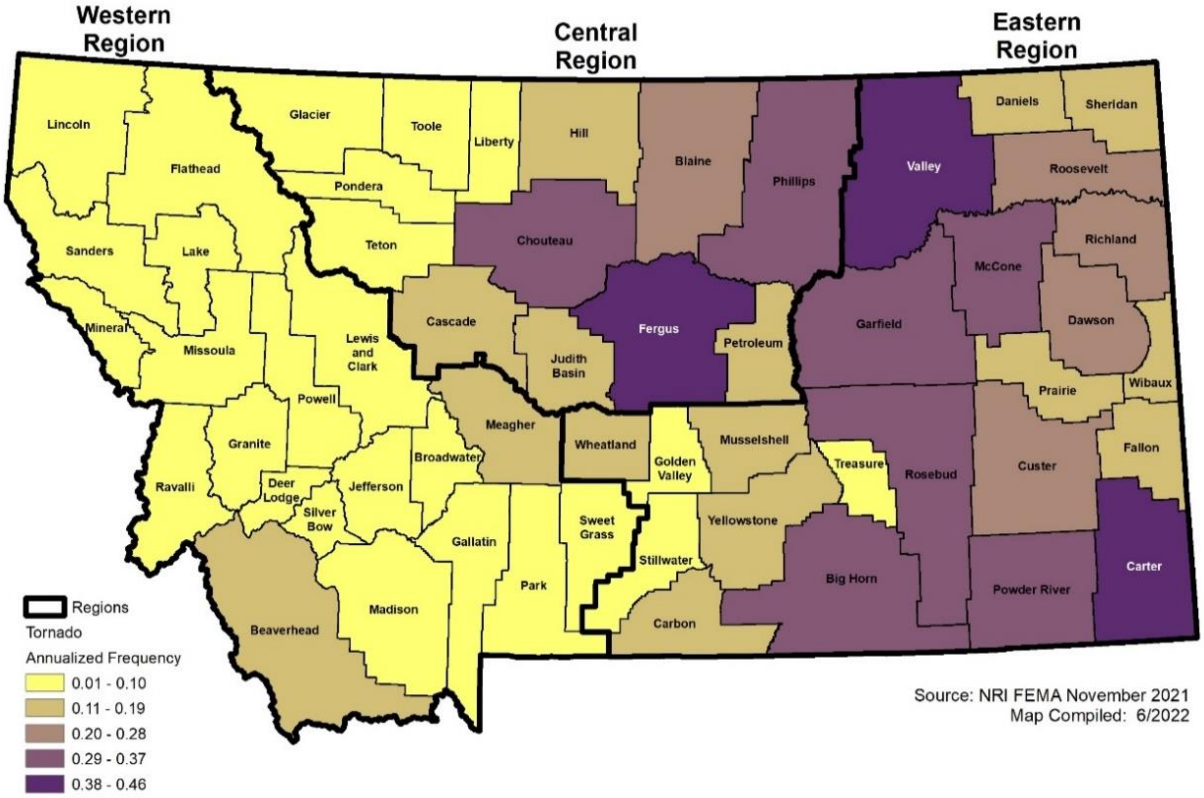
According to the NCEI dataset, there has been 2,323 total recorded severe windstorm and tornado events on 1,119 days over the past 72 years in the Western Region; therefore, there is an average of nearly 16 days with severe wind and tornado events per year in the planning area. This corresponds to a **highly likely** probability of occurrence (Table 4-1). Variability in the frequency of these hazards between counties in the planning area is considerable (Table 4-70).

Straight-line wind hazards are common in the planning area and are reported an average of 87 times each year in NCEI data (Table 4-68). Park County experiences these hazards nearly twice as often as any other county in the planning area yet has reported virtually no loss from these hazards.

Tornadoes are far less frequent, occurring somewhere in the Western Region an average once or twice each year. The frequency of tornadoes is especially high in Beaverhead County. This county has experienced 29% of all tornadoes in the region, three times more than any other county in the planning area. Beaverhead County has also experienced nearly all of the tornado-associated loss.

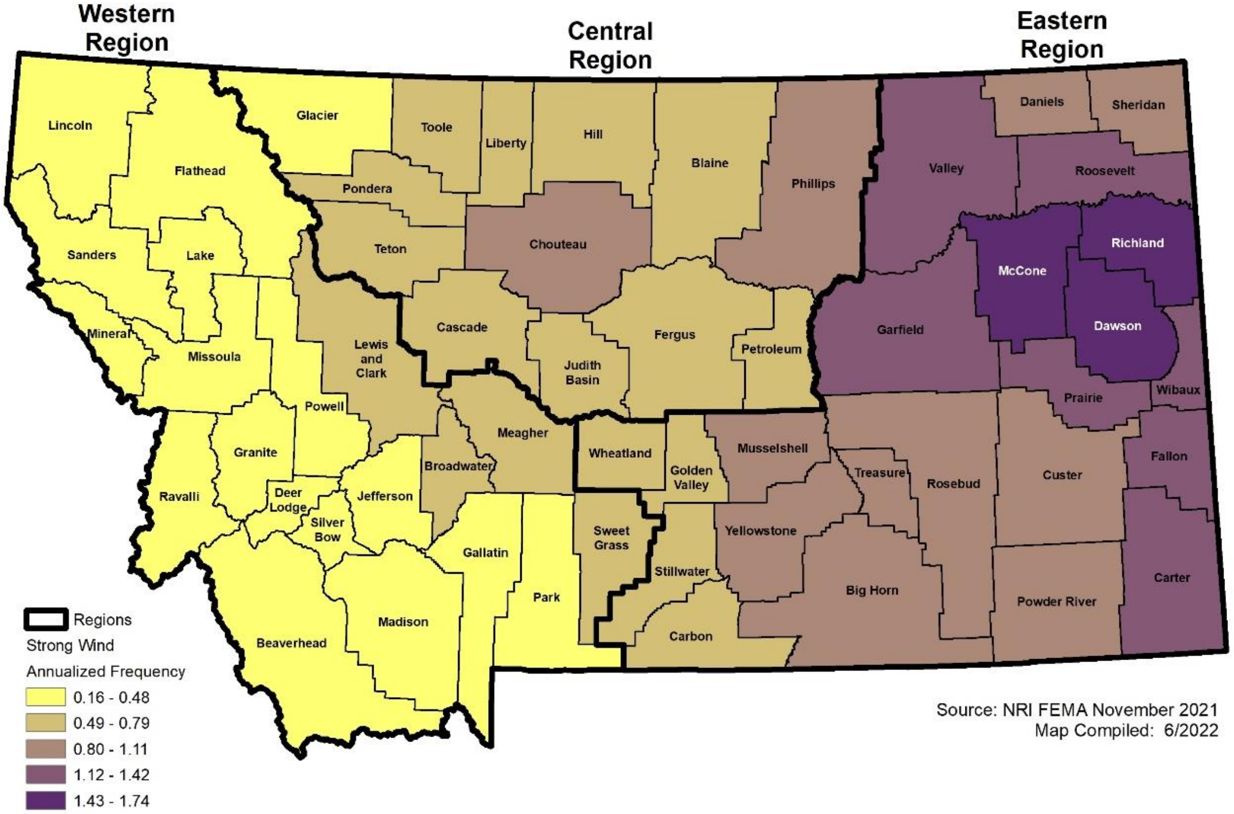
NRI data for annualized frequency of tornado events largely confirms the above characterization of frequency of tornado occurring in Western Region Counties (Figure 4-87). However, NRI data diverges sharply from NCEI data with regard to straight-line wind hazards (Figure 4-88). According to NRI data, Park County is among the least likely to experience these hazards, while Lewis & Clark, Broadwater, and Meager Counties are likely to experience them the most frequently of any county in the Western Region.

Figure 4-87 Annualized Frequency of Tornado Events by County



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-88 Annualized Frequency of Strong Wind Events by County



Source: NRI FEMA November 2021
Map Compiled: 6/2022

Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

4.2.14.5 Climate Change Considerations

There is little documentation of how climate change may be affecting present or future summertime windstorms or tornadoes, especially in the Western Region. Projecting the future influence of climate change on these events can be complicated by the fact that some of the risk factors for these events may increase with climate change, while others may decrease.

The 2022 NOAA Climate Summary acknowledges summertime high winds exist but provides no indication if a trend currently exists. The Fifth National Climate Assessment does not directly address climate-change impacts on summertime wind. This assessment also did not suggest a trend in wind conditions exists or is anticipated. Additionally, the 2021 Montana Climate Change and Human Health report does not directly address the issue of summertime high winds. Interestingly, this report discusses an increase in wind erosion of soil in wheat production, but attributes this to increased summer drought and changing precipitation patterns, without mention of changes in wind conditions.

There currently is no basis to assume climate change is or will affect tornado and windstorm hazards anywhere in the Western Region. Future updates to this plan should revisit this topic as scientific knowledge progresses. The aforementioned drought-related increase in wind erosion of soil in wheat production, documented in 2021 Montana Climate Change and Human Health report, is the only mention of climate change affecting vulnerability to wind hazards.

4.2.14.6 Potential Magnitude and Severity

To calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it reflects common occurrence. Based on NCEI records, over $17.6 million was recorded in property damages, almost $340,000 in crop losses, 28 injuries and two fatalities have been recorded in the Western Region. While it is possible these estimates are greater than actual losses due to potential duplicates in the dataset, these losses provide an understanding of the likely magnitude in the planning area.

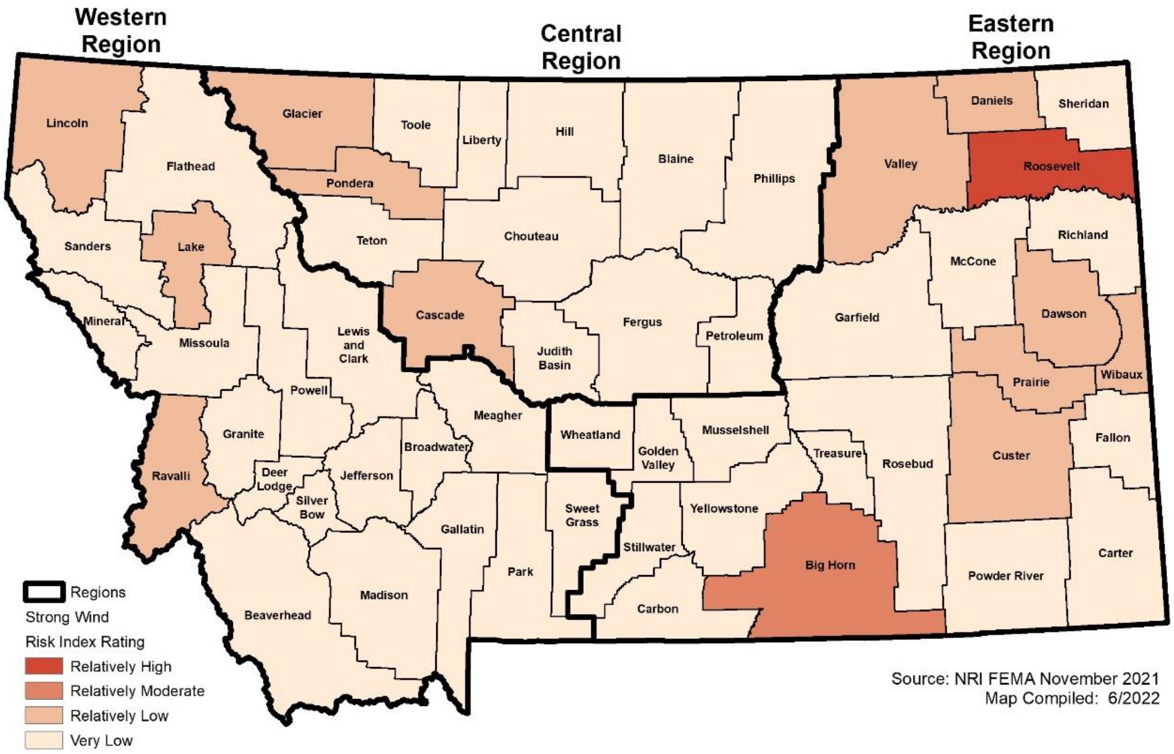
Potential magnitude and severity of windstorm and tornado impacts in the Western Region is rated as **moderate**. While wind occurs rather frequently in the area, most events cause little to no damage.

4.2.14.7 Vulnerability Assessment

The Tornadoes & Windstorms *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to tornado and windstorm hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with tornado and windstorm hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience tornado and windstorm hazards. *Susceptible* indicates a strong likelihood of damage from exposure to tornado and windstorm hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is not a concern for tornado and windstorm hazards in the Western Region, though this assessment will be revisited in future plan updates (see section titled *Climate Change Considerations*, above). Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

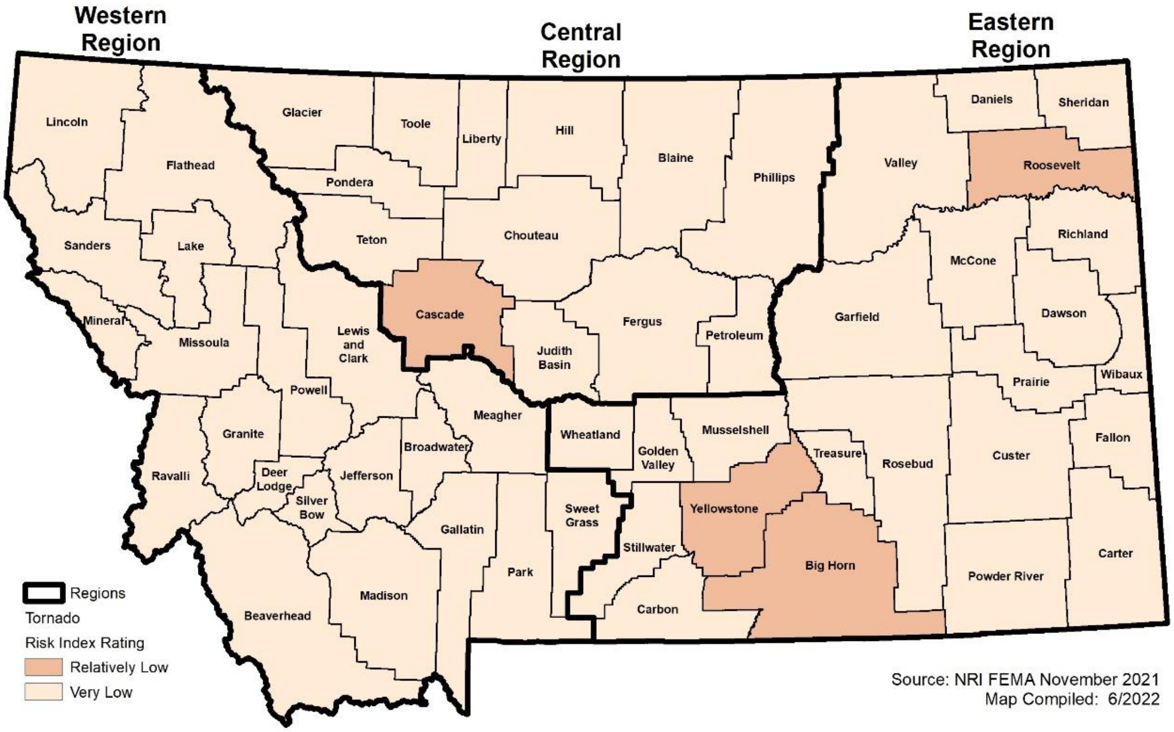
The NRI risk index rating for strong wind (Figure 4-89) and tornado (Figure 4-90) indicates a low level of vulnerability to these hazards. A deeper analysis of the vulnerability of each type of asset to tornado and windstorm hazards in Western Region jurisdictions is provided below.

Figure 4-89 NRI Risk Index Rating for Strong Wind



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-90 NRI Risk Index Rating for Tornadoes



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

People

Individuals caught in the path of a tornado who are unable to seek appropriate shelter are especially vulnerable. This may include vulnerable individuals who are out in the open, in cars, are unhoused, or who do not have access to basements, cellars, or safe rooms. Hikers and climbers in the area may also be more vulnerable to severe weather events. Visitors to the area may not be aware of how quickly a thunderstorm can build in the planning area. In addition, those living in mobile homes are especially vulnerable.

Other populations vulnerable to tornado and wind hazards include 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 due to severe wind or tornadoes can be life-threatening to those dependent on electricity for life support. These populations face isolation and exposure during thunderstorm wind, high wind, and tornado events and could suffer more secondary effects of the hazard. Overall, however, the vulnerability of people to tornado and wind hazards is low in the Western Region.

Property

Exposure to windstorms and tornadoes is low throughout most of the planning area, property in poor condition or in particularly vulnerable locations may be susceptible to damage when these hazards do occur. Property located at higher elevations and on ridges may be more prone to wind damage. Property located under or near overhead powerlines or large trees may be damaged in the event of a collapse.

Tornadoes often create flying debris which can cause damages to homes, vehicles, and landscape property. Older buildings in the planning area may be built to low code standards or none at all, making them more susceptible to severe wind and tornado events. Mobile homes are disproportionately at risk due to the design of homes. Mineral County has one of the greatest concentrations of mobile homes in the state, but fortunately has not experienced great loss from tornado hazards.

In the Eastern Region, property damages due to wind and tornadoes totaled over $68.4M. Reported impacts from high wind in the planning area include damage to trees, mobile homes, roofs, power lines, and vehicles.

Critical Facilities and Lifelines

Transportation is susceptible to wind and tornado caused blockage of roads by downed trees or power lines. Of particular concern are roads providing access to isolated areas and the elderly. Temporary loss of utilities, most notably power, is a susceptibility. Downed power lines can cause blackouts, leaving large areas isolated, which was reported several times in the NCEI dataset. Phone, water, and sewer system service can be interrupted. Loss of phone connection, cellular or landline, would leave populations isolated and unable to call for assistance.

Economy

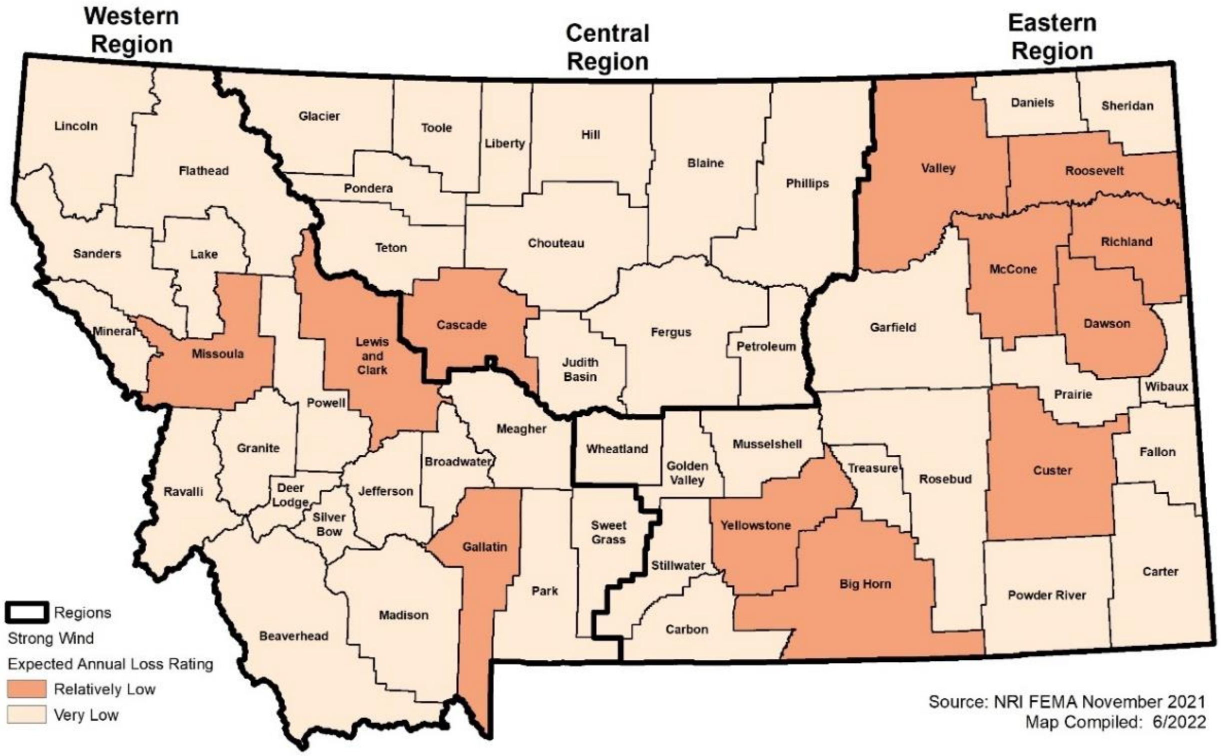
Exposure of the economy of the Western Region to ill effects is somewhat different for tornado and windstorm hazards. Windstorms are more frequent in the Western Region and have less intense impact over a wider area. In contrast, tornadoes are relatively rare, effect a relatively small area, but have a well-deserved reputation for causing intense destruction over a relatively narrow area. Both hazards expose local economies to potential property damage, business closures, loss of services such as power and transportation, displacement of people, loss of tourism and difficult to predict cascading effects. However, the economy is exposed to these factors somewhat differently depending on the storm type. For example, tornadoes are more likely to cause displacement of people, while windstorms can cumulatively cause very expensive damage, especially to housing.

In addition, the economy of the Eastern region is susceptible to damage from exposures such as property damage, business closures, loss of services such as power and transportation, displacement of people, and loss of tourism. The economy is also susceptible to cascading effects caused by these exposures.

When exposure and susceptibility is considered together, most economic loss due to wind and tornadoes is related to direct property damage and subsequent debris removal, response, and repair activities. Business closures, displacement of people, and loss of tourism also reduce economic activity and can cause substantial damage to local economies. The loss of services related to Community Lifelines can have a profound effect on the extent of damage to the economy. Loss of power and shelter/housing are particularly important in this regard.

NRI ratings of EAL in the Western Region for strong wind and tornado hazards are shown in Figure 4-91 and Figure 4-92, respectively. These ratings confirm a relatively low level of concern for these hazards in the Western Region. Gallatin County's risk rating for both hazards is elevated relative to the Western Region. Lewis & Clark and Missoula Counties also have an elevated risk rating due to strong wind hazards.

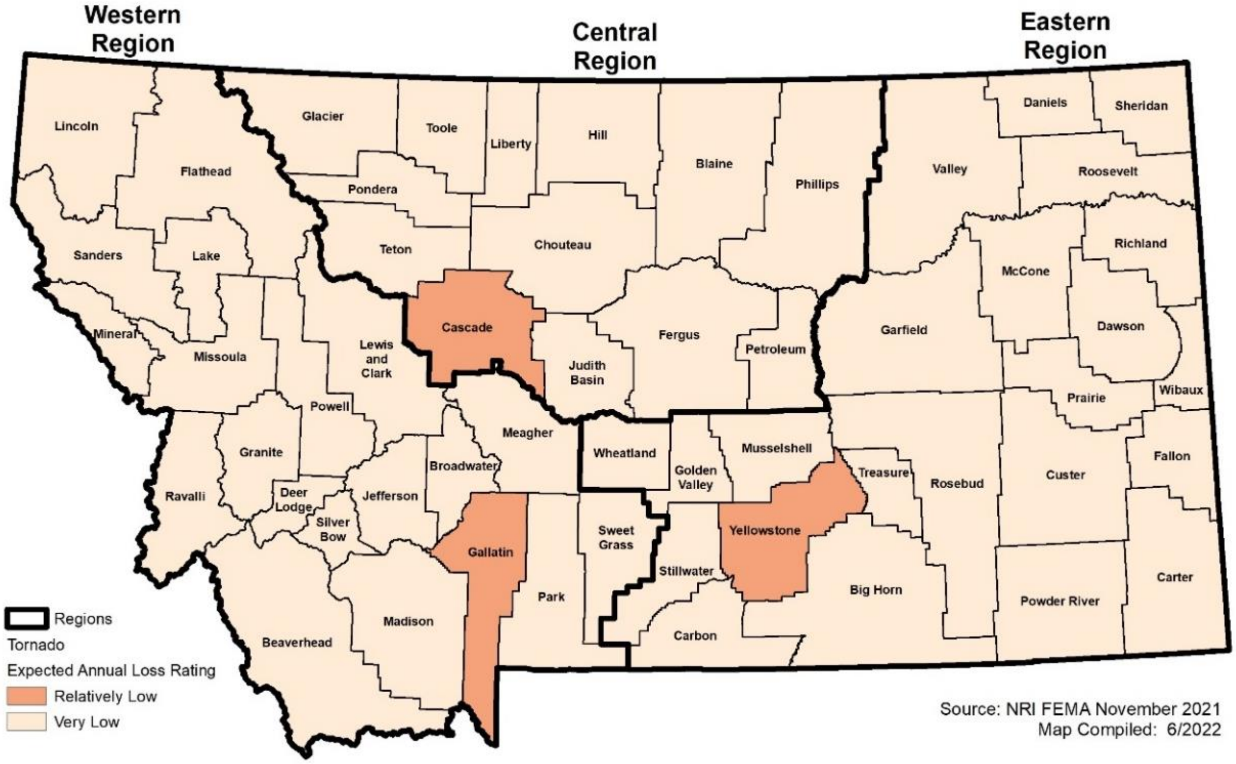
Figure 4-91 NRI Strong Wind Expected Annual Loss Rating



Source: NRI FEMA November 2021
Map Compiled: 6/2022

Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Figure 4-92 NRI Tornado Events Expected Annual Loss Rating



Map by WSP, Data Source: FEMA NRI, https://hazards.fema.gov/nri/determining-risk

Historic and Cultural Resources

Historic and cultural resources are exposed to tornadoes and windstorms similarly to other assets. In terms of susceptibility, historic buildings are typically built to old building codes or no codes at all and are more likely to sustain damage than newer buildings. This causes historic buildings and their contents to be more vulnerable to windstorms and tornadoes than newer buildings. Historic assets within newer buildings, such as a more recently built museum, are likely no more vulnerable to windstorm and tornadoes than non-historic assets.

Natural Resources

The environment is exposed and susceptible to severe winds and tornadoes. Large swaths of tree blowdowns can occur, particularly in the beetle-killed forests prevalent in the region. Severe winds can spread wildfire or even trigger wildfire near overhead power lines. Crops are also at risk of losses.

Development Trends Related to Hazards and Risk

In the past 10 years, Gallatin and Broadwater Counties grew by 37% and 29%, respectively (Table 2-1). Seven counties in the Western Region are expected to grow an additional 20% or more between 2020 and 2040, including Madison (57%), Gallatin (38%), Meagher (37%), Ravalli (26%), Powell (22%). Missoula (20%), and Flathead (20%) Counties (Table 2-2). There is no doubt that development is increasing vulnerability to tornadoes and windstorms by increasing the value of assets in the planning area, especially in these areas.

All future development will be exposed to severe winds and tornadoes. In some cases, new construction may be less susceptible to damage than what previously exists. This is not always the case, for example if the new construction includes mobile homes. Newer vehicles are also more costly to repair or replace if damaged.

4.2.14.8 Risk Summary

Tornadoes and windstorms have **medium** significance for the Western Region (Table 4-1). Within the Western Region, Mineral County rated these hazards as having low significance.

- People who are dependent on electricity and populations who work outdoors or in transportation are most vulnerable to severe windstorm events and tornadoes. Individuals living in mobile homes are also disproportionately likely to experience losses from wind and tornado events.
- Power outages and damage to buildings are frequently reported impacts to property of severe windstorm events and tornadoes.
- Downed power lines resulting in communication and electricity failures are the most common impacts on critical facilities.
- Significant economic losses are possible in the event of a severe windstorm or tornado due to infrastructure repair and business/service disruptions.
- These events can impact anywhere in the planning region; therefore, the hazard extent is rated as **Extensive**.
- Straight-line wind hazards are reported in NCEI data nearly 90 times each year. Tornadoes are reported once or twice each year. The likelihood of future occurrence is **highly likely.**
- Despite causing at least 2 deaths, 28 injuries, and nearly $18 million in damages since 1996 the severity/magnitude of tornadoes and windstorms is rated as **moderate.**
- Related Hazards: Wildfire, Severe Summer Weather, Severe Winter Weather, Transportation Accidents.

Table 4-71 Risk Summary Table: Tornadoes and Windstorms

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Medium	N/A	The Western Region as a whole has seen significantly fewer tornadoes than the Central or Eastern regions of the state, due to the high, mountainous terrain that is less conducive to the formation of tornadoes. High wind events specifically occur at a relatively similar frequency and intensity across all counties in the region.
Beaverhead	Medium	City of Dillon, Town of Lima	According to NCEI data, Beaverhead County has seen the greatest number of tornadoes, with approximately 29% of the recorded tornadoes in the region occurring in this county. There is not major difference in significance of high wind impacts between counties of the Western Region.
Broadwater	Medium	City of Townsend	There is not major difference in significance of high wind impacts between counties of the Western Region.
Butte-Silver Bow	Low	Butte-Silver Bow City, Town of Walkerville	Butte-Silver Bow has never recorded a tornado event and is unlikely to experience one due to its terrain and small geographic area. There is not major difference in significance of high wind impacts between counties of the Western Region.
CSKT	Medium	Confederated Salish and Kootenai Tribes of the Flathead Reservation	There is not major difference in significance of high wind impacts between CSKT and the counties of the Western Region.
Flathead	Medium	Columbia Falls, Kalispell, Whitefish	Flathead County is tied for the second greatest number of recorded tornadoes in the Western Region.
Granite	Medium	Towns of Drummond and Philipsburg	There is not major difference in significance of high wind impacts between counties of the Western Region.

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Jefferson	Medium	City of Boulder, Town of Whitehall	Jefferson County has never recorded a tornado event. There is not major difference in significance of high wind impacts between counties of the Western Region.
Lake	Medium	City of Polson, City of Ronan, Town of St. Ignatius	There is not major difference in significance of high wind impacts between counties of the Western Region.
Lewis and Clark	Medium	City of Helena, City of East Helena	Flathead County is tied for the second greatest number of recorded tornadoes in the Western Region.
Lincoln	Medium	City of Libby, City of Troy, Town of Eureka	Lincoln County has never recorded a tornado event. There is not major difference in significance of high wind impacts between counties of the Western Region.
Madison	Medium	Town of Ennis, Town of Sheridan, Town Virginia City	There is not major difference in significance of high wind impacts between counties of the Western Region.
Meagher	Medium	City of White Sulphur Springs	There is not major difference in significance of high wind impacts between counties of the Western Region.
Mineral	Low	N/A	Mineral County has never recorded a tornado event. There is not major difference in significance of high wind impacts between counties of the Western Region.
Park	Medium	City of Livingston, Town of Clyde Park	There is not major difference in significance of high wind impacts between counties of the Western Region.
Powell	Medium	City of Deer Lodge	There is not major difference in significance of high wind impacts between counties of the Western Region.
Ravalli	Medium	City of Hamilton, Town of Darby, Town of Stevensville	There is not major difference in significance of high wind impacts between counties of the Western Region.
Sanders	Medium	City of Thompson Fall, Town of Plains, Town of Hot Springs	There is not major difference in significance of high wind impacts between counties of the Western Region.
Sweet Grass	Medium	City of Big Timber	There is not major difference in significance of high wind impacts between counties of the Western Region.

4.2.15 Transportation Accidents

4.2.15.1 Hazard/Problem Description

This hazard encompasses air transportation, highway transportation, waterway transportation, railway transportation, and wild animal vehicle collisions. Transportation incidents can involve any mode of transportation that directly threatens life and which results in property damage and/or death(s)/injury(s) and/or adversely impact a community's capabilities to provide emergency services. Incidents involving buses and other high occupancy vehicles could trigger a response that exceeds the normal day-to-day capabilities of local response agencies.

Air Transportation

An air transportation incident may involve a military, commercial, or private aircraft. Airplanes and helicopters are used to transport passengers for business and recreation as well as thousands of tons of cargo. A variety of circumstances can result in an air transportation incident; mechanical failure, pilot error, enemy attack, terrorism, weather conditions and on-board fire can all lead to an air transportation incident.

Highway Transportation

Highway transportation incidents are very complex. Contributing factors can include a roadway's design and/or pavement conditions (e.g., rain, snow, and ice), a vehicle's mechanical condition (e.g., tires, brakes, lights), a driver's behavior (e.g., speeding, inattentiveness, and seat belt usage), the driver's condition (e.g., alcohol use, age-related conditions, physical impairment) and driver inattention by using a wireless device. In fact, the driver's behavior and condition factors are the primary cause in an estimated 67 percent of highway crashes and a contributing factor in an estimated 95 percent of all crashes.

Railway Transportation

A railway transportation incident is a train accident that directly threatens life and/or property, or adversely impacts a community's capabilities to provide emergency services. Railway incidents may include derailments, collisions and highway/rail crossing accidents. Train incidents can result from a variety of causes; human error, mechanical failure, faulty signals, and/or problems with the track. Results of an incident can range from minor "track hops" to catastrophic hazardous material incidents and even human/animal casualties.

Waterway Transportation

A waterway incident is an accident involving any water vessel that threatens life, property, or adversely affects a community's capability to provide emergency services. Waterway incidents primarily involve pleasure craft on rivers and lakes. Waterway incidents may also include events in which a person, persons, or object falls through the ice on partially frozen bodies of water. Impacts include fuel spillage, drowning, and property damage.

Wild Animal Vehicle Collisions

Wild animal vehicle collisions consist of any roadway transportation accident where an animal is involved in the accident. These accidents typically occur at dusk, from 6pm-9pm, when deer and other wildlife are most active and when the visibility of drivers decreases. Deer are the most common wild animal involved in roadway transportation accidents in the United States and in the Western Region.

4.2.15.2 Geographical Area Affected

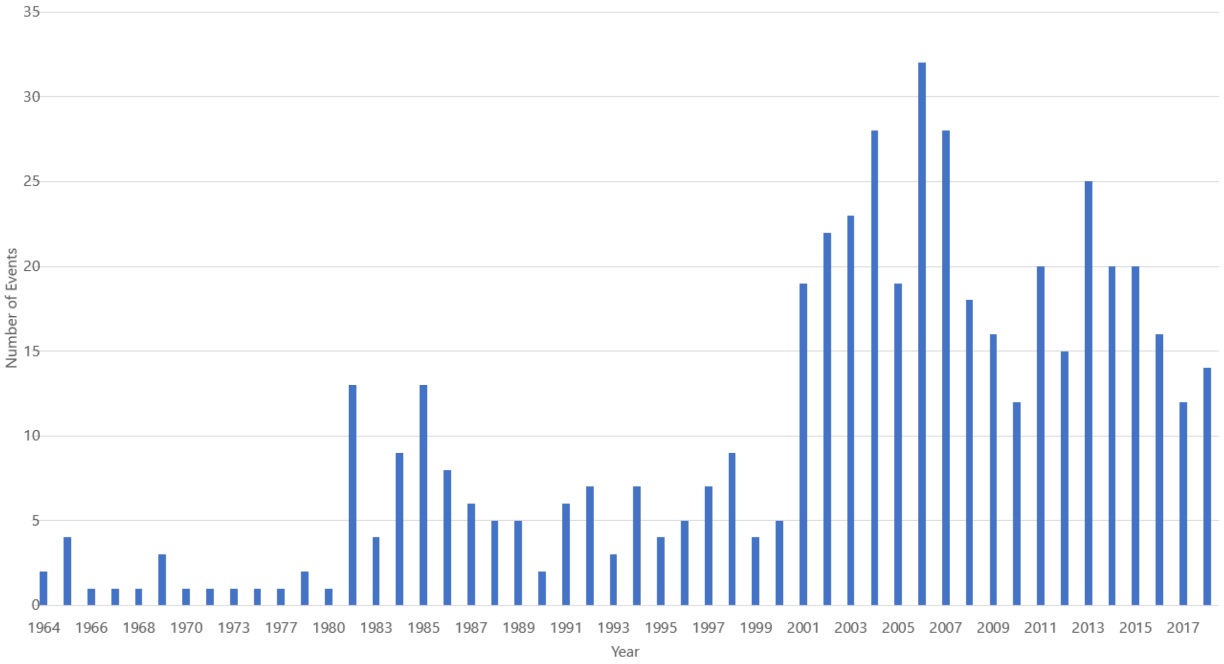
All counties in the Western Region are subject to transportation accidents. Due to transportation accidents typically occurring along roadways, waterways, or near airports, the significance rating for the geographic area affected in the Western Region is rated as **significant** (10-50% of planning area). Roads with frequently reported roadway transportation accidents in the Western Region include Interstates 15 and 90, and U.S. Route 2, U.S. Route 93, U.S. Route 287, and U.S. Route 12. The BNSF railway is the most significant railway running through the Western Region; therefore, the counties that contain the BNSF will be more likely to experience railway accidents. There are also several major airports in the Region, including the Bert Mooney Airport in Butte, the Glacier Park International Airport in Kalispell, Helena Regional Airport in Helena, and the Dillon Airport in Dillon. However, documented aircraft crashes have happened across the planning area and are most frequently documented as being small civilian aircrafts.

4.2.15.3 Past Occurrences

Air Transportation Incidents

The National Transportation Safety Board reported 505 air transportation incidents statewide in Montana from 1964 to 2018. Figure 4-93 displays the annual trends of total fatal air transportation accidents. The greatest number of incidents were reported in 2006 with 32 total incidents. Since 2001, there has been a significant increase in the number of events reported. Most crashes have been small, private planes. Small Cessna and Piper aircrafts were frequently reported in the dataset.

Figure 4-93 Annual Aircraft Incidents in the State of Montana



Source: National Transportation Safety Board*, Chart by WSP*

According to the National Transportation Safety Board, details on the following air transportation incidents were reported in the Western Region:

- October 2, 2022 - A plane crash occurred in Sanders County, located east of the Perma Bridge in the Flathead River. According to the report, upon further investigation it was determined that the plane struck power lines nearby leading to the crash. The pilot was the lone occupant of the plane and was killed in the incident.
- April 30, 2022 – Multiple area emergency response agencies converged on a property along Church Drive between Farm to Market Road and West Valley Drive in Flathead County after a yellow aircraft fell from the sky. Local officials said the two people aboard the single engine aircraft died in the crash.
- August 15, 2011 - A flight instructor and his student pilot sustained fatal injuries after a small aircraft crash in Sliver Bow County. The flight originated from Bert Mooney Airport in Butte. Witnesses traveling along I-90 reported seeing the aircraft spiraling and losing altitude before the crash, and investigations revealed that the aircraft struck terrain on a nearby mountain, resulting in the crash.

Highway Transportation Incidents

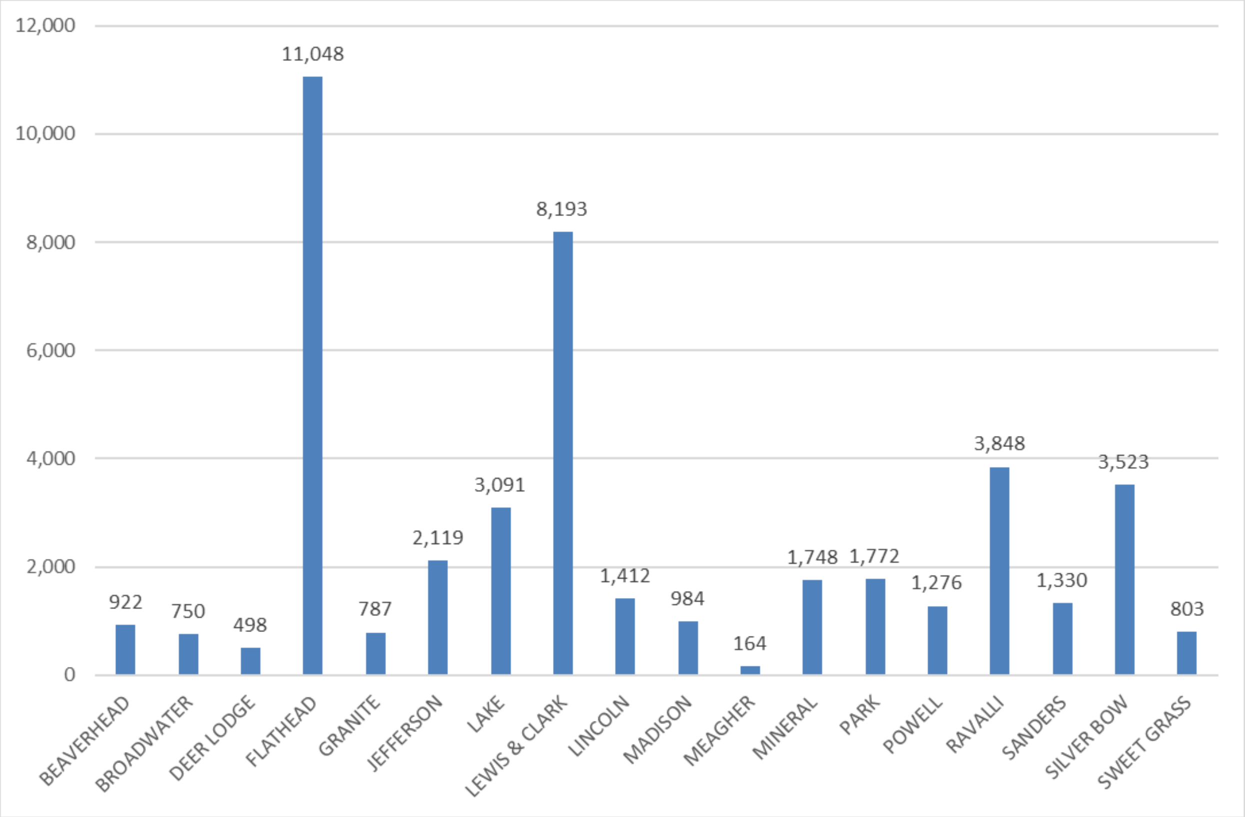
The MDT's Office of Traffic and Safety maintains traffic crash statistics and location maps by county. Table 4-72 and Figure 4-94 illustrate the trends of crashes by county in the Western Region between 2016 and 2020. This dataset was extracted from the MDT's Crash Database compiled for the purpose of safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings. The dataset has reported 44,268 road transportation events over the course of 4 years across the counties in the Western Region. Flathead County had the greatest number of reported crash events, with a total of 11,048 reported events, far outpacing all other counties in the Region. The second highest number of crashes in this time period occurred in Lewis and Clark County with 8,193 incidents. These two counties alone account for approximately 43% of the total crashes recorded in the Region.

Table 4-72 Roadway Crash Statistics by County in the Western Region (2016-2020)

County	Number of Accidents (2016-2020)
Beaverhead	922
Broadwater	750
Butte-Silver Bow	3,523
Flathead	11,048
Granite	787
Jefferson	2,119
Lake	3,091
Lewis & Clark	8,193
Lincoln	1,412
Madison	984
Meagher	164
Mineral	1,748
Park	1,772
Powell	1,276
Ravalli	3,848
Sanders	1,330
Sweet Grass	803
Total	**43,770**

Source: MDT 2016-2020

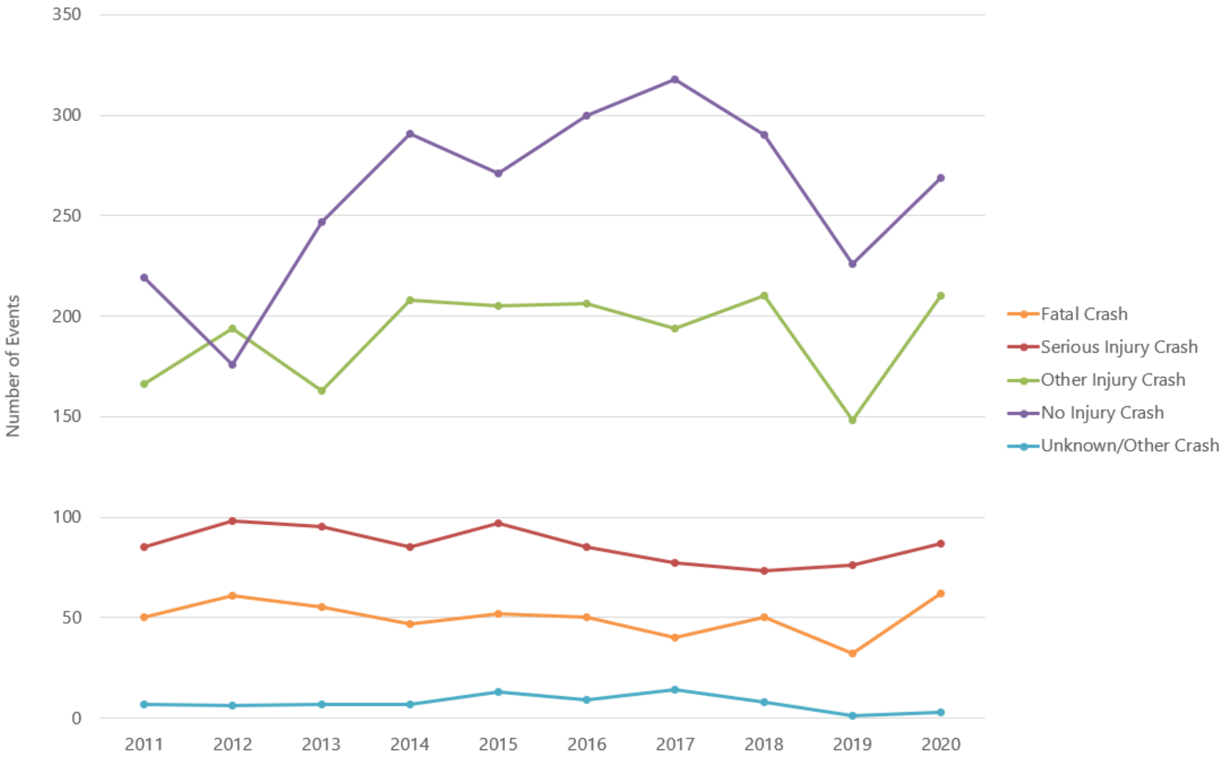
Figure 4-94 Roadway Crash Statistics by County in the Western Region (2016-2020)



Source: MDT *2016-2020*

The MDT (DoT) also reported crash severity from 2011-2020 for the entire State of Montana. Figure 4-95 displays the temporal trends of crash severity. Throughout the State, accidents with no injury are most commonly reported, followed by accidents with minimal injuries. Since 2011, 499 fatal crashes have been reported across the State and 858 serious injury crashes. There is an average of 49.9 fatal crashes per year in the State of Montana.

Figure 4-95 Roadway Crash Severity in Montana (2011-2020)

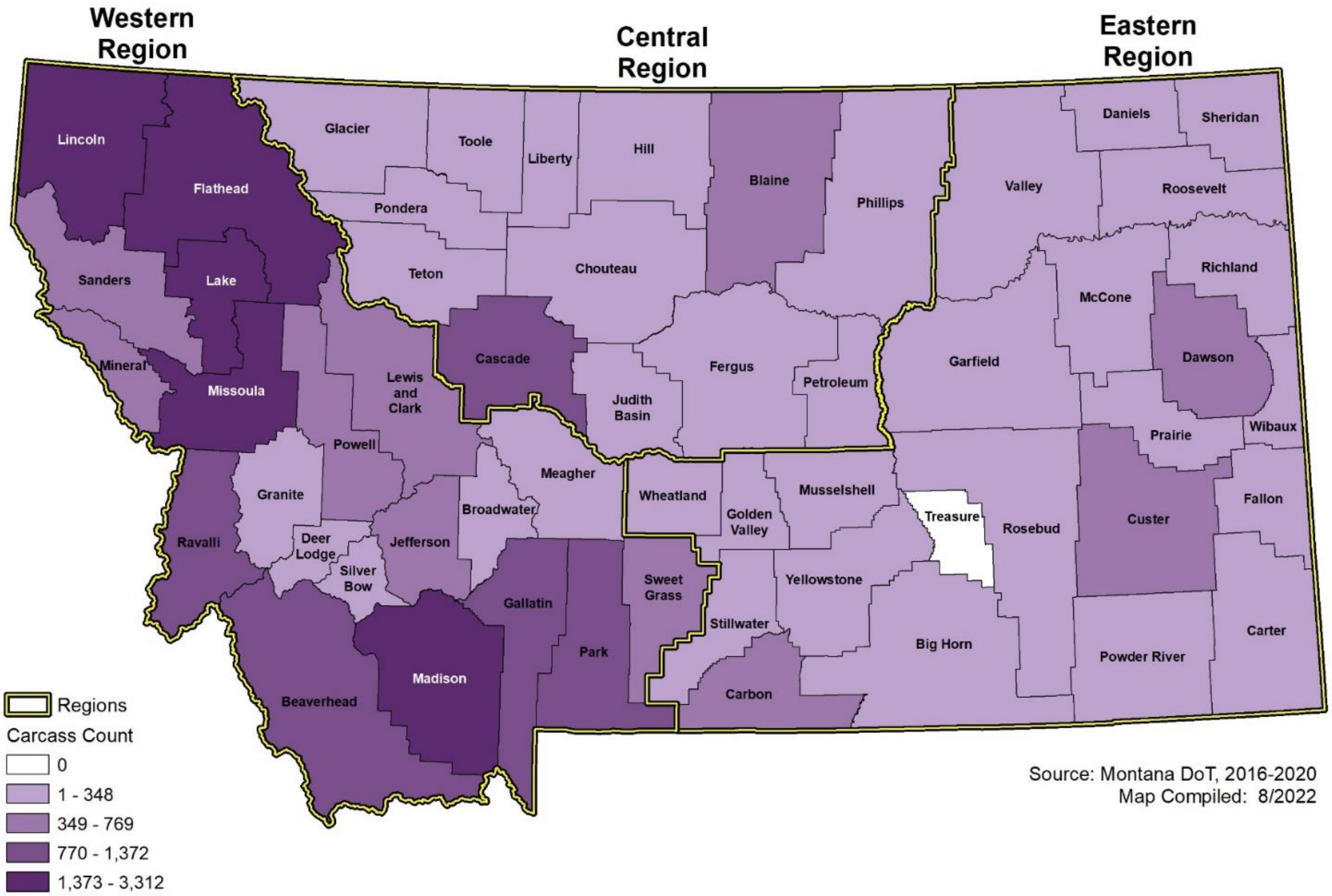


Source: MDT 2011-2020

Wildlife Car Accidents

The Montana DoT also documented the number of accidents caused by wildlife and the animal carcasses recovered. The Montana DoT emphasizes that this dataset is best used to identify patterns in wildfire car accidents, but the data is incomplete due to not all carcasses being reported on a regular schedule or some carcasses not being reported at all. According to the Montana DoT dataset, there were 28,585 wildlife car accidents from 2016-2020. Figure 4-96 displays the animal carcass data by county in Montana. The Western Region experiences consistently higher rates of wildlife car accidents than the rest of the State, with Flathead, Lake, Lincoln, Madison, and Missoula Counties seeing the greatest annual frequencies.

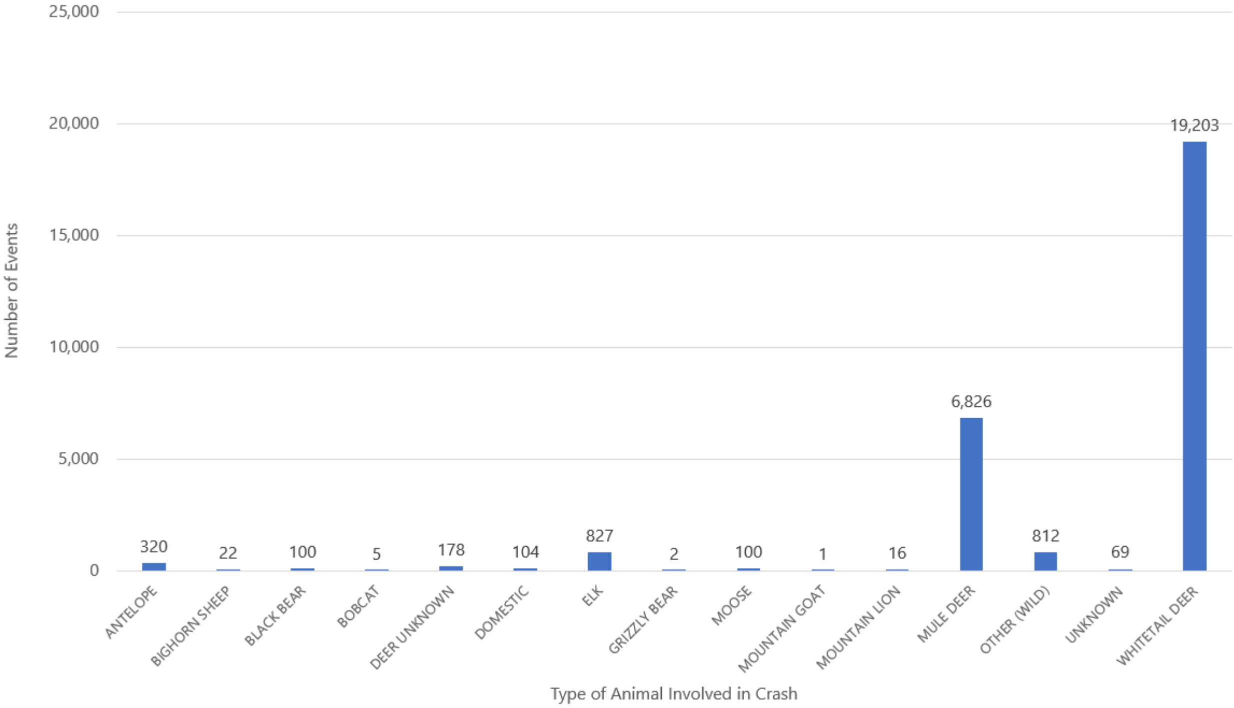
Figure 4-96 Wildlife Crash Statistics by County in Montana (2016-2020)



Source: Montana DoT, *Map by WSP*

Figure 4-97 displays a breakdown of the crashes by type of animal involved across the State of Montana. Whitetail deer was by far the most reported animal with 19,203 incidents in the past 4 years, followed by mule deer in second place with 6,826 reported incidents.

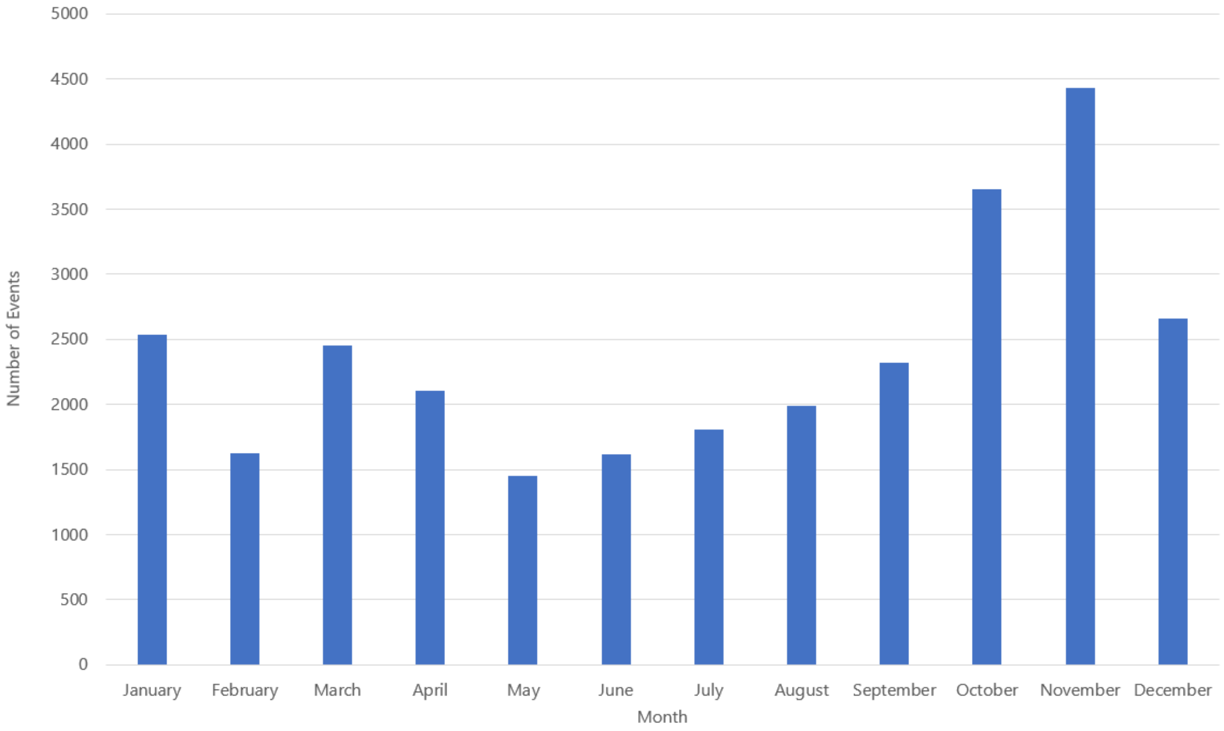
Figure 4-97 Wildlife Crash Statistics by Carcass Type in Montana (2016-2020)



Source: MDT 2016-2020

The Montana DoT also reported on the date that these wildlife accidents occurred. Figure 4-98 displays the temporal trends of these crashes. The greatest frequency of events occurs in the months of October and November. This is likely because deer mating season occurs at this time of year and therefore, they are more active and likely to wonder onto roadways. Accidents with deer are most likely to occur from 6 pm – 9 pm due to the crepuscular nature of deer, meaning that they are most active during twilight.

Figure 4-98 Wildlife Crash Statistics by Month in Montana (2016-2020)



Source: MDT 2016-2020

Waterway Transportation Incidents

The State of Montana has a variety of glacial-fed lakes and free-flowing rivers that provide opportunities for tourism and recreation. Several major rivers in the Western Region include the Flathead River, Bitterroot River, Missouri River, and Clark Fork River. Flathead Lake, Georgetown Lake, Lake Koocanusa, and Canyon Ferry Reservoir also provide space for outdoor recreation in the Western Region. With extensive opportunities for water recreation in the State, there are associated risks including boating accidents and drownings.

The U.S. Coast Guard documents annual recreational boating statistics across the United States. Table 4-73 below displays information from the annual reports for the State of Montana from 2017-2021. In total, 82 accidents have been reported in Montana over the past 5 years, resulting in 32 deaths and 41 injuries, as well as $450,925.95 in property damages.

Table 4-73 Boating Accidents by Year in Montana (2017-2021)

	Number of Accidents				Persons Involved			
Year	Total	Fatal	Non-Fatal	Property Damage	Total	Deaths	Injured	Damages
2021	16	4	6	6	12	5	7	$56,050.00
2020	25	7	9	9	20	7	13	$178,600.00
2019	13	4	6	3	13	5	8	$59,275.95
2018	19	9	6	4	22	13	9	$144,900.00
2017	9	2	3	4	6	2	4	$12,100.00
Total	**82**	**26**	**30**	**26**	**73**	**32**	**41**	**$450,925.95**

Source: U.S. Coast Guard 2017-2021 Recreational Boating Statistics

4.2.15.4 Frequency/Likelihood of Occurrence

Overall, transportation accidents are likely to occur on a yearly basis; therefore, the frequency/likelihood of occurrence is rated as **Highly Likely** for the Western Region. Air traffic overall is limited and any planes that crash are likely to be small planes with no more than a pilot and one passenger. However, since there are many commercial planes that fly over the Region, there is always a chance for a major crash. More and more people are utilizing air travel in recent years which may increase the statistical likelihood for an occurrence. The National Transportation Safety Board documented 505 aircraft accidents over 54 years, which averages over 9 aircraft accidents per year across the State. The trend of increasing numbers of people flying is likely to continue as will the crowdedness of airports and the skies above Montana.

Although traffic engineering, inspection of traffic facilities, land use management of areas adjacent to roads and highways, and the readiness of local response agencies have increased, highway incidents continue to occur. As the volume of traffic on the State’s streets, highways, and interstates increase, the number of traffic accidents will likely also increase. The combination of large numbers of people on the road, wildlife, unpredictable weather conditions, potential mechanical problems, and human error always leaves the potential open for a transportation accident. Local jurisdictions continue to look at where traffic signals and speed limit changes are needed to protect the public. The Montana DoT reported 44,268 roadway traffic accidents from 2016 to 2020 in the Western Region, or an average of 11,067 accidents per year. Collisions involving wildlife is commonly reported in Montana. The Montana DoT carcass database reported 28,652 accidents resulting in an animal carcass from 2016 to 2020, or an average of 7,163 accidents a year.

Many ponds, rivers, and lakes throughout the Region are used for recreation, including angling, boating, and swimming. The number of users of Montana lakes and rivers is increasing each year with increased tourism and population growth in the Region. Minor incidents involving one or two boats and/or individuals can occur that tie up response resources and cause death and injury are possible but unlikely each year. Incidents will be recreational-related, as opposed to transportation-related, because the waterways are too small to support barges. Waterway accidents are less likely to occur than roadway incidents. However, the U.S. Coast Guard reported 82 waterway accident events from 2017 to 2021 across the State of Montana, or an average of 16 events per year.

Based on the available information, the probability of air transportation, highway, waterway, or railway incident that directly threatens life and which results in property damage and/or death(s)/injury(s) and/or adversely impact a community’s capabilities to provide emergency services is “Highly Likely” as multiple occurrences happen each year.

4.2.15.5 Climate Change Considerations

If projections regarding milder winters come to fruition, climate change impacts may reduce the number of transportation incidents associated with some severe weather. However, if ice occurs, rather than snow, this could result in higher incidents of weather-related accidents. Extreme heat can also impact the performance of motor vehicles, especially planes. Increasing temperatures due to climate change could therefore pose threats to aircrafts.

4.2.15.6 Potential Magnitude and Severity

The U.S. Department of Transportation Federal Highway Administration issued a technical advisory in 1994 providing suggested estimates of the cost of traffic crashes to be used for planning purposes. These figures were converted from 1994 dollars to 2020 dollars. The costs are listed below in Table 4-74. Injuries and deaths are also impacts of transportation accidents. While transportation accidents are frequent in the Western Region, most accidents result in minor property injuries to vehicles involved; therefore, the magnitude ranking for transportation incidents in the Western Region is **Limited**.

Table 4-74 Costs of a Traffic Crash

Severity	Cost per injury (in 2020 $)
Fatal	$4,645,467
Evident Injury	$64,320
Possible Injury	$33,948
Property Damage Only	$3,573

Source: U.S. Department of Transportation Federal Highway Administration Technical Advisory T 7570.2, 1994. Adjusted to 2020 dollars

4.2.15.7 Vulnerability Assessment

People

All people are vulnerable to transportation accidents in the Western Region. Travelers, truckers, delivery personnel, and commuters are always at risk on the road. During rush hours and holidays the number of people on the road is significantly higher. This is also true before and after major gatherings such as sporting events, concerts, and conventions. Pedestrians and bystanders of the community are less vulnerable unless they are in the roadway. Any individual incident will have a direct impact on only a few people. Individuals involved in a transportation accident can have cuts, bruises, broken bones, loss of limbs, and death. It is also common for individuals involved in an accident to experience psychological effects from a severe accident.

Not all people are equally vulnerable to transportation incidents. A study by the Governors Highway Safety Association, An Analysis of Traffic Fatalities by Race and Ethnicity 2021, found that traffic fatalities are more common in low-income areas and among Native and Black Americans. The study found that in 2020, total traffic deaths in the United States rose by 7.2%, but total traffic deaths among Black Americans increased by 23%. The study reported several reasons for this, including poor road quality in low-income areas, pedestrians being disproportionally Black, and members of the low-income population being unable to stay home from work during the pandemic.

Property

All property is vulnerable to transportation accidents, including the modes of transportation themselves and all associated equipment. Roadway accidents can impact surrounding infrastructure, including surrounding buildings, poles, or guardrails. Railway accidents frequently result in damages to the railway tracks which can be expensive to repair and result in delays in the transportation of goods. Aircraft accidents frequently result in damaged or destroyed planes, as well as damage to infrastructure in the landing area. At least one aircraft accident case documented in the Western Region damaged powerlines. Boating incidents can cause extensive damage to ships, bridges, and docks.

Critical Facilities and Lifelines

Transportation accidents can result in delayed responses for emergency vehicles and severe or multi-car accidents can put a strain on response services and hospital capacity. The transportation of goods can also be delayed due to road closures from an accident. Power outages are also possible due to damages infrastructure.

Economy

There are significant economic impacts likely to result from transportation accidents. Cost of repairing property and hospital bills for those impacted by the accident can be substantial. The U.S. DoT reported the estimated cost of a fatality is over $4.6 million in damages. Additionally, lost revenue from business disruptions and disruptions in the transportation of goods can be significant.

Historic and Cultural Resources

Historic and cultural resources are equally vulnerable to transportation accidents as other types of property.

Natural Resources

Transportation accidents to natural resources is minimal. These accidents can result in debris and fuel leakage into the environment, which can harm the surrounding ecosystem. Trees and other landscaping can be damaged when a vehicle leaves the roadway. Wildlife is also at risk to injury or death due to vehicles on the road. Significant threat to natural resources could occur if a transportation accident involving HAZMAT occurs.

Development Trends Related to Hazards and Risk

Increasing roadway infrastructure and the number of cars on the road will likely result in an increase in the number of transportation accidents in the Western Region. Increase in air travel is likely to continue and therefore the increase in number of aircraft disasters. Construction and re-routing of local roads also increases the chances of a traffic accident.

4.2.15.8 Risk Summary

In summary, the transportation accidents hazard is considered to be overall **Medium** significance for the Region. Variations in risk by jurisdiction are summarized in the table below, as well as key issues noted in the vulnerability assessment.

- These events typically impact areas along roadways, railways, waterways, or near airports; therefore, the hazard extent is rated as **Significant**.
- The data sources used for each type of transportation accidents reported significantly more than one accident a year, therefore, frequency is rated as **Highly Likely**.
- While transportation accidents commonly occur, most accidents impact only the people and vehicles involved and therefore magnitude is ranked as **Limited**.
- People who work in transportation and spend extensive time on the road, such as truck drivers or deliver drivers, are most likely to experience transportation accidents. Studies have found that Black and Native Americans are disproportionately likely to be involved in a transportation accidents and accidents are more likely to occur in low-income areas.
- Transportation accidents are **Likely** to cause damage to the vehicles involved as well as surrounding infrastructure. First responder services may be delayed due to multi-car pileup accidents or significant train derailments.
- Significant economic losses can result from business interruptions due to delays in the transportation of goods and from repairs to transportation vehicles and infrastructure.
- Critical infrastructure such as bridges and major roads can be blocked off or closed due to major roadway accidents. Railroads can also be closed for extended periods of time due to track damage, which would limit the movement of goods in and out of the areas impacted.
- The frequency of transportation accidents is high across jurisdictions, but some counties such as Flathead, Lewis & Clark, Ravalli, and Butte-Silver Bow Counties are much more likely to experience greater losses due to larger populations and greater concentration of transportation systems.
- Related Hazards: Hazardous Materials Accident.

Table 4-75 Risk Summary Table: Transportation Accidents

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Low	NA	Major interstates, state highways and rail systems located throughout the study area. Several airports throughout the Region as well.
Beaverhead County	Low	Dillon, Lima	NA
Broadwater County	Low	Townsend	NA
Butte-Silver Bow County	Medium/High	NA	Butte has a high concentration of transportation infrastructure, the convergence of I-15 and I-90, and Bert Mooney Airport. Larger population also makes higher likelihood.
CKST	Medium	NA	The Flathead Reservation is contained largely within Lake and Flathead Counties, both of which see some of the higher rates of traffic incidents in the region.
Flathead County	Medium	Columbia Falls, Kalispell, Whitefish	Flathead County has the highest number of recorded traffic incidents in the Western Region. Kalispell is likelier to experience incidents due to larger population and traffic congestion.
Granite County	Low	Drummond, Philipsburg	NA
Jefferson County	Low	Boulder, Whitehall	NA
Lake County	Low	Polson, Ronan, St. Ignatius	Lake County contains a primary transportation corridor between the much larger population centers of Flathead and Missoula Counties and sees a higher rate of traffic incidents.
Lewis & Clark County	Medium	East Helena, Helena	Second highest number of recorded traffic incidents in the Western Region. Higher population in Helena makes likelihood for incidents higher.
Lincoln County	Low	Eureka, Libby, Rexford, Troy	NA
Madison County	Low	Ennis, Sheridan, Twin Bridges, Virginia City	NA
Meagher County	Low	White Sulphur Springs	NA
Mineral County	Medium	Alberton, Superior	NA
Park County	Low	Clyde Park, Livingston	NA
Powell County	Low	Deer Lodge	NA
Ravalli County	Medium	Darby, Hamilton, Pinesdale, Stevensville	NA
Sanders County	Medium	Hot Springs, Plains, Thompson Falls	NA
Sweet Grass County	Medium	Big Timber	NA

4.2.16 Volcanic Ash

4.2.16.1 Hazard/Problem Description

A volcano is a vent in the earth's crust, or a mountain formed by the eruption of subsurface material including lava, rock fragments, ash, and gases, onto the earth's surface. Volcanoes produce a wide variety of hazards that can damage and destroy property and cause injury and death to people caught in its path, one of which is fallout of volcanic ash.

The two volcanic centers affecting Montana in recent geologic time are: 1) the Cascade Range of Washington, Oregon, and California; and 2) the Yellowstone Caldera in Wyoming and eastern Idaho. Based on the historic trends of past eruptions, volcanic eruptions in the Cascade Mountains are more likely to impact Montana than Yellowstone eruptions. The primary effect of the Cascade volcanic eruptions in Montana would be ash fall.

The distribution of ash from a violent eruption is a function of the weather, particularly wind direction and speed and atmospheric stability, and the duration of the eruption. As the prevailing wind in the mid-latitudes of the northern hemisphere is generally from the west, volcanic ash is usually spread eastward from the volcano. Exceptions to this rule do, however, occur.

Yellowstone National Park is a (literal) hot spot for geologic activity. A large magma chamber is believed to exist from 5 to 10 miles beneath the surface, beneath the North American continental plate, and cover an area of approximately 25x50 miles. A fear is that this magma could rise to the surface and trigger a massive eruption. This chance is incredibly remote, as discussed in Section 4.2.16.4.

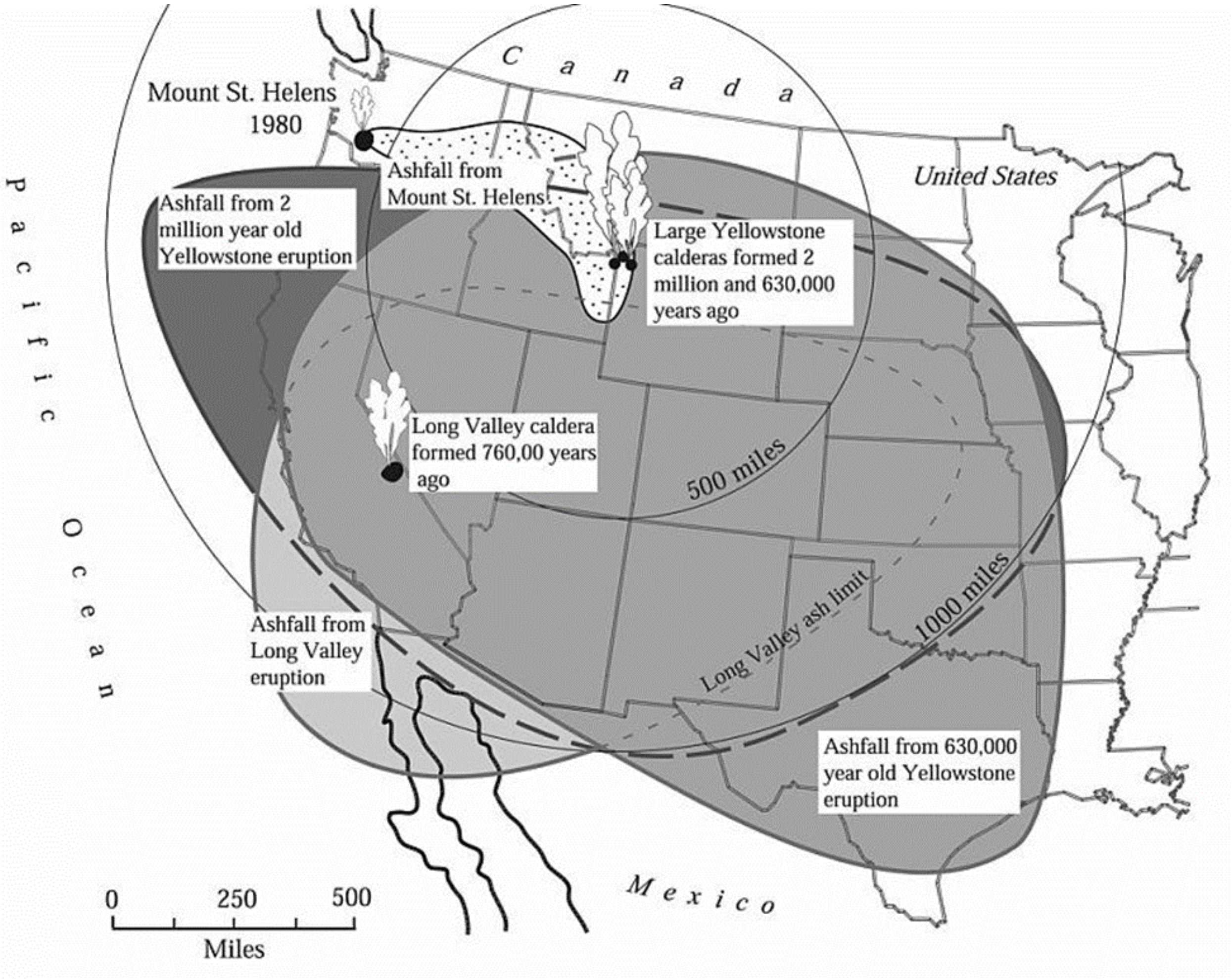
4.2.16.2 Geographical Area Affected

The 1980 eruption of Mt. St. Helens demonstrated that eruptions the volcanoes in the Cascades are easily capable of causing troublesome ashfall in Western and Southwestern Montana. Most of the state was blanketed in ash fallout from that eruption. Much of the Western Region has been covered with volcanic ash at some point in the recent geologic history (Figure 4-99).

The area affected by a volcanic eruption of the Yellowstone Caldera would be truly impressive, though the chance of that scenario occurring is absurdly small (Section 4.2.16.4).

Overall, the geographic area affected by volcanic ash fallout is **extensive**.

Figure 4-99 Areas of the United States Once Covered by Volcanic Ash from Major Eruptions



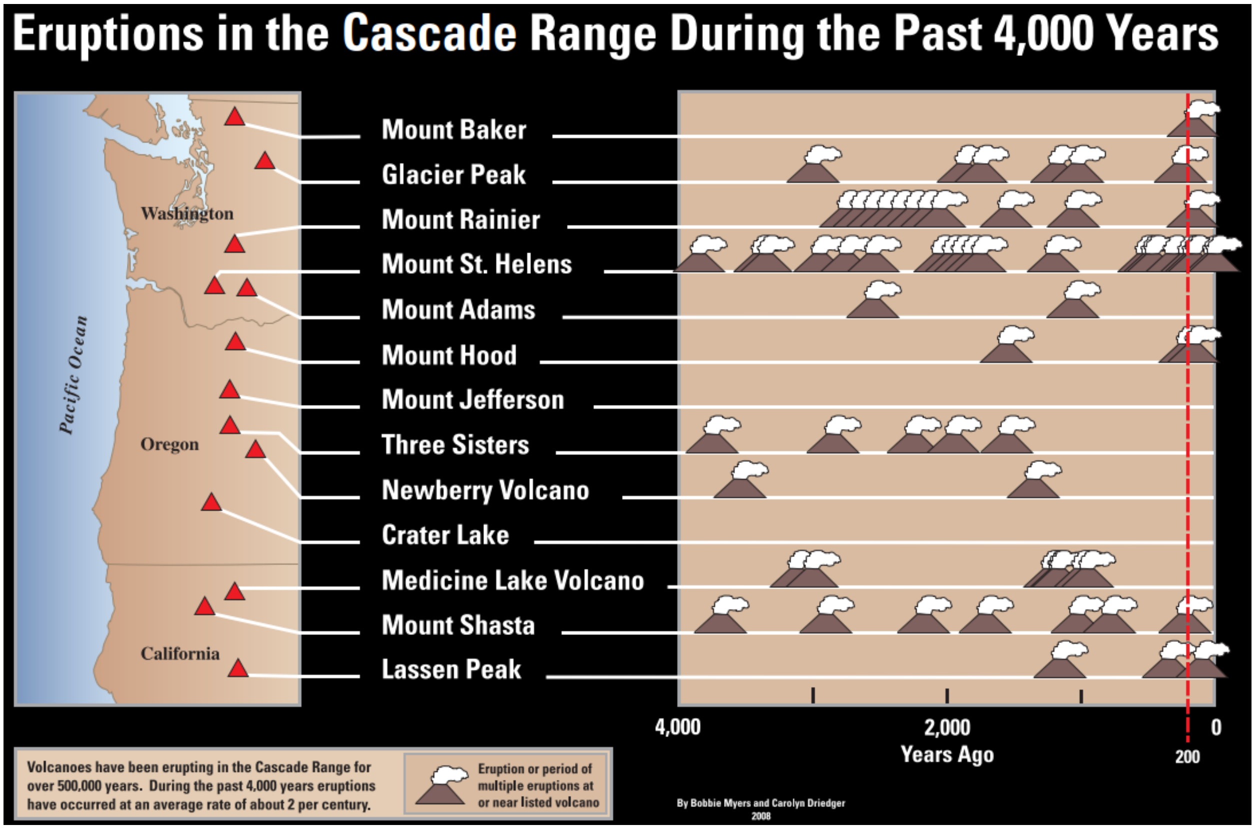
Source: USGS, 2000

4.2.16.3 Past Occurrences

Eruptions in the Cascades have occurred at an average rate of 1-2 events per century during the last 4,000 years, and future eruptions are certain. Seven volcanoes in the Cascades have erupted in the last 200 years, a frequency of once per 28 years (Figure 4-100).

Eruptions in the Yellowstone area are massive, but with much less frequency, measured in hundreds of thousands of years. This issue is discussed further in the following section, 4.2.16.4 *Frequency/Likelihood of Occurrence*.

Figure 4-100 Past Eruptions of Cascade Volcanoes



Source: Myers, B. and Driedger, C. (2008) Eruptions of the Cascade Range During the Past 4,000 Years, USGS General Information Product 63, https://pubs.usgs.gov/gip/63/.

4.2.16.4 Frequency/Likelihood of Occurrence

Despite relatively recent concern of a cataclysmic eruption in the Yellowstone area driven in part by reactions to a 2005 BBC docudrama, it is not known if this pool of magma will *ever* erupt. Or when that might happen. USGS considers the annual chance of such an eruption occurring at 730,000 to 1.[8] The potential hazard of a Yellowstone eruption is not considered further in this plan.

The next eruption of a volcano in the Cascades that could deposit volcanic ash across the planning area is imminent, at least in geologic terms (Figure 4-100). Over the past 200 years, eruptions have occurred an average of once every 28 years. Though these seven eruptions have not all been as large as the 1980 Mt. St. Helens eruption. In the context of hazard mitigation planning, the likelihood of such an eruption affecting western Montana in the next hazard mitigation planning cycle is **unlikely**, but certainly worth considering.

4.2.16.5 Climate Change Considerations

While climate change is not expected to impact the size or frequency of eruptions, eruptions themselves can have a huge impact on climate. Eruptions can inject millions of tons of gases and debris into the atmosphere, which can circulate far away from the incident site and disrupt normal climate patterns. Large-scale volcanic activity may only last a few days, but the massive outpouring of gases and ash can influence climate patterns for years, influencing both heating and cooling.

---

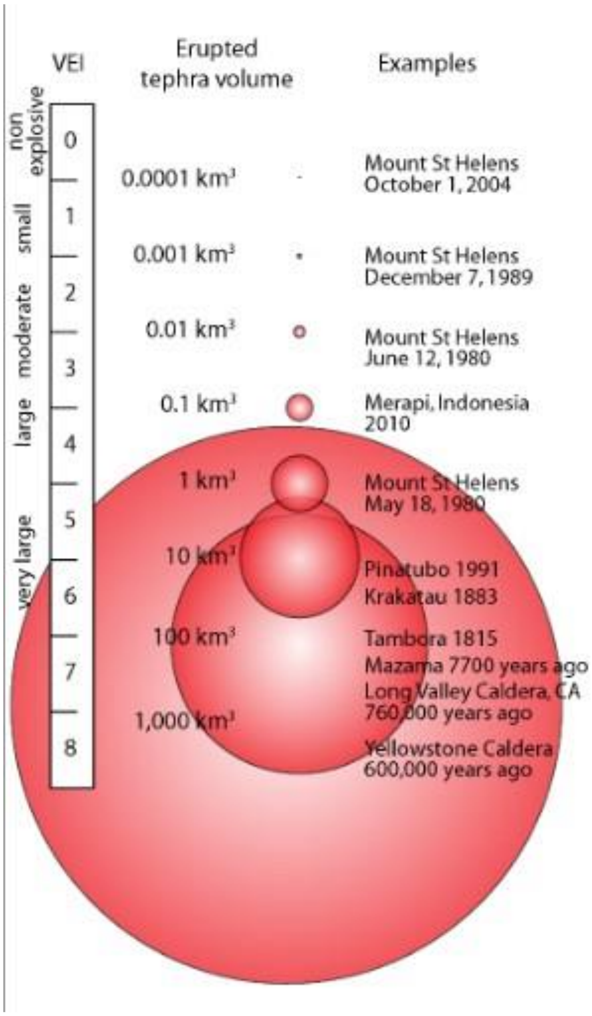
[8] Questions About Supervolcanoes, USGS webpage https://www.usgs.gov/volcanoes/yellowstone/questions-about-supervolcanoes

For example, the 1883 eruption of the Krakatoa volcano in Indonesia resulted in far reaching global climate impacts, with the average summer temperatures in the Northern Hemisphere falling by 0.72 degrees Fahrenheit the year after the eruption. The 1815 Mt. Tambora eruption, also in Indonesia, was the deadliest volcanic eruption in recorded history. It also led to global climate impacts resulting in 1816 being referred to as "the Year Without a Summer". According to NASA, average global temperatures dropped with frost and snow experienced in the middle of summer as far away as New England and Europe, leading to massive crop losses and famine. A similar scale eruption of the Yellowstone Caldera would also likely eject massive amounts of gasses which could affect the global climate, as well as the nearby regions of Montana.

4.2.16.6 Potential Magnitude and Severity

The magnitude of volcanic eruptions can be measured on the Volcanic Explosivity Index (VEI), shown in Figure 4-101.

Figure 4-101 Historic Volcanic Eruptions Measured on the Volcanic Explosivity Index Scale



Historic eruptions measured on the Volcanic Explosivity Index scale. Red spheres indicate the volume of ash ejected. Image adapted from: www.usgs.gov/observatories/yvo/news/volcanic-explosivity-index-a-tool-comparing-sizes-explosive-volcanic.

Similar to the Richter Scale, every This index is a semi-quantitative eruption magnitude scale used to rate volcanic eruptions based primarily on the volume of ash ejected. The duration of the eruption is incorporated into the VEI, but only makes a significant difference for especially long-duration eruptions. For example, the 9-year eruption of a volcano in Paracutin, Mexico in the 1940's, ejected enough ash to qualify as a VEI 5, but was downgraded somewhat to a VEI 4. Eruptions with no ash, such as in the Hawaiian Islands, typically are assigned VEI of zero regardless of the volume of lava produced. For context, the May 18, 1980 eruption of Mount St. Helens was a VEI 5, while the largest eruptions in the geologic record for the Yellowstone area were VEI 8 events.

Volcanic ash poses a unique hazard to Western Montana. According to the U.S. Geological Survey, the volcanoes of the Cascade Range are very active and their proximity to the residents of the Pacific Northwest makes them some of the most hazardous volcanoes in the United States. While the greatest risks presented by the Cascade Range are posed by large eruptions, even small eruptions can have detrimental effects to the surrounding populations. The severity of volcanic ash fallout in the Western Montana region is **moderate**.

The volcanic ash fallout from the eruption of Mount St. Helens in 1980 was formidable and provides a good reference when considering the potential magnitude and severity of ash fallout hazards. Local news sources reported the sky appeared to be foggy, and a thin layer of gritty, dull, grey powder was deposited across much of Montana. Ash deposits were up to a fifth of an inch thick in the western part of the State and tapered to near zero toward the eastern part of the State. The 2018 State Hazard Mitigation Plan notes travel was restricted in Western Montana for over a week in part due to reduced visibility that resulted in closed roads and airports, as well as health risks posed to children, the elderly, and people with cardiac or respiratory conditions. It is estimated that the eruption cost between $15-20 million statewide (HMP, 2018).

Compared to previous volcanic events in the Cascades, the 1980 eruption of Mount St. Helens was not a large one (Table 4-76). It was less than 1/100th of the estimated volcanic material ejection from the Mount Mazama eruption that formed Crater Lake (Foxworthy and Hill, 1982). Compacted ash deposits from the Mount Mazama eruption were measured to be 6 inches deep in Teton County, and although the eruption occurred approximately 7,700 years ago, ash layers can still be found in the geology of Western Montana.[9]

Glacier Peak is another active volcano in the Cascade Range. While it has historically erupted every 500 to 2,000 years, the last volcanic event that affected Montana occurred about 13,000 years ago. A series of six eruptions occurred, with one eruption ejecting more than five times the amount of volcanic material than was discharged by Mount St. Helens. Ash from those eruptions formed a layer up to 1.2 inches thick in Western Montana. All of this is to say the potential magnitude and severity of ash fallout in the Western Region is far greater than what was experienced in 1980.

Table 4-76 **Ash Deposits in Montana From Past Volcanic Eruptions**

Volcano	Most Recent Eruption (Years Before Present)	Location Affected	Thickness of Ash
Glacier Peak	13,000	Western Montana	1.2 in. (compacted)
Crater Lake	7,700	Western Montana	Up to 6 in. (compacted)
Mount St. Helens	42	Entire Montana	Up to 0.2 in. (uncompacted)

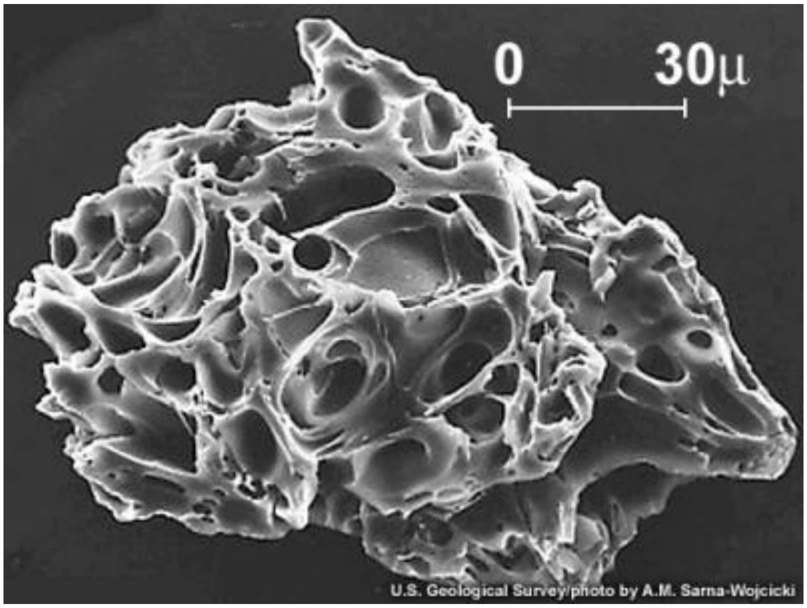
Source: USGS; Foxworthy and Hill, *1982; Nimlos, 1981*

Volcanic ash is composed of small, jagged pieces of minerals and volcanic glass (Figure 4-102). It is abrasive, corrosive, and does not dissolve in water. The severity of ash hazards are considered further in the vulnerability analysis section, 4.2.16.7, especially in the subsection *People*.

---

[9] Nimlos, T. J. (1981). Volcanic Ash Soils in Montana.

Figure 4-102 Microscopic View of Volcanic Ash



Source: Sarna-Wojcicki et al, 1981

4.2.16.7 Vulnerability Assessment

The volcanic ash *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to volcanic ash hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with volcanic ash hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience volcanic ash hazards. *Susceptible* indicates a strong likelihood of damage from exposure to volcanic ash hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is not a concern for volcanic ash hazards (see section titled *Climate Change Considerations*, above). Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

People

All people in the planning area are potentially exposed to volcanic ash fallout, as well as indirect effects of volcanic ash. Direct exposure to volcanic ash can be reduced, though not eliminated, for people inside buildings.

People are susceptible to complex health effects, related to both the physical effects of ash and secondary impacts related to disruption caused by the ash fallout. The abrasiveness of the volcanic ash particles can scratch the surface of skin and eyes and in general cause discomfort and inflammation. Inhaling volcanic ash can cause a wide range of health impacts, including death. The International Volcanic Health Hazard Network (IVHHN) provides a good reference to the current research and information on the health hazards and impacts of volcanic eruptions (http://www.ivhhn.org/).

Populations that are especially vulnerable include children, the elderly, and individuals with cardiac and respiratory considerations. The US Department of Health and Human Services tracks Medicare beneficiaries who rely on electricity-depending medical equipment, such as ventilators, oxygen concentrator equipment, and implanted cardiac devices. Many of these same individuals will be vulnerable to effects of volcanic ash.

Property

Virtually all property is potentially exposed to volcanic ash. Building exteriors and property located outdoors are exposed to a greater degree, but property located indoors is also exposed. In fact, the USGS website on impacts & mitigation of volcanic ashfall impacts contains a page dedicated to indoor cleanup procedures (https://volcanoes.usgs.gov/volcanic_ash/cleaning_up_inside.html).

Susceptibility of property to damage caused by exposure to volcanic ash hazards is variable but potentially extensive. Paint in general and especially on cars is susceptible to the abrasive nature of volcanic ash. Non-structural elements of rooftops, such as gutters and drains, are susceptible to damage from as little as a few millimeters of ashfall. Gutters tend to collect ash from the rooftop, can become blocked, and collapse from the weight, especially when the ash becomes wet. In extreme cases, roofs have collapsed from the weight of wet ash.

Building interiors can also be susceptible to damage from ash. Ash may clog ventilation grills and cooling fans, which may cause overheating of buildings. Ash certainly passes through ventilation systems and can coat interior surfaces. Some electronic equipment is especially susceptible, such as keyboards and mice. Hard drives, however, are well sealed and not particularly susceptible to damage. Damage may become apparent months or years later due to corrosion that is chemically accelerated by ash.

Nearly everything is exposed to ashfall hazards and susceptibility to damage is extensive. Cleanup is complex, difficult, and expensive. After the Mount Saint Helen eruption in 1980 extensive cleanup efforts were required throughout Montana. Vulnerability of property to ash is high, but risk is fortunately muted somewhat by the low probability of ashfall occurring.

Critical Facilities and Lifelines

Critical facilities and infrastructure are vulnerable to the effects of ashfall. Volcanic eruption with ashfall can cause electricity outages and issues with power supply. The air intakes for generators will also be vulnerable to airborne ash post eruption. Telephone and radio communications can also be interrupted and electronic components and short-circuits, especially high-voltage circuits and transformers, can fail due to ashfall.

Potable water supply can be susceptible to ash. Water treatment is susceptible to decreased quality of raw water sources, both from increased turbidity and from chemical changes in the water, both caused by ash. Cleanup also creates a high demand for water, which puts additional stress on the water supply.

Stormwater systems collect great amounts of ash from a broad area and can become clogged and cause surface flooding. Clearing underground accumulation of ash in stormwater systems can be extremely difficult. Pumps used in stormwater systems are especially susceptible to damage from volcanic ash.

Wastewater collection systems are also vulnerable to damage from ashfall. Buildup of ash in drainage systems can result in stormwater flooding. Ash-laden sewage that makes its way to wastewater treatment plants can cause mechanical damage and, if it makes it further through the system, it will settle and reduce the capacity of biological reactors, increasing the volume of sludge and changing its composition.

Transportation infrastructure is vulnerable to the impacts of ashfall. Roads, highways, and airport runways can become impassable due to the slippery ash and reduction of visibility. The abrasive volcanic ash can have damaging effects on aircraft, including melting the inside of engines and solidifying the turbine blades ultimately causing the engine to stall. According to Dzurisin et al., volcanic ash can cause damage to jet engines thousands of miles away. Ash can also lead to the failure of critical navigational and operational instruments.

Economy

Virtually everything that affects the economy is potentially exposed to volcanic ash. The economy is susceptible to both the direct costs of damage and cleanup, as well as indirect effects of reduced economic activity following ashfall. The economy can be impacted for years following a significant ashfall. Vulnerability is difficult to calculate, but risk is fortunately somewhat muted by the low probability of ashfall occurring.

Historic and Cultural Resources

All historic and cultural resources are potentially exposed to ashfall. Historical buildings and historical assets within and outside of buildings all are susceptible similarly to what is described above in the subsection titled *Property*. Terrestrial and especially aquatic ecosystems are vulnerable to ashfall, which damages recreation and tourism.

Natural Resources

Volcanic ash can collect carbon dioxide and fluorine gases that can be toxic to humans and have significant impacts on the natural environment. Windblown ash can spread and pollute areas that had previously been unaffected. Vegetation is also vulnerable to the impacts of ashfall that can result in decreased plant photosynthesis and poor pollination if flowers were damaged. Visual inspection of vegetation in a large area of the State of Washington impacted by the Mount St. Helens eruption showed three broad categories of plant damages: breakage due to the weight of ash, physiological changes such as decreased plant growth, and chemical damages to the leaves (Ayris, Delmelle, 2012).

Water bodies are also vulnerable to the effects of ashfall and can cause chemical changes that can affect water quality. The following table from the USGS Volcanic Ashfall Impacts Working Group show the typical effects of ashfall on the quality of surface waterbodies.

Table 4-77 Typical Effects of Ashfall on the Quality of Surface Water Bodies

Characteristic	Effect
Turbidity	Ash suspended in water will increase turbidity in lakes, reservoirs, rivers, and streams. Very fine ash will settle slowly, and residual turbidity may remain in standing water bodies. In streams, ash may continue to be mobilized by rainfall events, and lahars may be a hazard in some regions.
Acidity (pH)	Fresh ashfall commonly has an acidic surface coating. This may cause a slight depression of pH (not usually below pH 6.5) in low-alkalinity surface waters.
Potentially Toxic Elements	Fresh ash has a surface coating of soluble salts that are rapidly released on contact with water. The most abundant soluble elements are typically Ca, Na, K, Mg, Al, Cl, S and F. Compositional changes depend on the depth of ashfall and its 'cargo' of water-soluble elements; the area of the catchment and volume available for dilution; and the pre-existing composition of the water body. In rivers and streams, there will be a short-lived pulse of dissolved constituents In lakes and reservoirs, the volume is usually large enough that changes in composition are not discernible The constituents most likely to be elevated above background levels in natural waters are Fe, Al, and Mn, because these are normally present at very low levels. Thus, water is likely to become unpalatable due to discoloration or a metallic taste before it becomes a health hazard.

Source: USGS Volcanic Ashfall Impacts Working Group, Volcanic Ash Impacts & Mitigation - Water Supply (usgs.gov)

Development Trends Related to Hazards and Risk

In the past 10 years, Gallatin and Broadwater Counties grew by 37% and 29%, respectively (Table 2-1). Seven counties in the Western Region are expected to grow an additional 20% or more between 2020 and 2040, including Madison (57%), Gallatin (38%), Meagher (37%), Ravalli (26%), Powell (22%). Missoula (20%), and Flathead (20%) Counties (Table 2-2). There is no doubt that development is increasing vulnerability to volcanic ash hazards by increasing the value of assets in the planning area, especially in the areas listed above.

4.2.16.8 Risk Summary

Volcanic ash is considered a **low** significance hazard throughout the Western Region, due largely to the long recurrence intervals between events. Every jurisdiction within the region rated volcanic ash hazards as a low significance hazard.

- Effects on people: Serious adverse health impacts can occur, such as scratches and abrasion to the skin and eyes from direct contact with ash, and ultimately death potentially if ash is inhaled and cements in the lungs.
- Effects on property: exterior of buildings can have abrasive damage to roofs and gutters can be blocked, and the collapse of roofs if too much ash accumulates.
- Effects on the economy: ashfall can lead to disruptions in the tourism industries, through the prevention of travel and access to affected areas, as well as massive losses to agriculture if heavy ashfall were to occur during the growing season.
- Effects on critical facilities and infrastructure: ash can seriously damage electrical and mechanical components of infrastructure, disrupt air travel and EMS/first responder operations, and lead to backups and damage of wastewater systems.
- Related Hazards: Earthquake.

Table 4-78 Risk Summary Table: Volcanic Ash

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	Low		
Beaverhead	Low	City of Dillon Town of Lima	None
Broadwater	Low	City of Townsend	None
Butte-Silver Bow County	Low	City of Butte Town of Walkerville	None
Confederated Salish and Kootenai Tribes of the Flathead Reservation	Low	City of Columbia Falls City of Kalispell Town of Whitefish	None
Flathead	Low		None
Granite County	Low	Town of Drummond Town of Philipsburg	None
Jefferson	Low	City of Boulder Town of Whitehall	None
Lake	Low	City of Polson City of Ronan Town of St. Ignatius	None
Lewis and Clark	Low	City of Helena City of East Helena	None
Lincoln	Low	City of Libby City of Troy Town of Eureka Town of Rexford	None
Madison	Low	Town of Ennis Town of Sheridan Town of Twin Bridges Virginia City	None
Meagher	Low	City of White Sulphur Springs	None
Mineral	Low	Town of Superior Town of Alberton	None
Park	Low	City of Livingston Town of Clyde Park	None
Powell	Low	City of Deer Lodge	None
Ravalli	Low	City of Hamilton Town of Darby Town of Stevensville Town of Pinesdale	None
Sanders	Low	City of Thompson Fall Town of Plains Town of Hot Springs	None
Sweet Grass	Low	City of Big Timber	None

4.2.17 Wildfire

4.2.17.1 Hazard/Problem Description

FEMA defines wildland fire simply as "an unplanned, unwanted fire burning in a natural area." This hazard is unfortunately common in Western Montana.

Western Montana can be described as mostly rural and exhibits complex mountainous terrain, expansive forests, valley rangelands, and a complex and variable climate. Hot and dry summers typically follow cold and wet winters. As such, the Region's wildfire ecology is complex. Wildfire is an ongoing concern and considerable risk for the residents of Western Montana. Fires can occur at any time of the year in Western Montana, but historically, the fire season extends from spring to fall, with large fires being more common in the later summer months and early fall months when fire conditions are more probable. Prime wildfire conditions occur when accumulated fuels become sufficiently dry from high temperatures and drought and can more easily ignite. Furthermore, high winds during the summer and fall can favor the chance of wildfire spreading. Climate change has led to hotter summers and has caused an increase in fuel drying, which has resulted in increases to wildfire intensity, frequency, and fire season length. The 2017 Montana Climate Assessment, MCA https://montanaclimate.org/) documents these trends and how they are expected to be exacerbated as climate change progresses.

Historically, wildfire has been an important and normal component of the montane forest and rangeland ecosystems in Western Montana. Wildfires are necessary for maintaining the natural conditions and ecology of the Region. Until the latter 20th century, fire suppression was the dominant fire management policy across state and federal lands across the Western U.S. As a result, high levels of fuels have built up in many fire-prone ecosystems, especially Western Montana's forests. Management goals in wildland areas typically are focused on bringing fire regimes back to their natural historic range of variation. However, in areas with heavy human use, fuel maintenance and land management strategies will be required to replace the historic role of wildfires. These can include, but are not limited to, prescribed burns, targeted livestock grazing, and mechanical fuel removal treatments. Due to the complexity of the fire ecology exhibited by Western Montana's landscapes, wildfire risk and wildfire management vary drastically across the Region.

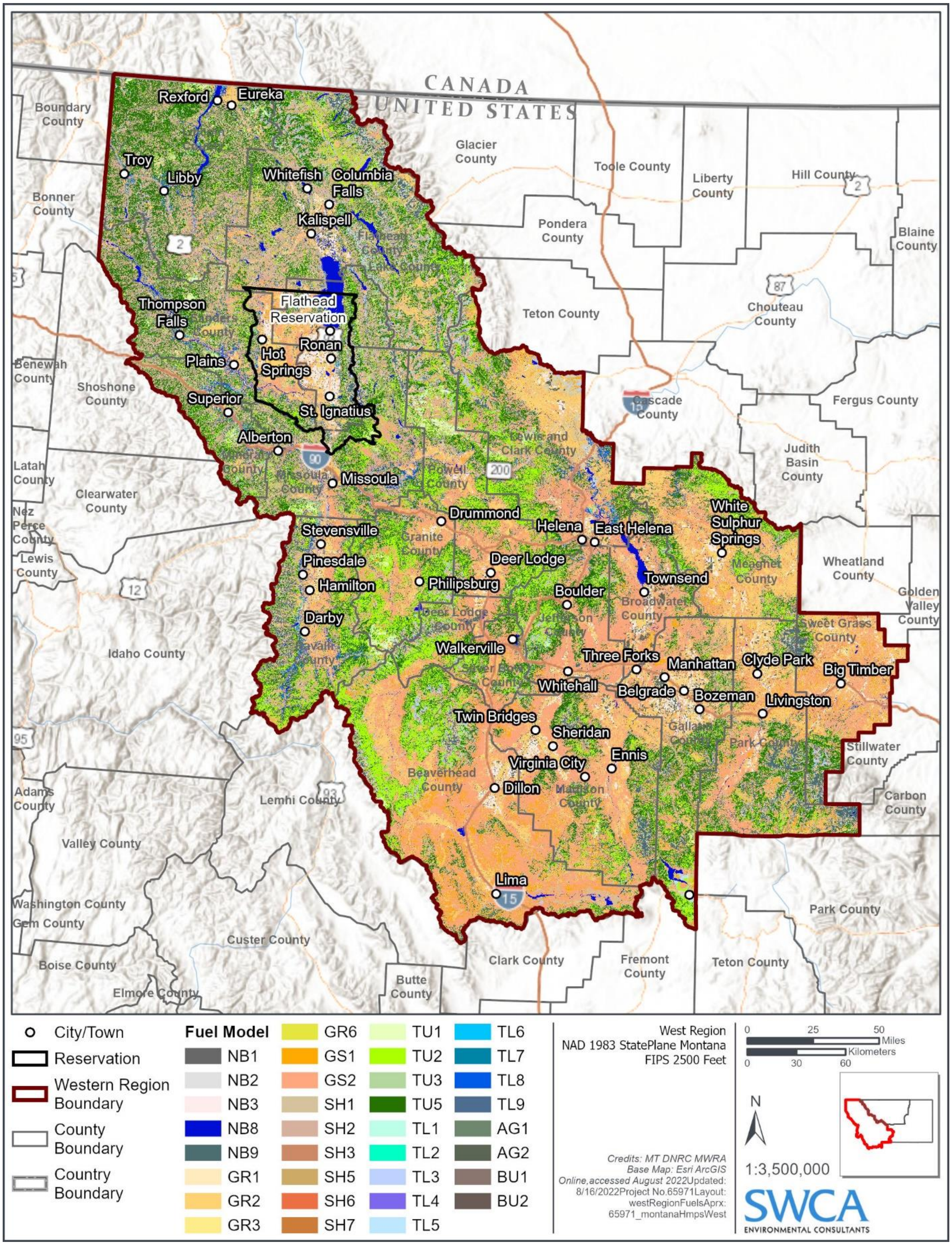
Generally, there are three major factors that predict wildfire behavior and predict a given area's potential to burn. These factors include fuel, topography, and weather.

Fuel: Fuel is what feeds a fire and is generally determined by fuel type and volume. Generally, the various fuel types and fuel characteristics that cover a landscape have significant impacts on wildfire behavior. Fuel types vary drastically throughout the Western Region. Fuel sources can vary from dead fine grasses, leaves, and needles to live large trees. Combustible manmade structures also contribute to fuel sources. Fuels can be modified by humans through land use and land management (e.g., prescribed burns, mechanical fuel removal, invasive plant management, and grazing, among others). Scott and Burgan's (2005) fire behavior fuel models were used to model fuels in Western Montana.

The northern portion of the Region is characterized by extensive tracts of forests which primarily exhibit TU5 (timber-understory) followed by TU2 fuels. TU5 fuels represent forests that have fuel beds with a high load of conifer litter and a shrub understory. Spread rate and flame length in TU5 fuels is usually moderate. Usually the cooler and/or wetter forests occupying the Western Montana are more likely to contain TU5 fuels. Common tree species characterizing the TU5 fuels can include subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), lodgepole pine (*Pinus contorta*), and western larch (*Larix occidentalis*). Additionally, in the wetter and more temperate regions of Western Montana, species found in TU5 fuels can also include western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). TU2 fuels are characterized by fuelbeds with a moderate litter load with a shrub component where wildfire spread rate is usually moderate and flame lengths are predicted to be low. TU2 fuels are more likely to occur in the southern portion of the Western Region, but they are also more commonly observed in the lower elevation forests of the montane regions. Species in TU2 forests typically consist of Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*).

There are also substantial expanses of rangelands in Western Montana. The primary fuel types in these rangelands are GS2 (grass-shrub) and GR2 (grass) fuels (Figure 4-103). GS2 fuels are characterized as lands with up to 50% shrub cover with shrub height ranging from 1 to 3 feet high and accompanied with a moderate grass load. Wildfire spread rate is usually high and flame lengths are moderate. Sagebrush (*Artemisia* sp.) systems occupy most of the GS2 fuels. GR2 fuels are characterized as lands with moderately coarse continuous grass with an average depth of about 1 foot. Wildfire spread rate is usually high and flame lengths are moderate. Bunchgrass grasslands occupy much of the GR2 fuels.

Figure 4-103 Wildfire Fuel Model of the Western Region



Source: MT DNRC 2022

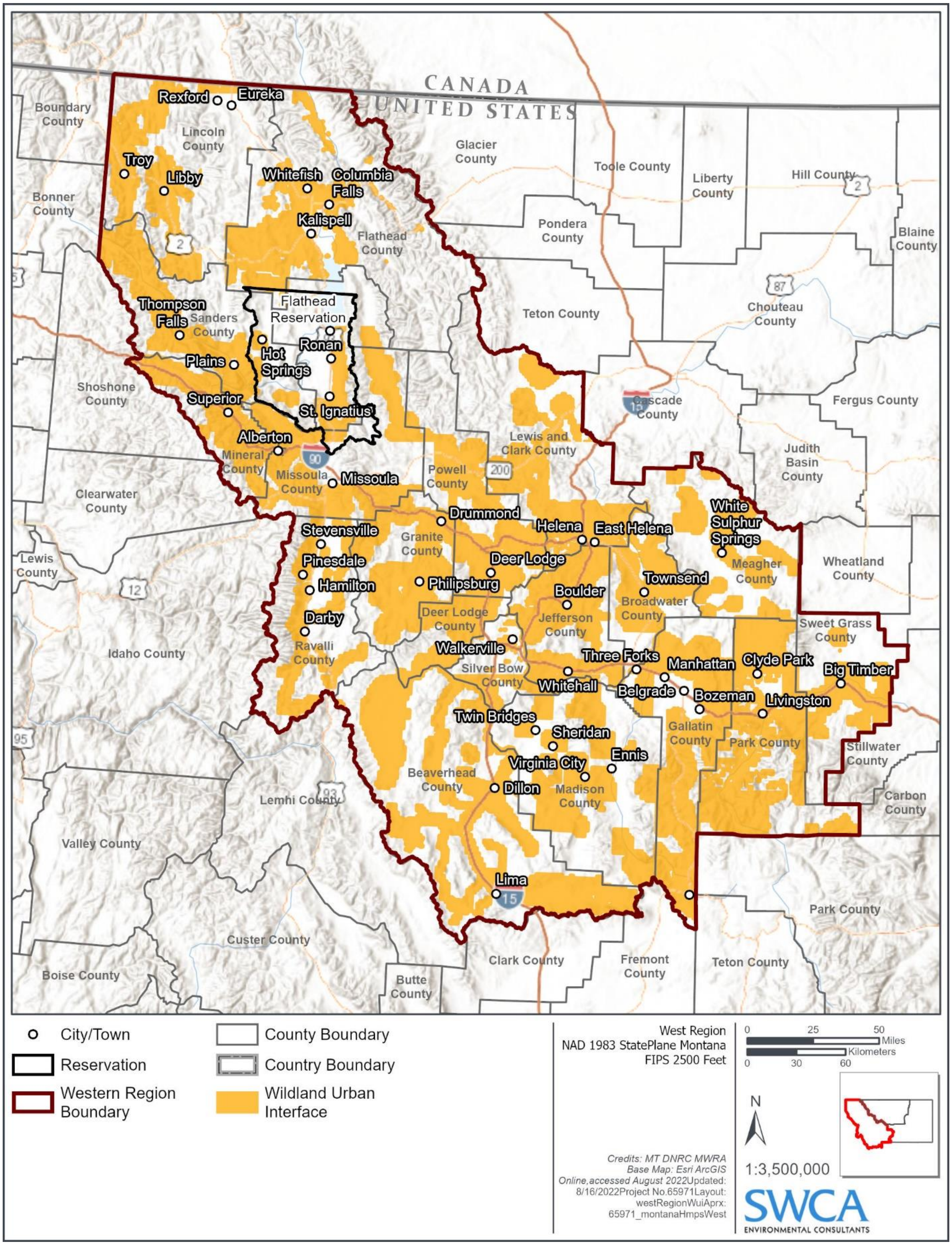
Topography: A region's topography is determined by slope and aspect. Normally, wildfire behavior, such as fire intensity and rate of spread, is more pronounced on steep slopes due to convective heat transfer (i.e., heat rising up the slope). South-facing slopes are typically drier due to receiving more sunlight than north facing slopes. Thus, they normally contain drier and finer fuels that are more prone to producing faster rates of spread than the fuels seen on wetter north facing slopes. The Western Montana Region's topography is diverse. It contains steep forested mountains, deep canyons, forested hills, valley rangelands, and flat farmlands.

Weather: Important weather characteristics, such as precipitation, wind speed, wind direction, temperature, relative humidity, and lightning can affect both the potential for wildfire. Low precipitation, high temperatures, and low relative humidity in drought years dry out live and dead fuels. These dry fuels feed wildfire and result in more extreme fire behavior. Additionally, antecedent wet years can build up finer fuels that may contribute to extreme wildfire behavior during summer or fall droughts. Weather regimes in the Western Montana Region can vary drastically between low and high elevations, where the mountains receive more precipitation than the valleys. Additionally, the western areas of the Region generally receive more precipitation than the eastern portions (PRISM 2022). Specifically, the greater rangelands in and around Dillion and Livingston (Beaverhead and Park Counties, respectively) display the driest climates, while the montane forested regions around Troy and West Glacier (Lincoln and Flathead Counties, respectively) display the wettest climates.

Wildland Urban Interface: The wildland/urban interface (WUI) is defined as the zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel (MT MHMP 2018). Starting in 2011, Montana DNRC compiled WUI boundaries for all counties within the State based upon information provided from countywide CWPPs or through consultation between the county and the MT DNRC. The methods for WUI delineation vary by county, which is why some WUI areas encompass an entire county land mass, and some areas are more nuanced, based on fuels, hazards, population density etc. (Figure 4-104).

Humans are currently the primary sources of wildfire ignition in Western Montana, especially in the WUI (e.g., utilities and vehicle/roadside ignitions); however, lighting strikes during thunderstorms are also a source of ignition (MT DNRC 2022). Increased development in Western Montana, especially around Missoula, Helena, Hamilton, Bozeman, and Whitefish, among others, is resulting in a greater portion of the Region falling within the WUI. Expansion of the WUI combined with increasing drought, high levels of fuel, and a higher likelihood of ignition is resulting in increased and considerable wildfire risk in the WUI.

Figure 4-104 Wildland Urban Interface Delineation



Source: MT DNRC 2020b

4.2.17.2 Geographical Area Affected

Wildfires can occur throughout the Region. The climate of the Western Montana Region varies from arid to semi-arid to mesic. These climates, combined with continuous loading of forest and rangelands fuels, make most of the Region susceptible to wildfire. The two main types of wildfires that can occur in the Region are forest fires and rangeland fires. These fire types are reflected in the mapped risks from wildfire. The forested regions of Western Montana, especially the northern areas, have historically been most at-risk from wildfire; however, wildfires also occur in the rangelands. Rangeland fires are more likely to occur in the southern portion of the Project Area. As a whole, almost the entire Western Region is at-risk and/or susceptible to wildfire. Large tracts of land with agricultural crop cover in the Region are usually at less risk of wildfire. These can include, but are not limited to, the Flathead Valley, Gallatin Valley, and Beaverhead Valley.

The U.S. Forest Service classifies individual wildfires by the size of area burned:

- Size Class: A = up to 0.25
- Size Class B = 0.25 to 10 acres
- Size Class C = 10 to 100 acres
- Size Class D = 100 to 300 acres
- Size Class E = 300 to 1,000 acres
- Size Class F = 1,000 to 5,000 acres
- Size Class G = 5,000 to 10,000 acres

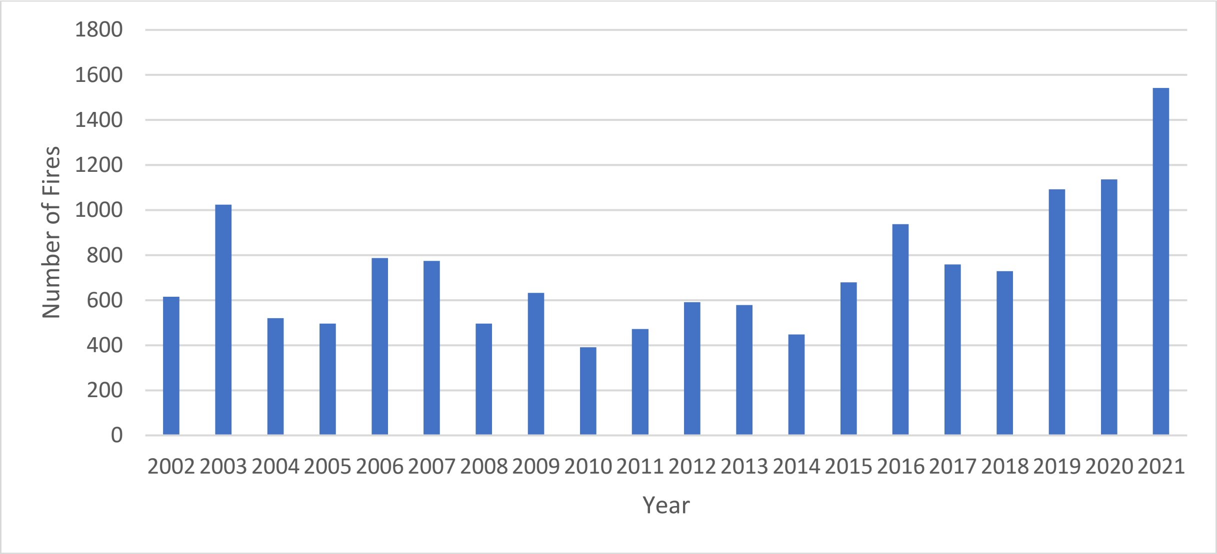
4.2.17.3 Past Occurrences

The Montana Wildfire Risk Assessment (MWRA) database, maintained by the Montana Department of Natural Resources and Conservation, includes perimeter GIS layers for recent wildfires throughout the State of Montana (MT DNRC 2022).

The vast majority of wildfires occurrences are small (less than 10 acres, Size Class A-B) and cause no meaningful damage. From 2002 to 2021 there were 14,704 fires that burned 10 acres or less (Figure 4-105).

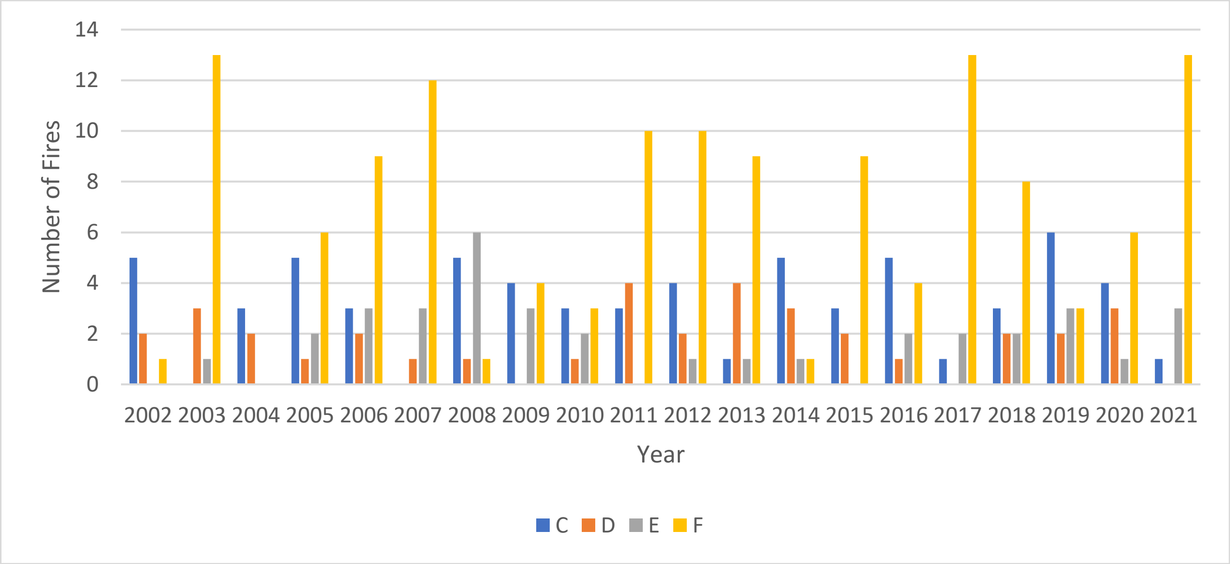
However, in the same time frame there have been 271 fires greater than 10 acres (Size Class C or greater), 135 of which exceeded 1,000 acres (Size Class F or greater, Figure 4-106). Years with an especially high number of large and destructive wildfires (e.g. the 2003, 2007, 2017 and 2021 wildfire seasons in Figure 4-107) are correlated with drought conditions and/or warmer growing season temperatures. The correlation between drought and total area burned is significant.

Figure 4-105 Number of Notable Wildfires in Western Montana by Year and Size Class A and B, 2002 to 2021



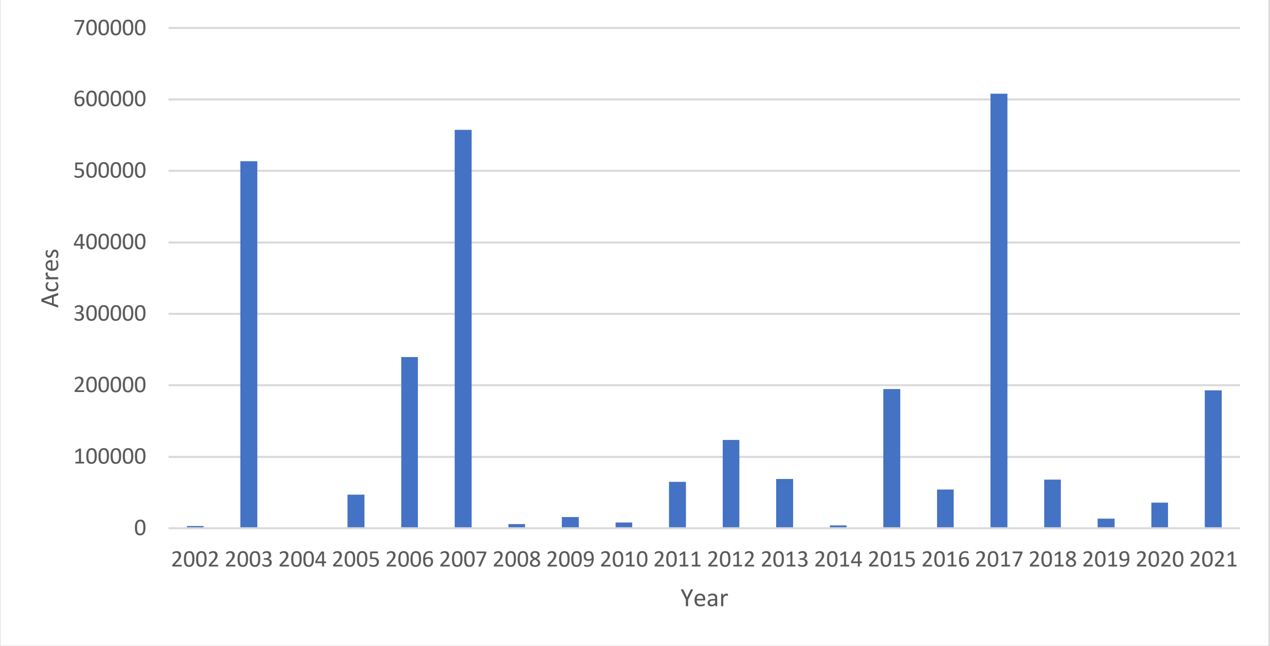
* Size Class: A = 0.25 acre or less; B = greater than 0.25 to 10 acres
Source: MT DNRC 2022

Figure 4-106 Number of Notable Wildfires in Western Montana by Year and Size Class C-F, 2002 to 2021



* Size Class: C = 10 to 100 acres; D = 100 to 300 acres; E = 300 to 1,000 acres; F = 1,000+ acres
Source: MT DNRC 2022

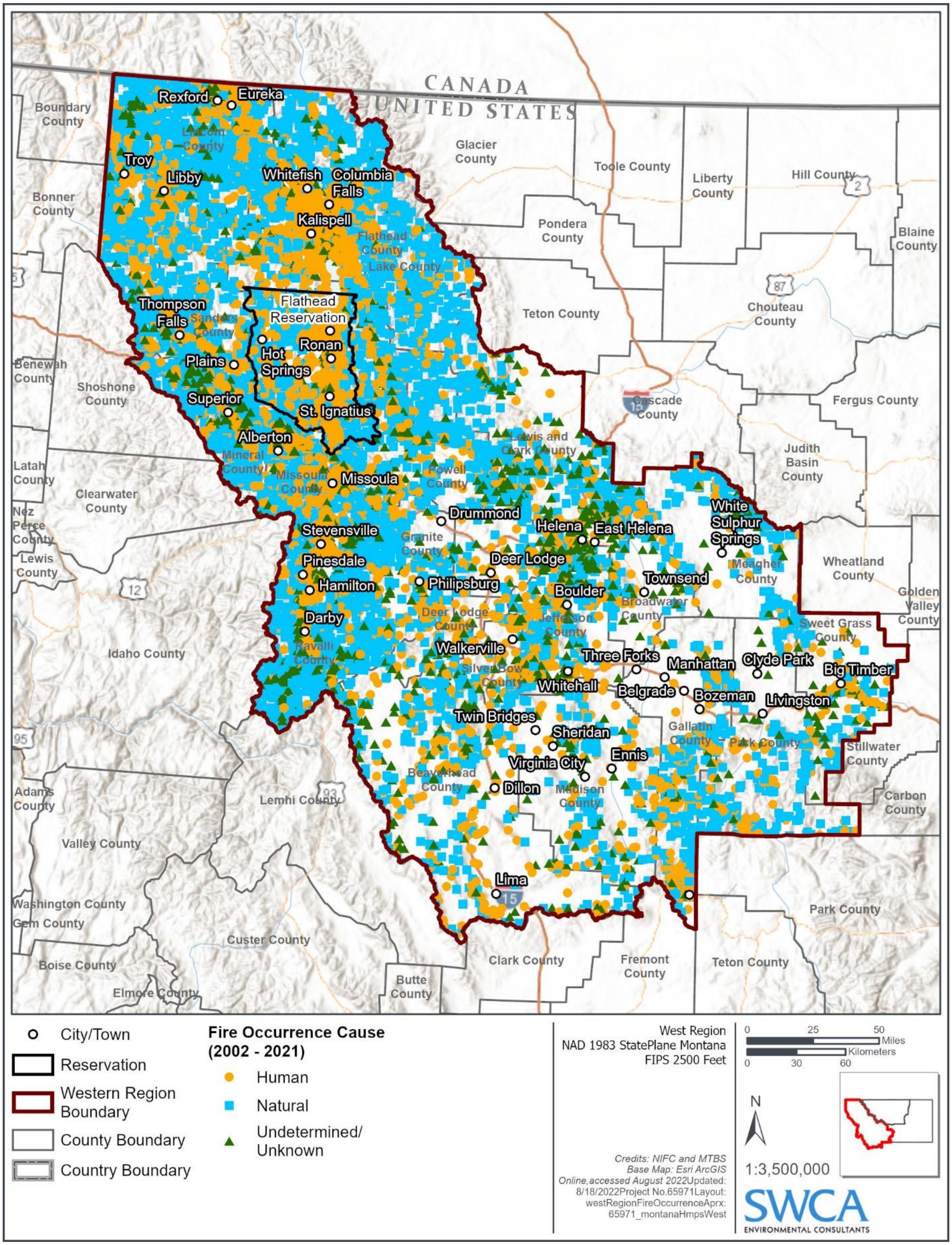
Figure 4-107 Total Acres Burned Per Year in the Western Region, 2002 to 2021



Source: MT DNRC 2022

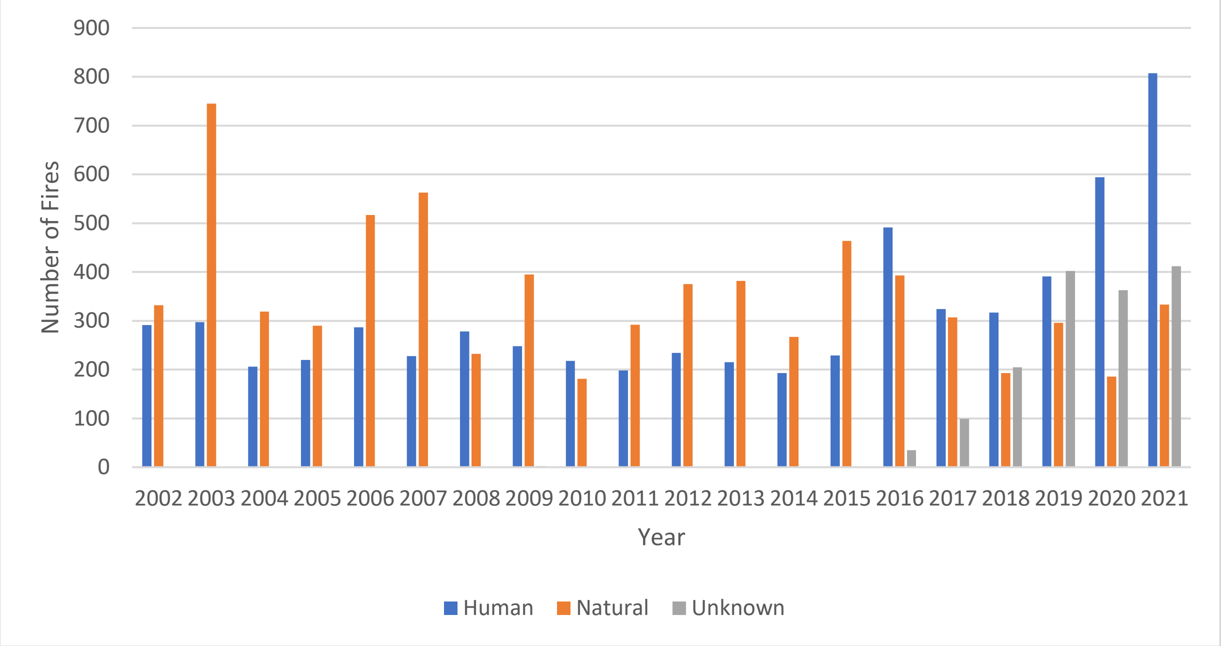
Natural wildfire occurrences (e.g., lightning ignitions) in the Region are common and particularly common in the northern portion of the Region where expansive tracts of montane forests occur (Figure 4-108). Human-caused wildfire occurrences are also common and are, generally, concentrated near the Region's municipalities. Over the last decade there has been a consistent increase in the number of wildfires attributed to human causes (Figure 4-109). From 2016 to 2021 the number of human-caused wildfires outnumbered the number of natural caused wildfires.

Figure 4-108 Fire Occurrence History of Western Montana, 2002 to 2021



Source: MT DNRC 2022

Figure 4-109 Number of Wildfires by Cause, 2002 to 2021



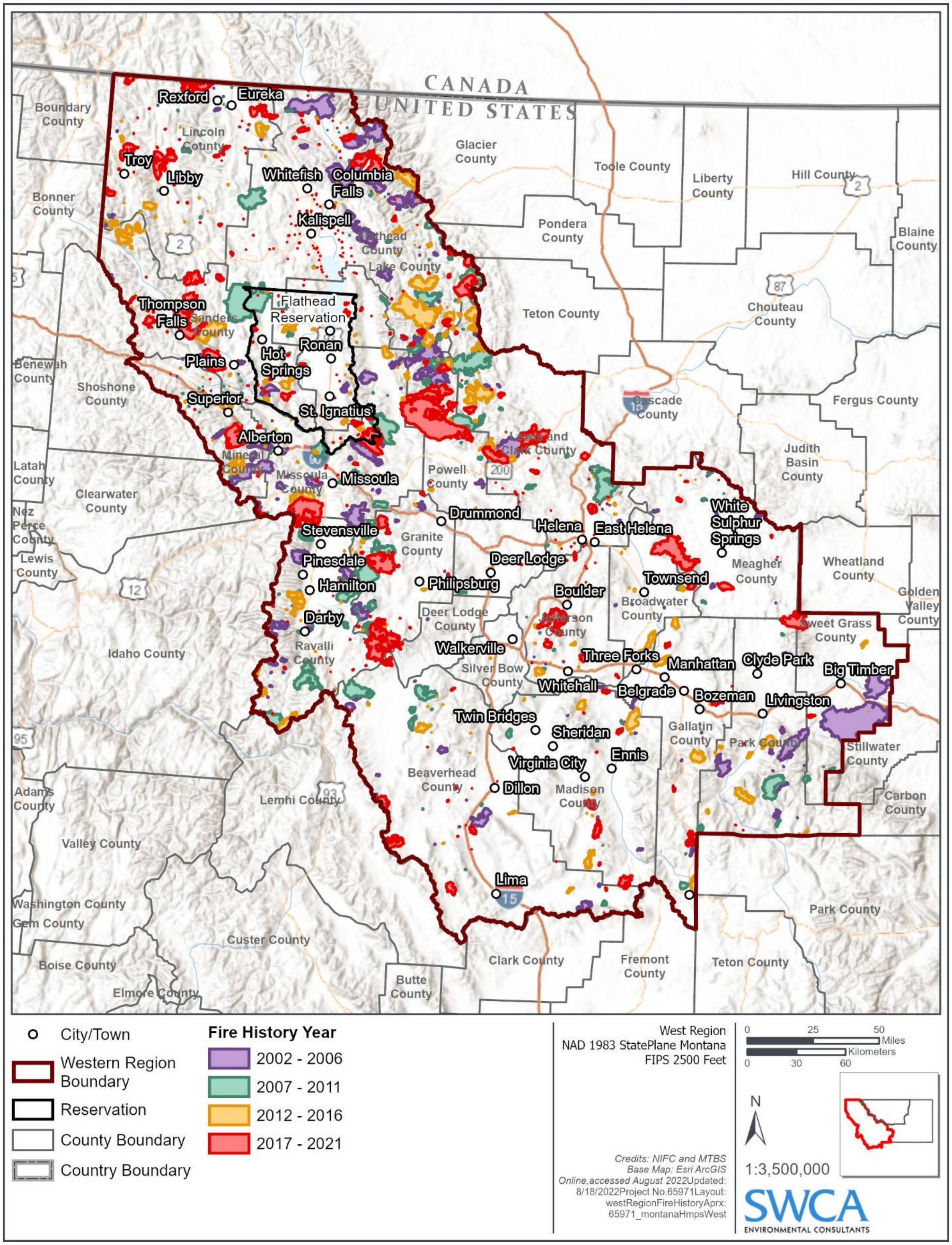
Source: MT DNRC 2022

Over the last 20 years, the larger fires in the Region have generally occurred in forested areas. Notable fire incidents occurred in the Bob Marshall Wilderness Complex, the Glacier National Park Region, the Bitterroot Divide, and the Sapphire Mountains. In recent years, a more notable forest fire was the Rice Ridge wildfire of 2017 (Figure 4-111). This was a lightning caused wildfire that burned 160,193 acres in the Lolo National Forest located to the north and east of Seeley Lake, Montana. This fire threatened over 1,000 homes, required over 700 firefighting personnel, and caused significant degradation to regional air quality. In total, it cost 33.8 million dollars to fight this fire. It should be noted that 2017, a particularly hot and dry summer (PRISM 2022), was one of the most destructive and costly wildfire seasons in recent history. In the Western Region alone, wildfires burned over 600,000 acres of land. Additional notable wildfires that season in the Western Region included the Meyers Fire (62,034 acres), the Lolo Peak Fire complex (53,902 acres), the Sapphire Fire Complex (43,733 acres), and the Alice Creek Fire (29,252 acres) (MT DNRC 2022).

Other historic fires in the Region include the Yellowstone Fires of 1988 which affected Park and Gallatin Counties and had a broader economic impact. The Great Fire of 1910 (also commonly referred to as the Big Blowup, the Big Burn, or the Devil's Broom fire) burned three million acres in two days in August 20-21, 1910, in Northern Idaho and Western Montana. It killed 87 people, mostly firefighters, destroyed numerous manmade structures, including several entire towns, and burned more than three million acres of forest with an estimated billion dollars' worth of timber lost. It is believed to be the largest, although not the deadliest, forest fire in U.S. history (Wikipedia accessed 11-2022). The fire is often considered a catalyst in the development of early wildfire prevention and suppression strategies of the U.S. Forest Service.

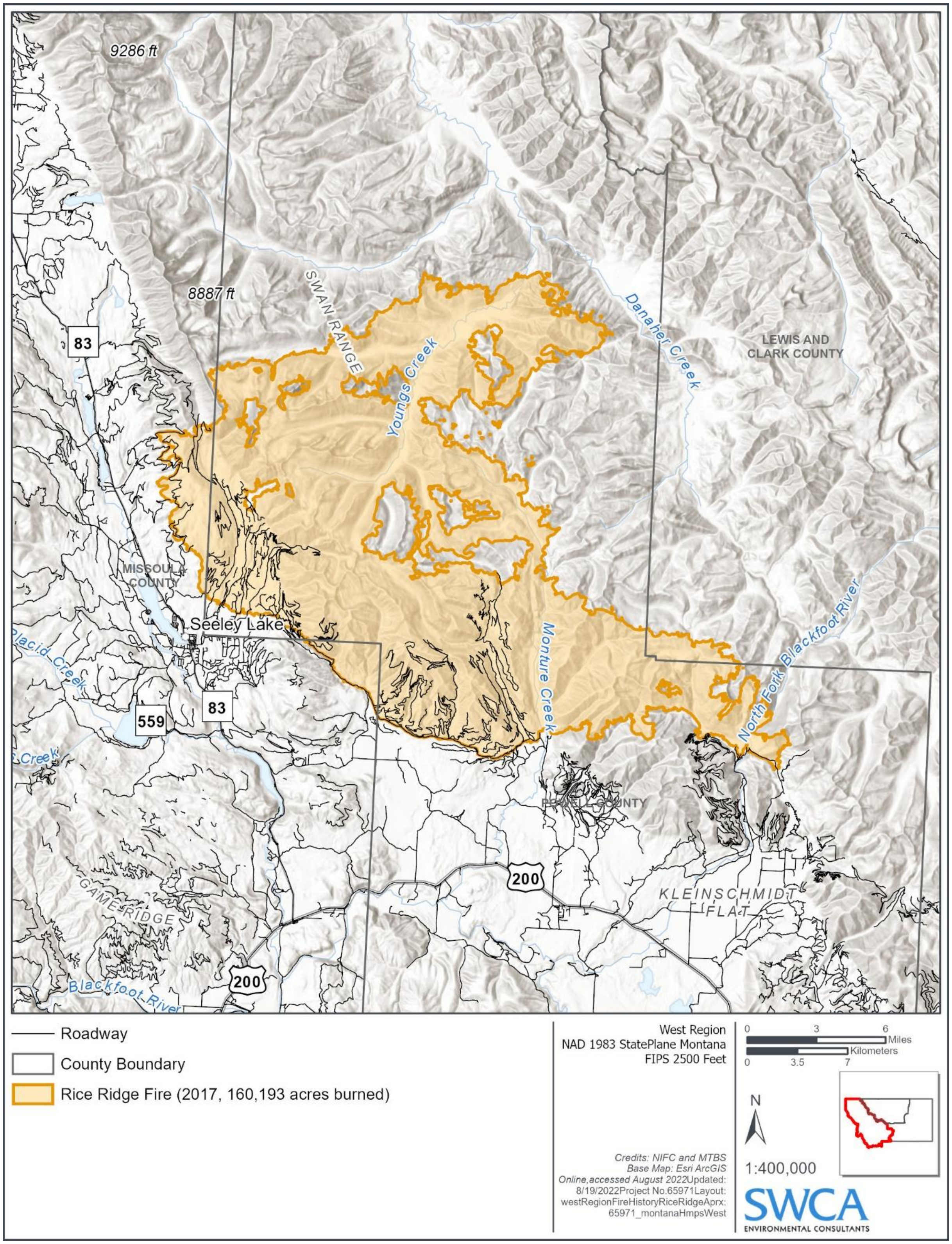
Rangeland wildfire can also occur in the Western Region. Rangeland fires can occur throughout the Region but are more likely to occur in the southern portions of the Region, where the majority of the rangelands are located. The largest rangeland fire in recent history was the large and destructive Derby Fire of 2006 (Figure 4-112). This fire occurred during drought conditions and burned 207,431 acres. Most of the burned acres were rangelands; however, large portions of forests also burned. This fire threatened Greycliff and Big Timber, MT. It destroyed 26 homes, and 20 outbuildings. The firefighting cost for this wildfire was estimated to be $22.5 million (Gallatin County Emergency Management 2016).

Figure 4-110 Fire History of Western Montana – Fire Perimeters, 2002 to 2021



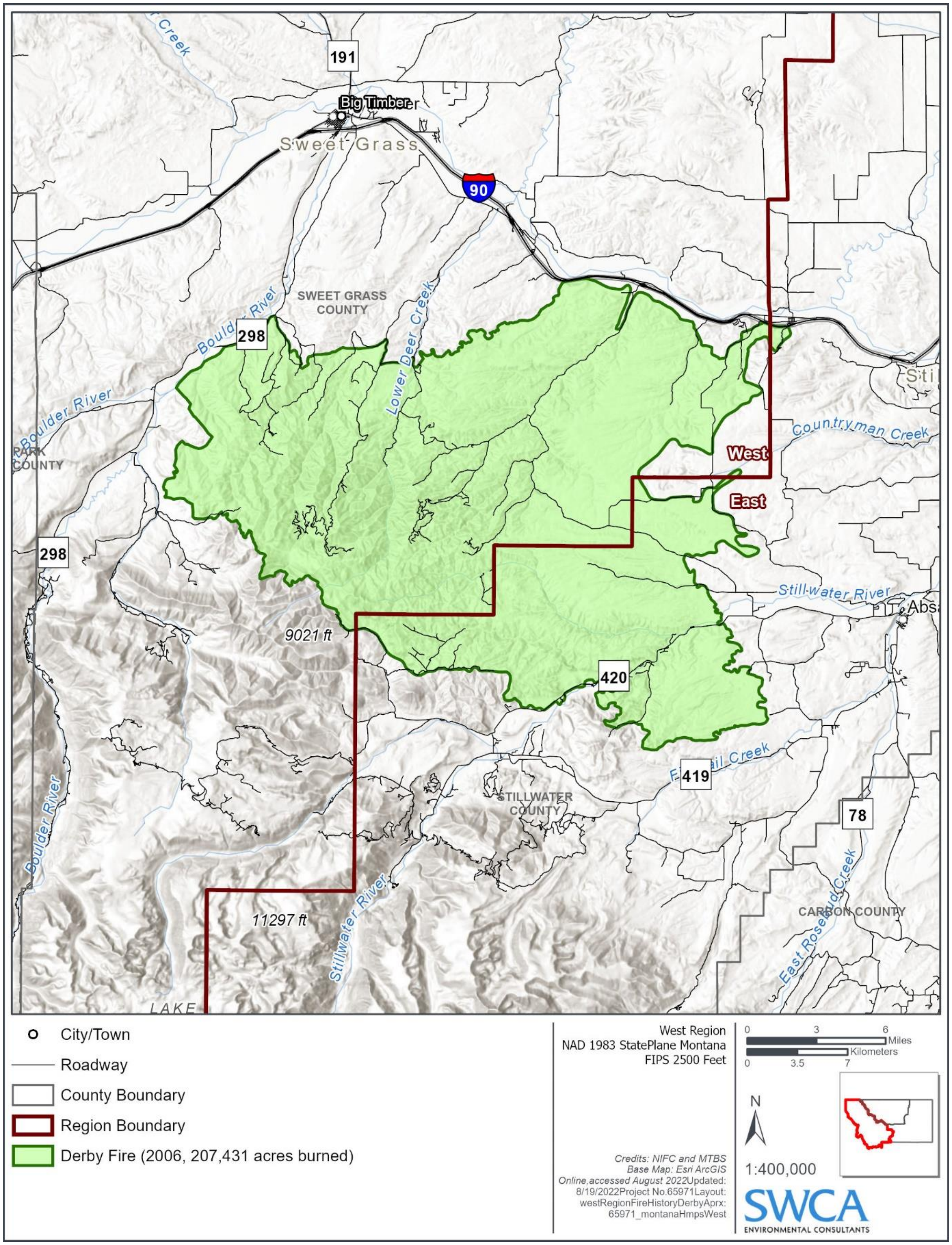
Source: MT DNRC 2022

Figure 4-111 Representative Large Forest Fire in the Western Region – Rice Ridge Fire of 2017



Source: MT DNRC 2022

Figure 4-112 Representative Large Rangeland Fire in the Western Region – 2006 Derby Fire



Source: MT DNRC 2022

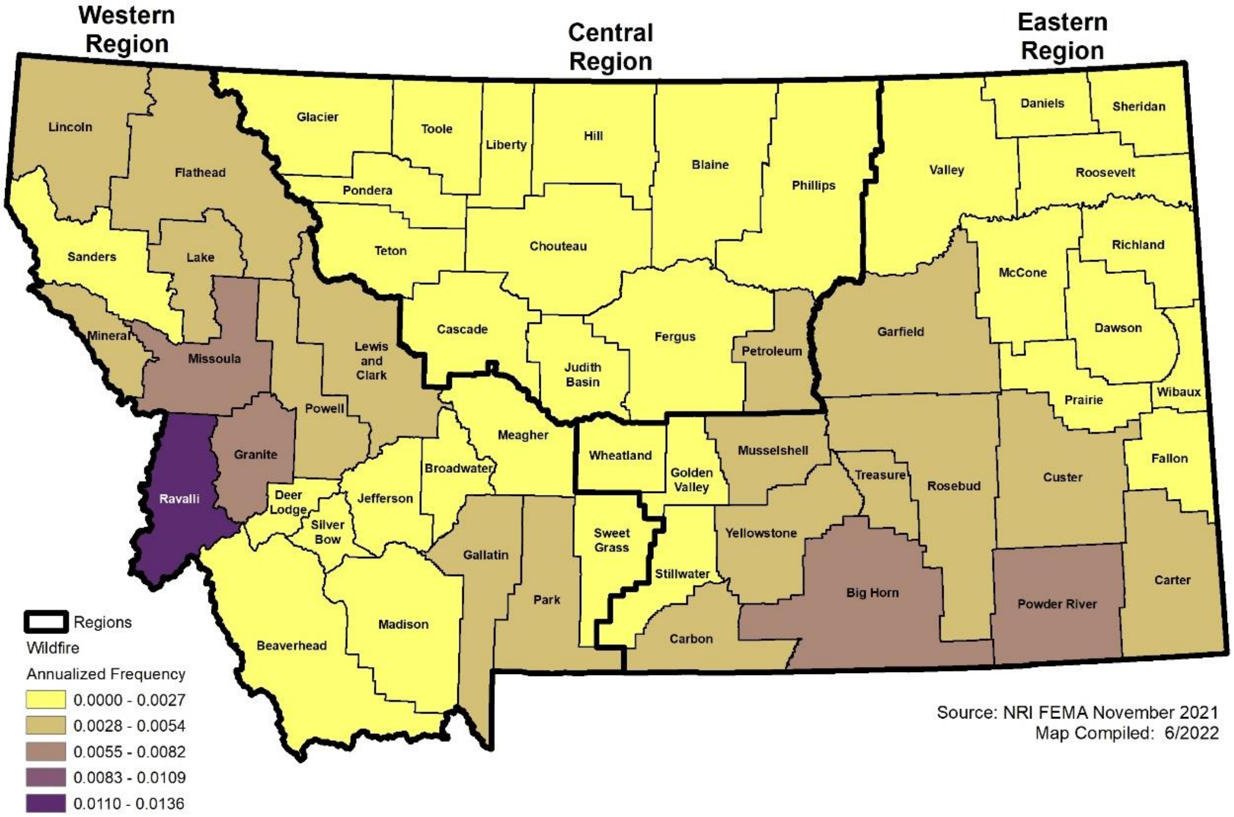
4.2.17.4 Frequency/Likelihood of Occurrence

Wildfires occur every year throughout the Region and could occur in any county in any given year. Generally, the forested regions of the Western Region exhibit a high annual burn probability, usually greater than 1% annual burn probability. The forests of the Bitterroot and Sapphire Mountains exhibit the highest annual burn probabilities in the Region. The rangelands are less likely to experience wildfire. Rangelands typically display a 0.1 to 0.2% annual burn probability. The counties with a proportion of forested lands are usually more likely to experience wildfire and experience larger wildfires (see Table 4-79 for summary breakdown of wildfire statistics by county). Counties with a larger proportion of rangelands are less likely to experience wildfire (Figure 4-114). While many rangeland wildfires in these counties can be small, it is very possible large rangeland fires can occur.

Wildfire risk is substantially higher during drought years. The 2017 Montana Climate Assessment confirms the years with the largest wildfires in Montana have normally occurred during periods of drought with associated high temperatures.

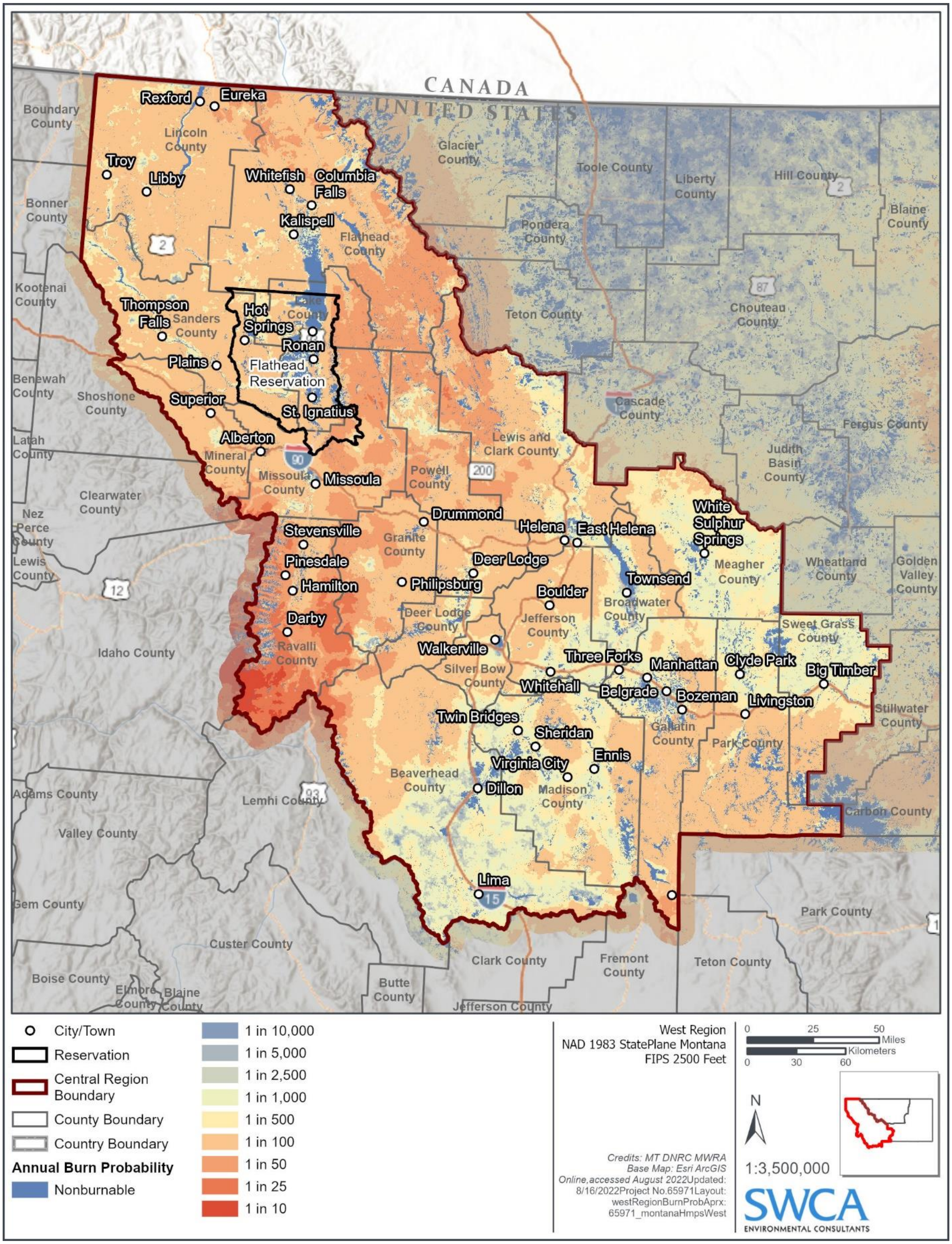
Figure 4-113 depicts the annualized frequency of wildfire at a county level based on the NRI. The mapping shows the greatest likelihood of occurrence in Ravalli County. Figure 4-114 below further details the burn probability for the Western Region at a more detailed level.

Figure 4-113 Annualized Frequency of Wildfire Events by County



Source: NRI FEMA November 2021
Map Compiled: 6/2022

Figure 4-114 Western Montana Region Annual Burn Probability



Source: MT DNRC 2022

Table 4-79 Average Number of Wildfires per year for Western Region Counties, 2002-2021

County/Reservation	Annual Number of Wildfire Occurrences (average, includes all ignitions)	Annual Average Size of Total Acreage of Wildfires
Anaconda-Deer Lodge	6.35	50.95
Beaverhead	27.05	6,155.85
Broadwater	4.80	1,708.58
Butte-Silver Bow	9.15	3.43
CSKT	78.85	4,240.67
Flathead	99.75	26,463.52
Granite	24.80	9,258.83
Jefferson	29.75	1,912.82
Lake	62.30	592.64
Lewis and Clark	43.55	14,634.36
Lincoln	96.50	6,359.54
Madison	13.50	2,476.74
Meagher	12.00	2,488.03
Mineral	47.65	4,741.38
Park	12.75	5,862.52
Powell	25.30	13,359.57
Ravalli	86.95	8,997.27
Sanders	65.30	12,607.78
Sweet Grass	9.80	9,796.25
Total	**749.75**	**131,659.78**

Source: MT DNRC 2022

4.2.17.5 Climate Change Considerations

Annual average temperatures in the planning area, including daily minimums and maximums have risen 2.0 – 3.0°F across the State between 1950 and 2015 (Whitlock et al 2017). Furthermore, Montana's growing season length has increased, as spring has come on earlier and fall freezes have occurred later. Between 1951 and 2010, Montana's growing season increased by 12 days. All regions of Montana are expected to experience warming in all seasons and under all future emissions scenarios. By 2050, Montana's average annual temperatures are expected to increase 4.5-6.0°F. Additionally, the number of days where 90°F will be exceeded will increase under future conditions. Finally, in Western Montana, there is expected to be increases in winter, spring, and fall precipitation, but decreases in summer precipitation, with substantial decreases in summer precipitation in the southern portion of Western Region (2017 Montana Climate Assessment).

Taken together these climate change effects have contributed to increases in wildfire frequency and severity across the State and will exacerbate the future fire conditions across Western Montana. These climate impacts are also affecting forest and rangeland health. Hotter and longer summers and prolonged drought are known to put increased physiological stress on trees and increase mortality caused by diseases such as, mountain pine beetle, Douglas-fire beetle, and spruce budworm, among others. Degraded forest health, significantly attributed to climate change, has already been linked with increased fire risk throughout large portions of Western Montana's forested regions. Climate change associated disease outbreaks in Western Montana's forested areas further build up in hazardous fuels (2017 Montana Climate Assessment).

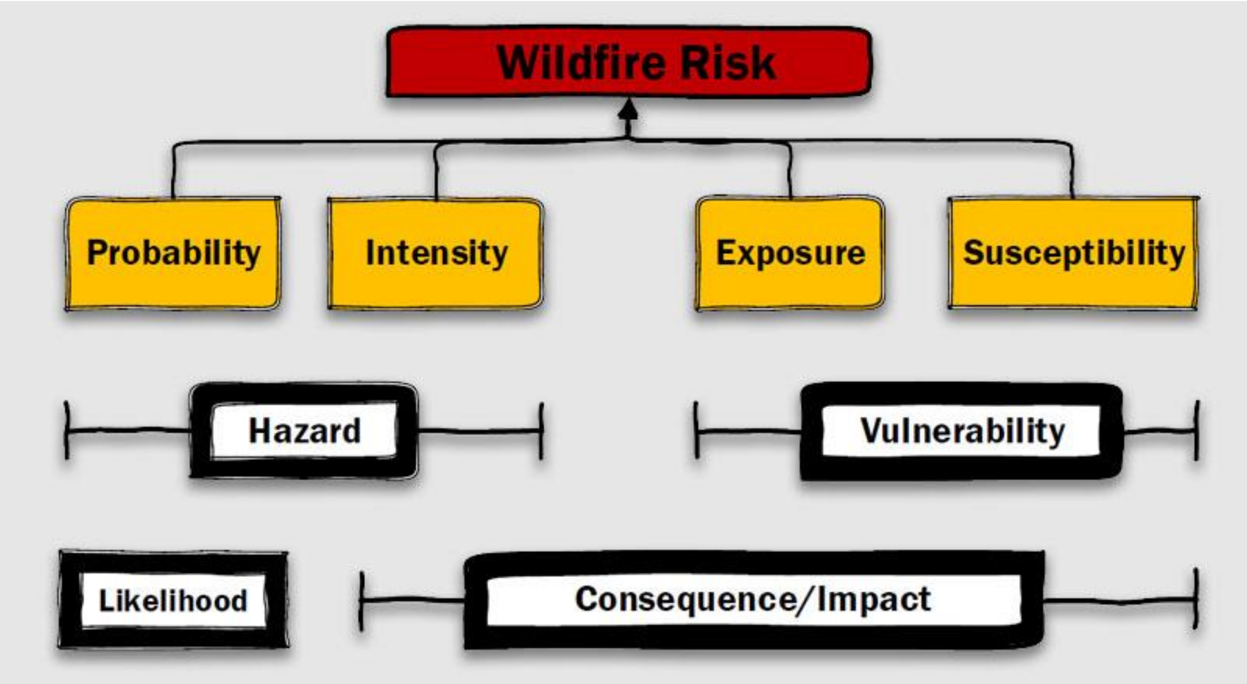
Additionally, climate change can result in an increase in invasive grass and weed abundance in grasslands and rangelands, which can contribute to increased wildfire risk in these systems (Whitlock et al 2017). Additionally, wetter winters and springs combined with hotter and drier summers will likely result in higher loading of dry fine fuels, which will also contribute to increased wildfire risk (Whitlock et al 2017). As the fire season increases there will be a higher likelihood of wildfires coinciding with high wind events during fall, winter, and spring storms, especially during drought years. When wildfire, wind, and drought converge they can create conditions for particularly destructive wildfires, even outside of the traditional wildfire season (e.g., the Denton, MT West Wind Fire of December 2021, a wildfire that occurred in the Central Region).

4.2.17.6 Potential Magnitude and Severity

Montana Wildfire Risk Assessment

The MWRA provides information about the wildfire hazard and risk to highly values resources and assets (HVRAs) across Montana. This information is essential for planning wildfire response, fuel management, and land planning. The MWRA is a quantitative assessment of how human and natural resources are both influenced and affected by wildfire. The MWRA considers the following statewide spatial components when quantifying wildfire risk: likelihood of fire burning, the intensity of a potential fire, the exposure of assets and resources based on their location, and the susceptibility of those assets and resources (MT DNRC 2020c). Wildfire vulnerability to wildfire is determined by wildfire exposure and susceptibility, whereas wildfire hazard is determined by wildfire intensity and wildfire probability.

Figure 4-115 Conceptual Breakdown of the Components and Meaning of the Montana Wildfire Risk Assessment



Source: MT DNRC 2022

MWRA Components

Wildfire Hazard

Wildfire hazard is determined by wildfire intensity and wildfire probability (MT DNRC 2022). Areas that experience frequent and intense wildfire have the greatest wildfire hazard, while areas that experience low intensity fires over longer time scales have the lowest wildfire hazard.

Wildfire likelihood is the annual probability of wildfire burning in a specific location. At the community level, wildfire likelihood is averaged where housing units occur. It is the probability that any specific location may experience wildfire in any given year. It does not say anything about the intensity of fire if it occurs. Wildfire likelihood is derived from fire behavior modeling across thousands of simulations of possible fire reflect any currently forecasted weather or fire danger conditions (MT DNRC 2022). The forested and rangeland portions of Western Montana are more likely to experience wildfire in a given year, while agricultural areas and alpine areas above tree line are less likely to experience wildfire (Figure 4-114).

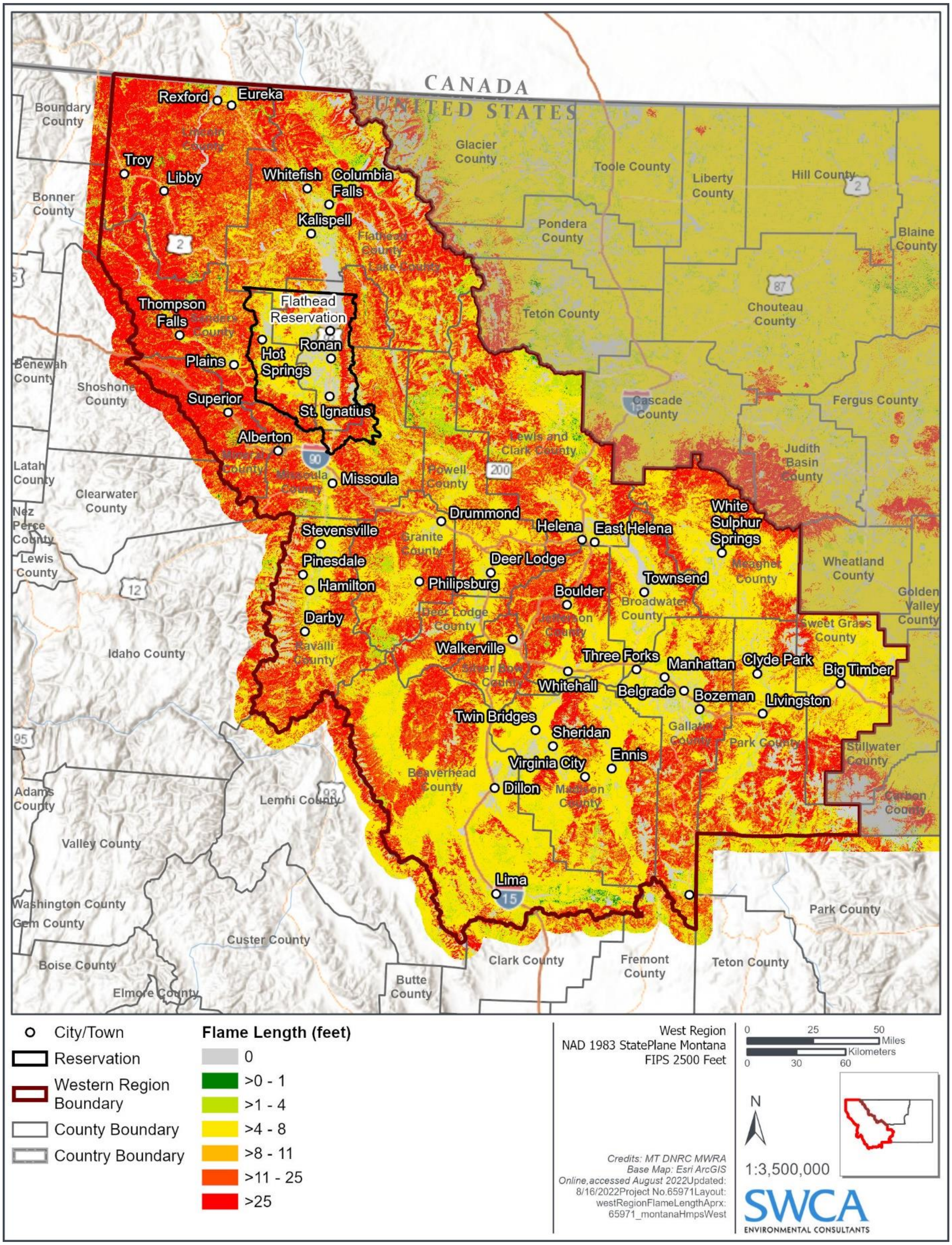
Wildfire intensity is a measure of the energy expected from a wildfire and is mainly determined by the topography and vegetative fuels of a landscape. Greater fuel loads (e.g., forests compared to grass lands), especially on steeper terrain, typically produce greater wildfire intensity. Wildfire intensity is technically measured in units of heat transfer per length of fire perimeter. However, it can also be observed and expressed in terms of flame length (MT DNRC 2022). The MWRA (MT DNRC 2022) uses wildfire intensities calculated in fire behavior modeling simulations. Tall flame lengths (i.e., more intense fires) are more likely to occur in regions comprised of forested areas (Figure 4-116). More intense and taller fires are usually more difficult to control (Table 4-80).

Table 4-80 Control Efforts Associated with Different Flame Lengths

Flame Length	Interpretations
Less than 4 feet	Fires can generally be attacked at the head or flanks by firefighters using hand tools. Handline should hold fire.
4 to 8 feet	Fires are too intense for direct attack in the head with hand tools. Handline cannot be relied on to hold the fire. Dozers, tractor-plows, engines, and retardant drops can be effective.
8 to 11 feet	Fires may present serious control problems: torching, crowning, and spotting. Control efforts at the head will probably be ineffective.
over 11 feet	Crowning, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.

Source: Andrews et al. 2011

Figure 4-116 Western Montana Region Estimated Flame Length



Source: MT DNRC 2022

Vulnerability

Wildfire vulnerability to wildfire is determined by wildfire exposure and susceptibility (MT DNRC 2022). For example, fire susceptible structures and/or infrastructure located in high fire intensity and high fire likelihood environments would have high exposure and high susceptibility to fire. In other words, they would be vulnerable to wildfire.

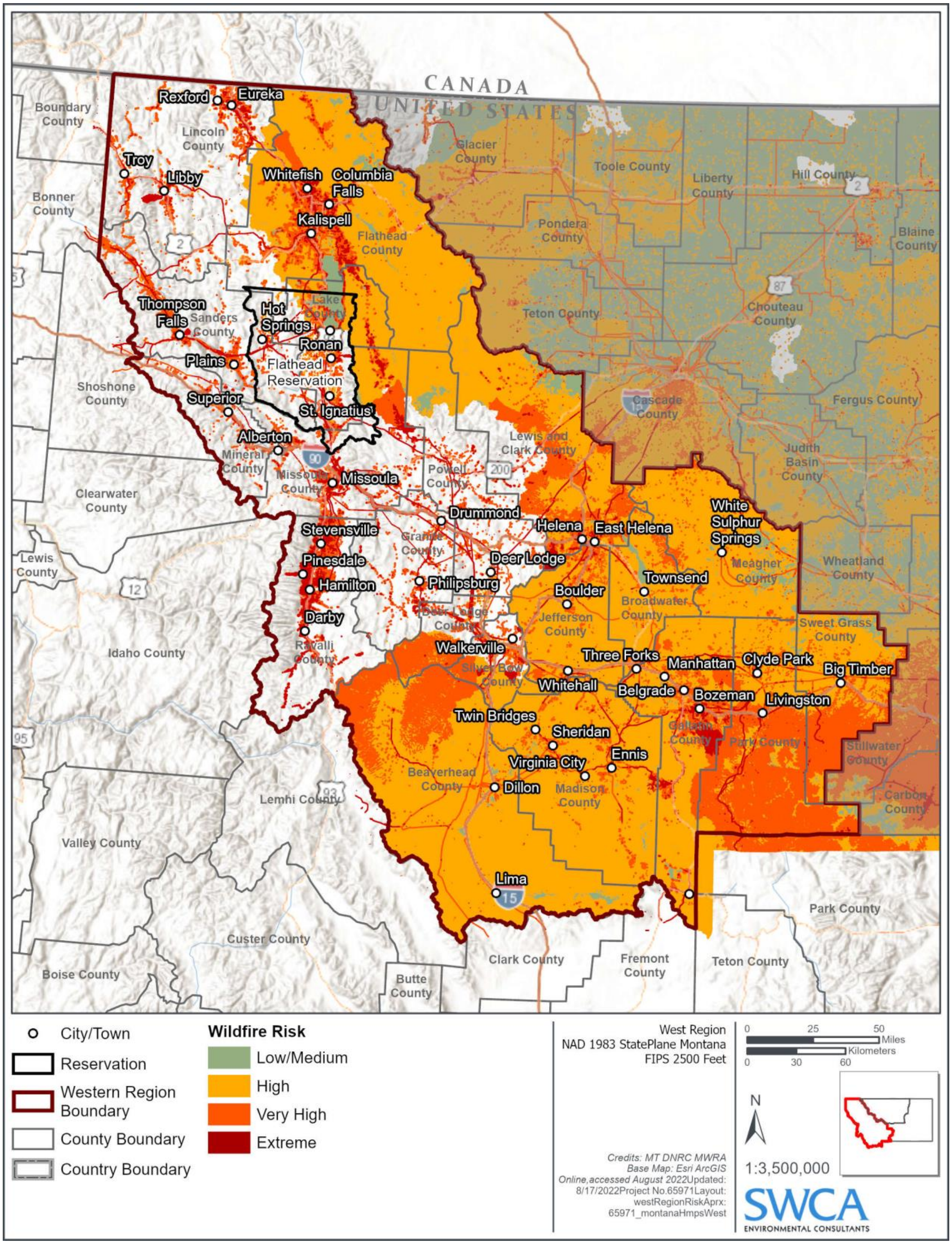
Wildfire exposure is the spatial coincidence of wildfire likelihood and intensity to homes and communities. Homes are exposed to wildfire if they are located where there is any chance wildfire could occur (i.e., burn probability is greater than zero). Communities can be directly exposed to wildfire from adjacent wildland vegetation (e.g., homes situated in a forest), or indirectly exposed to wildfire from embers and home-to-home ignition (MT DNRC 2022).

Wildfire susceptibility is the propensity of a home or community to be damaged if a wildfire occurs. The susceptibility of a HVRA to wildfire is determined by how easily it is damaged by varying degrees of wildfire intensity and type. Assets that are fire hardened and can withstand very intense fires without damage (i.e., low susceptibility), whereas non-fire-hardened structures are more easily damaged by fire (i.e., high susceptibility). The MWRA generalizes the concept of susceptibility. The MWRA assumes all homes that encounter wildfire will be damaged, and the degree of damage is directly related to wildfire intensity. The greater the wildfire intensity, the greater the percent damage to the structure. A community's wildfire risk is the combination of likelihood and intensity (together called "hazard") and exposure and susceptibility (together called "vulnerability") (MT DNRC 2022).

Wildfire Risk

As described previously, wildfire risk is calculated by combining the following components: likelihood of fire burning, the intensity of a potential fire, the exposure of assets and resources based on their location, and the susceptibility of those assets and resources (MWRA 2022). To quantitatively assess wildfire risk MWRA utilized an expected net value change (eNVC) analysis. The eNVC is an effects analysis that helps to quantify wildfire risk to various HVRA for example homes, infrastructure, water resources, utility lines etc. (Finney, 2005; Scott et al., 2013; MT DNRC 2020c). The methodology is described in detail in the MWRA Report (https://mwra-mtdnrc.hub.arcgis.com/documents/montana-wildfire-risk-assessment-report/explore) The overall risk of loss to those HVRAs is categorized from low to extreme (Figure 4-117).

Figure 4-117 Western Region Wildfire Risk Summary as Determined by eNVC



*Blank areas have burnable fuels but no HVRAs have been mapped for the area (MT DNRC 2020c).
Source: MT DNRC 2022

The risk to highly valued resources and assets from wildfire varies from medium to extreme throughout the Region but the risk from wildfire to people and property is usually greatest within and near the inhabited areas (see extreme risk ratings in inhabited areas in Figure 4-117). The municipalities most notably at risk from wildfire include most of the Bitterroot Valley, Whitefish, Thompson Falls, Missoula, Bozeman's suburban and exurban areas, Helena, Libby, and Eureka, among others. Across the Region, agricultural areas generally have low to medium risk from wildfire (e.g., agricultural areas near Townsend, MT), while the rangelands and forested areas are at high risk to very high risk from wildfire, respectively. Forests and rangelands in areas with more complex topography and/or drier climates generally have higher risk than forests and rangelands on flatter or less complex topography.

However, most of the towns and municipalities throughout the Region have high to extreme risk from wildfire regardless of the risk of surrounding landscape. This is because the expected net value change (eNVC) risk assessment model provides more weight in assessing detrimental changes (or expected losses) to structures and infrastructure than to wildlands or agricultural areas. Thus, HVRAs (typically structures or infrastructure) are given higher levels of weight (i.e., importance) in the model. The results of these expected losses are then summed by each pixel displayed in the map. Thus, areas (or pixels) with a high concentration of HVRAs (e.g., towns and municipalities) will display far greater risk to wildfire even if the likelihood of fire occurring on the surrounding landscape is low. Thus, the results of these eNVC risk assessment should be interpreted with caution.

To summarize, the observed trends are mainly driven by risk to structures and infrastructure within the Region's towns and municipalities. Most of these structures/infrastructures are susceptible to fire (where they tend to be damaged if a wildfire occurs) and are exposed (located where there is a chance wildfire could occur) to wildfire occurrence, which accounts for the high vulnerability and risk overall (Figure 4-117).

Generally, towns/municipalities surrounded by undeveloped forests and rangelands (i.e., landscapes with a higher probability of fire occurring and fire spreading) have higher levels of risk to wildfire than towns surrounded by more agricultural areas. However, agricultural fires can and do occur, such as the Denton fire of 2021.

The MWRA was developed by the MT DNRC at the statewide scale. Assessments at these scales may omit finer resolution, and more precise assessment of risk, as well as input by local subject matter experts. Many countywide or multi-county community wildlife protection plans (CWPPs) have been developed for counties covering the Western Region. For example, the 2020 Tri-County CWPP for Broadwater, Jefferson, and Lewis and Clark County provides a fine-scale local, wildfire risk assessment that incorporates recent wildfire effects, community input, and recent wildfire mitigation efforts (Tri-County CWPP 2020). In the event that a County has recently completed a CWPP with fine-scale risk assessment, land managers and fire responders should carefully consider if those locally derived assessments provide a more accurate, authoritative dataset for use in addressing and mitigating wildfire risk, than the statewide assessment.

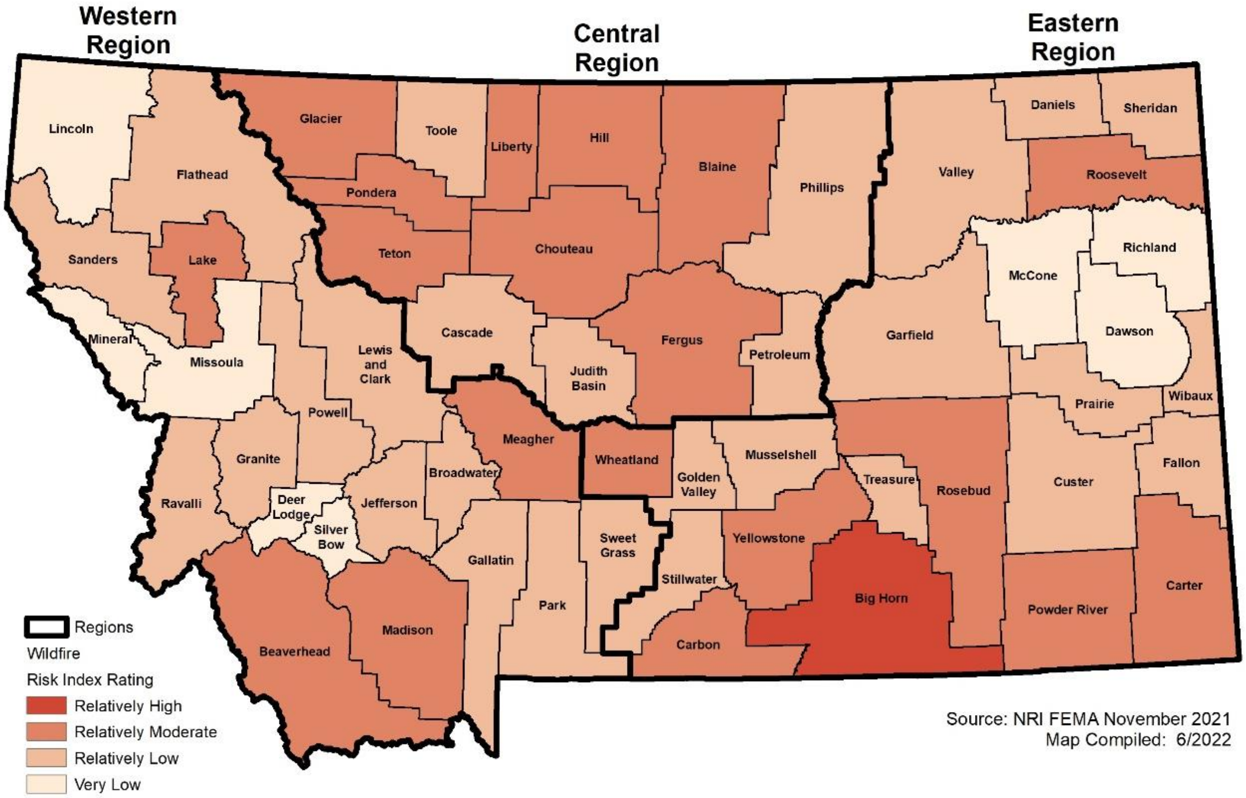
4.2.17.7 Vulnerability Assessment

The wildfire *Vulnerability Assessment* identifies, or at least discusses, *assets* that are *likely to be exposed* to wildfire hazards, are *susceptible* to damage from that exposure, and the potential consequence of exposure. In this context, *assets* are (1) people, (2) property, (3) critical facilities and lifelines, (4) the economy, (5) historic and cultural resources, and (6) natural resources. *Exposure* indicates interacting with wildfire hazards, and *likely to be exposed* indicates a presence in areas deemed to be especially likely to experience wildfire hazards. *Susceptible* indicates a strong likelihood of damage from exposure to wildfire hazards, a concept that is described in greater detail in Section 4.2.1, subsection titled *Vulnerability Assessment*. Climate change is a large concern for wildfire hazards in the Western Region. The reasons and ramifications of climate change effects on wildfire are complex (see section titled *Climate Change Considerations*, above).

Development in the Western Region is considered below in the subsection titled *Development Trends Related to Hazard and Risk*.

The NRI risk index rating for wildfire in the Western Region is shown in Figure 4-118. The risk index rating considers impacts to many types of assets and provides insight to the overall significance of wildfire hazards in jurisdictions throughout the Western Region. A deeper analysis of the vulnerability of each type of asset to wildfire hazards in Western Region jurisdictions is provided below.

Figure 4-118 Risk Index Rating for Wildfire by County



Source: NRI FEMA November 2021
Map Compiled: 6/2022

People

The most exposed population are those that are living within the WUI. The WUI in the Western Region is expansive, but generally, population densities within the WUI are highest in the Region's more-populated municipalities/towns. More-populated areas, generally, have more property and, thus, a greater degree of property exposure to wildfire. The greater property exposure (e.g., greater wildfire risk to structures and infrastructure) puts greater portions of the population in a vulnerable position to negative effects of wildfire. The vulnerability to property is discussed further below.

People can also experience deleterious mental and physical health effects from fire. A study conducted in California found that extreme wildfire (and it associated impacts) can result in post-traumatic stress disorder, depression, and exacerbate pre-existing mental illness (Silveira et al 2021). Another study conducted in California found that particulate air pollution from wildfire had greater impacts on respiratory health than particulate air pollution from traditional sources (e.g., vehicle and power plant emissions) (Aguilera et al 2021). In Montana specifically, a study conducted on pulmonary function for community members living in Seeley Lake found that that lung function diminished significantly when exposed to extreme levels of smoke during the 2017 wildfire season (mostly due to the Rice Ridge Fire) and that lung function continued to decline even one year post fire (Orr et al 2022). In the Western U.S, ten of the largest years for wildfire (by total acres burned) have occurred since 2004. These large wildfires have been directly linked to poor air quality and have led to adverse physical and mental health effects and costs to society (EPA 2022). As climate change progresses, it is likely Western Montana will have larger and more frequent wildfires. Planning to address the needs of populations at risk will be become increasingly important to mitigate property damage and health impacts from wildfire.

Populations especially at risk from wildlife include socially vulnerable populations. As defined by the U.S Forest Services Wildfire Risk to Communities (USFS 2022) socially vulnerable populations include the following: families living in poverty, people with disabilities, people over 65 years, people who have difficulty with English, households with no car, and people living in mobile homes. In order to determine the total general population living in wildfire risk areas, the structure count of residential buildings within the various wildfire risk areas was calculated, and then the census estimated household size for each county was multiplied by the total number of structures. This provides an estimated figure for the number of residents living in areas exposed to elevated wildfire risk. Across the Western Region counties, there are an estimated 16,572 residents exposed to high-risk wildfire areas, 242,745 residents exposed to very high-risk wildfire areas, and 251,898 residents exposed to Extreme risk wildfire areas (Table 4-81).

Wildland fire fighters are a population at risk from wildfire. Wildland fire fighting is an inherently dangerous profession where firefighters risk their health and lives while battling fires. During the 2017 Lolo Peak Complex, two wildland fire fighters were killed while battling the fire (Reuters, 2017). Wildland fire fighters are especially vulnerable to medium- and long-term health and safety risks associated with smoke and chemical inhalation and other conditions while firefighting, as well as immediate risks that may endanger their lives due to the fire environment.

Table 4-81 Population Within Wildfire Risk Areas

County	High-Risk Population	Very High-Risk Population	Extreme Risk Population
Anaconda-Deer Lodge	*138*	*1,836*	*6,958*
Beaverhead	1,444	4,736	614
Broadwater	1,308	3,710	214
Butte-Silver Bow	878	15,918	5,056
Flathead	1,031	54,714	49,027
Gallatin	2,697	36,585	34,260
Granite	36	1,471	3,514
Jefferson	1,365	8,369	3,763
Lake	1,092	14,804	9,909
Lewis & Clark	1,361	26,905	24,809
Lincoln	394	10,356	11,829
Madison	2,214	5,251	4,203
Meagher	257	1,301	1,140
Mineral	15	1,543	2,809
Missoula	*587*	*29,211*	*51,831*
Park	657	6,914	7,925
Powell	135	1,732	3,448
Ravalli	46	9,213	30,712
Sanders	381	6,765	4,235
Sweet Grass	388	1,412	1,564
Total	**16,426**	**242,745**	**257,820**

Source: MSDI 2022, MWRA, US Census Bureau

*Italicized counties are included in analysis totals, but are not participating in the regional plan

Property

The potential impacts of wildfire on property include crop loss, timber loss, injury and death of livestock and pets, and damage to infrastructure, homes and other buildings located throughout the wildfire risk area. The greatest potential impact on property, buildings and infrastructure is likely to occur to those structures 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.

Federal, state, and county lands throughout the Eastern Regions have high amounts of property and infrastructure that are susceptible to wildfire. Repairing or replacing public property lost or damaged by wildfire can exhaust budgets, result in degraded infrastructure (e.g., damaged roads and recreational facilities), and degrade the value of natural resources (which could inhibit leasing efforts and result in lost revenue generation). There are multiple state and federal grants available which can ease costs due to damages from wildfire (MT DNRC 2022b; FEMA 2022).

Another method of estimating vulnerability is to determine the value of structures that are located within wildfire risk areas. For this plan update loss estimations for the wildfire hazard were modeled by using April 2022 MSDI Cadastral Parcel layer 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 then intersected with the MWRA data. Wildfires typically result in a total building loss, including contents. Content values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for commercial and exempt structures, 50% for residential structures and 100% for vacant improved land. Improved and contents values were summed to obtain a total exposure value. Table 4-82, Table 4-83, and Table 4-84 summarize the estimated exposed value of improvements in each wildfire risk category. Figure 4-119, Figure 4-120, and Figure 4-121 summarize these data in charts.

Table 4-82 Exposure and Value of Structures at High Risk to Wildfire by County

County	Improved Parcels	Improved Value	Content Value	Total Value	Loss Ratio
Anaconda-Deer Lodge	*91*	*$16,879,244*	*$10,622,937*	*$27,502,181*	*2%*
Beaverhead	1,030	$224,290,699	$147,702,695	$371,993,394	22%
Broadwater	809	$190,561,047	$111,542,331	$302,103,378	25%
Butte-Silver Bow	511	$241,293,188	$204,382,523	$445,675,711	3%
Flathead	654	$327,153,361	$233,083,626	$560,236,987	1%
Gallatin	*1,554*	*$830,642,479*	*$532,983,121*	*$1,363,625,600*	*4%*
Granite	18	$4,556,268	$3,400,659	$7,956,927	1%
Jefferson	664	$126,106,685	$78,967,813	$205,074,498	12%
Lake	533	$116,138,844	$77,650,402	$193,789,246	4%
Lewis and Clark	755	$264,504,766	$156,750,798	$421,255,564	3%
Lincoln	223	$47,301,937	$27,967,464	$75,269,401	2%
Madison	1,378	$1,271,056,383	$722,090,592	$1,993,146,975	21%
Meagher	228	$48,841,582	$39,906,031	$88,747,613	15%
Mineral	8	$1,765,276	$958,253	$2,723,529	0.3%
Missoula	*300*	*$263,145,029*	*$151,657,032*	*$414,802,061*	*1%*
Park	538	$260,728,820	$189,786,880	$450,515,700	6%
Powell	91	$22,252,379	$13,766,860	$36,019,239	3%
Ravalli	27	$9,181,237	$5,447,324	$14,628,561	0.1%
Sanders	270	$47,820,415	$35,658,115	$83,478,530	4%
Sweet Grass	372	$107,428,827	$85,967,724	$193,396,551	19%
Total	**10,054**	**$4,421,648,466**	**$2,830,293,175**	**$7,251,941,641**	**4%**

Source: MSDI 2022, MWRA *Italicized counties are included in analysis totals, but are not participating in the regional plan

Table 4-83 Exposure and Value of Structures at Very High Risk to Wildfire by County

County	Improved Parcels	Improved Value	Content Value	Total Value	Loss Ratio
Anaconda-Deer Lodge	*988*	*$154,696,480*	*$81,687,695*	*$236,384,175*	*21%*
Beaverhead	2,476	$425,854,983	$226,486,228	$652,341,211	52%
Broadwater	1,903	$350,420,549	$183,495,344	$533,915,893	60%
Butte-Silver Bow	8,258	$1,504,470,121	$847,041,977	$2,351,512,098	54%
Flathead	23,306	$7,273,646,655	$4,005,689,117	$11,279,335,772	50%
Gallatin	*16,106*	*$7,181,749,851*	*$3,869,272,880*	*$11,051,022,731*	*44%*
Granite	766	$164,599,464	$97,580,741	$262,180,205	30%
Jefferson	3,290	$796,755,560	$413,658,239	$1,210,413,799	58%
Lake	6,658	$1,695,481,672	$955,126,115	$2,650,607,787	50%
Lewis and Clark	11,882	$2,710,857,875	$1,483,605,654	$4,194,463,529	45%
Lincoln	5,062	$878,048,821	$497,210,940	$1,375,259,761	46%
Madison	2,572	$1,818,616,729	$944,935,629	$2,763,552,358	39%
Meagher	613	$83,235,462	$50,539,176	$133,774,638	39%
Mineral	844	$144,188,735	$86,896,888	$231,085,623	37%
Missoula	*13,042*	*$4,083,489,798*	*$2,212,655,168*	*$6,296,144,966*	*32%*
Park	3,613	$1,338,610,640	$759,429,142	$2,098,039,782	42%
Powell	984	$249,839,507	$163,489,255	$413,328,762	31%
Ravalli	4,787	$1,450,607,195	$899,516,300	$2,350,123,495	25%
Sanders	3,747	$647,617,544	$384,519,281	$1,032,136,825	58%
Sweet Grass	658	$164,954,516	$97,126,001	$262,080,517	33%
Total	**111,555**	**$33,117,742,157**	**$18,259,961,765**	**$51,377,703,922**	**43%**

Source: MSDI 2022, MWRA *Italicized counties are included in analysis totals, but are not participating in the regional plan

Table 4-84 Exposure and Value of Structures at Extreme Risk to Wildfire by County

County	Improved Parcels	Improved Value	Content Value	Total Value	Loss Ratio
Anaconda-Deer Lodge	*3,523*	*$386,029,309*	*$199,023,794*	*$585,053,103*	*74%*
Beaverhead	320	$40,669,267	$22,877,825	$63,547,092	7%
Broadwater	111	$13,039,203	$7,042,727	$20,081,930	3%
Butte-Silver Bow	2,575	$313,692,710	$164,372,132	$478,064,842	17%
Flathead	19,866	$5,541,787,546	$2,851,077,342	$8,392,864,888	43%
Gallatin	*14,829*	*$6,126,881,271*	*$3,324,111,075*	*$9,450,992,346*	*40%*
Granite	1,519	$217,228,561	$111,985,454	$329,214,015	59%
Jefferson	1,473	$273,083,764	$143,490,526	$416,574,290	26%
Lake	4,164	$958,311,351	$514,127,032	$1,472,438,383	31%
Lewis and Clark	10,806	$2,239,000,809	$1,180,186,156	$3,419,186,965	41%
Lincoln	5,348	$785,210,773	$435,947,785	$1,221,158,558	49%
Madison	2,033	$965,382,563	$496,756,440	$1,462,139,003	31%
Meagher	512	$56,523,960	$30,701,420	$87,225,380	33%
Mineral	1,329	$174,799,880	$95,121,565	$269,921,445	58%
Missoula	*22,563*	*$5,587,451,245*	*$2,903,542,310*	*$8,490,993,555*	*56%*
Park	1,018	$326,676,571	$169,554,682	$496,231,253	12%
Powell	1,757	$223,405,244	$121,192,911	$344,598,155	55%
Ravalli	13,433	$3,122,609,560	$1,712,064,030	$4,834,673,590	70%
Sanders	2,051	$242,274,036	$131,851,490	$374,125,526	32%
Sweet Grass	683	$124,553,378	$70,133,348	$194,686,726	34%
Total	**112,855**	**$28,374,730,589**	**$15,022,188,600**	**$43,396,919,189**	**43%**

Source: MSDI 2022, MWRA *Italicized counties are included in analysis totals, but are not participating in the regional plan

Figure 4-119 Total Improved Parcels in Wildfire Risk Areas by County

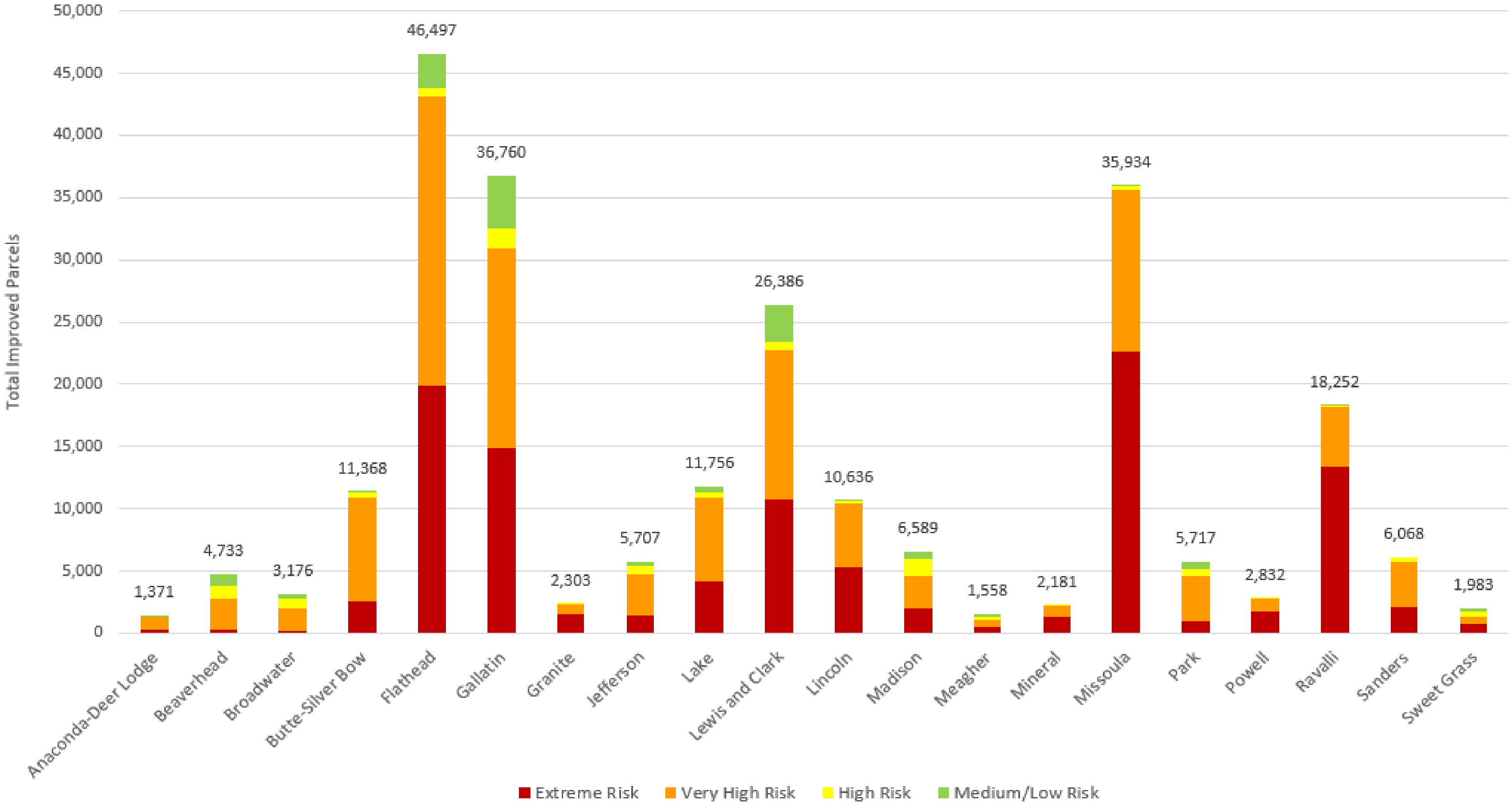


Figure 4-120 Total Improved Parcels (Values) in Wildfire Risk Areas by County

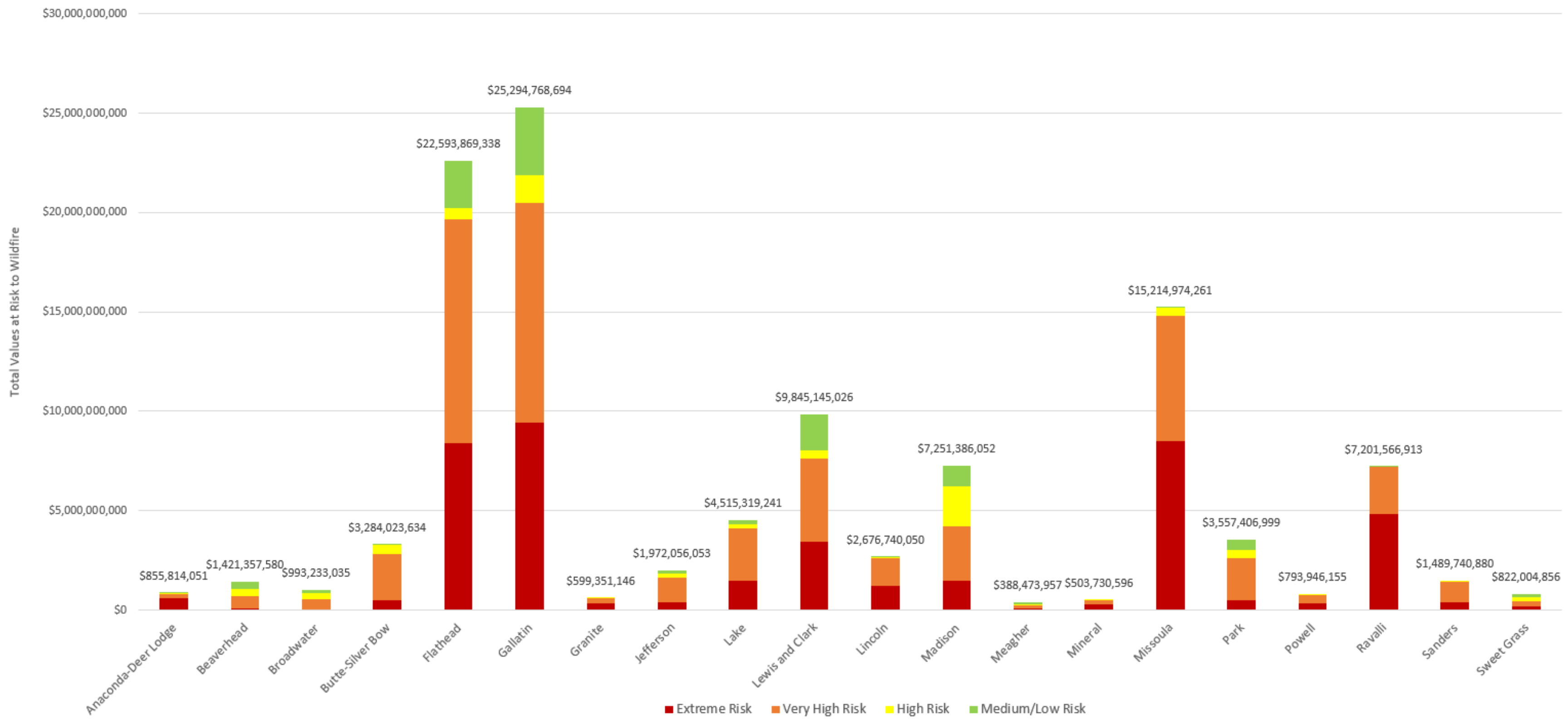
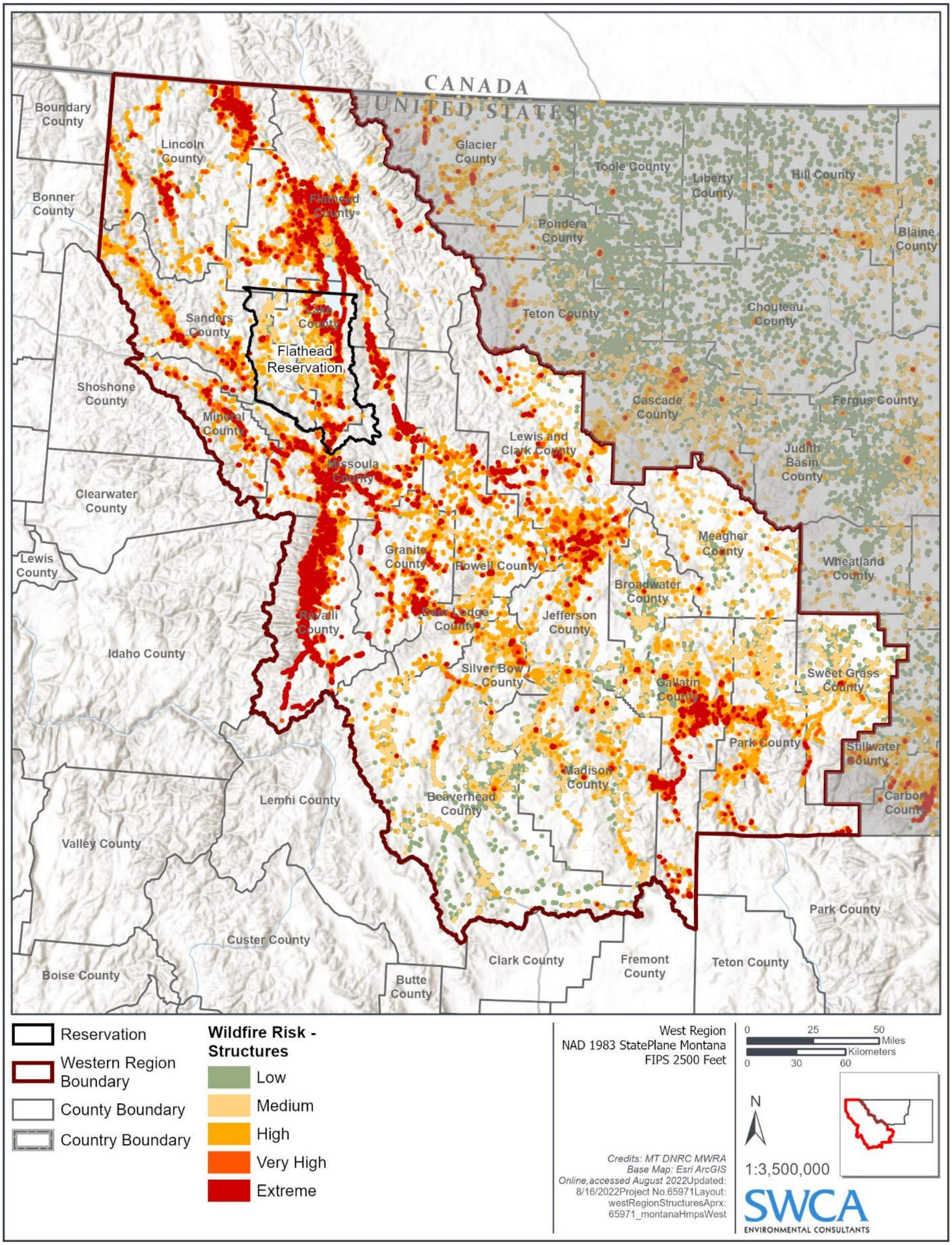


Figure 4-121 Wildfire Risk to Structures in the Western Region



Source: MT DNRC 2022

Critical Facilities and Lifelines

Buildings, equipment, vehicles, and communications and utility infrastructure are exposed and lost to wildfires every year. Potential risk exists to water treatment facilities, government buildings, public safety facilities and equipment, and healthcare services. Scour on bridge pilings may result in bridge and road closures. 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 vulnerability analysis was performed similarly to the property vulnerability analysis, by intersecting the MWRA data with critical facility data from HIFLD, Montana DES, and NBI. Summary tables of these results are shown below in Table 4-85, Table 4-86, and Table 4-87 summarize the type and number of facilities in each county that are located in high, very high, or extreme wildfire risk areas.

Table 4-85 Critical Facilities at Risk to Extreme Wildfire Hazards

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Beaverhead	10	3	7	0	3	9	4	**36**
Broadwater	19	3	0	0	0	4	0	**26**
Butte-Silver Bow	34	15	1	0	0	5	1	**56**
Flathead	102	41	23	0	14	60	22	**262**
Granite	30	13	4	0	2	6	14	**69**
Jefferson	78	11	2	0	2	17	12	**122**
Lake	32	14	0	0	4	19	21	**90**
Lewis and Clark	90	9	15	1	3	38	27	**183**
Lincoln	38	13	7	1	5	34	18	**116**
Madison	20	12	1	0	4	14	12	**63**
Meagher	4	1	2	0	1	6	0	**14**
Mineral	19	9	5	0	1	16	35	**85**
Missoula/CSKT	0	0	0	0	0	0	2	**2**
Park	65	23	13	0	4	20	10	**135**
Powell	30	18	6	1	2	17	14	**88**
Ravalli	88	21	8	1	12	42	72	**244**
Sanders	40	12	7	0	6	22	6	**93**
Sweet Grass	11	5	6	1	1	5	2	**31**
Total	**710**	**223**	**107**	**5**	**64**	**334**	**272**	**1715**

Source: HIFLD 2022, Montana DES, NBI, MWRA

Table 4-86 Critical Facilities at Risk to Very High Wildfire Hazards

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Beaverhead	25	12	9	1	1	7	34	**89**
Broadwater	10	8	1	0	0	4	8	**31**
Butte-Silver Bow	28	11	11	1	0	20	29	**100**
Flathead	57	17	29	4	5	57	100	**269**
Granite	1	0	0	0	0	1	27	**29**
Jefferson	4	0	0	1	1	12	48	**66**
Lake	12	10	5	0	2	25	49	**103**
Lewis and Clark	29	10	21	4	1	35	90	**190**
Lincoln	3	1	3	1	2	12	51	**73**
Madison	9	6	1	0	1	5	33	**55**
Meagher	2	4	0	0	0	3	13	**22**
Mineral	0	1	1	1	0	0	40	**43**
Missoula/CSKT	0	0	0	0	0	0	4	**4**
Park	27	5	9	0	1	9	55	**106**
Powell	4	0	1	0	0	5	44	**54**
Ravalli	28	1	1	2	0	1	44	**77**
Sanders	2	2	2	1	2	10	42	**61**
Sweet Grass	13	6	0	0	1	3	38	**61**
Total	**254**	**94**	**94**	**16**	**17**	**209**	**749**	**1433**

Source: HIFLD 2022, Montana DES, NBI, MWRA

Table 4-87 Critical Facilities at Risk to High Wildfire Hazards

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Anaconda-Deer Lodge	3	0	0	0	0	1	12	**16**
Beaverhead	2	2	1	0	0	1	98	**104**
Broadwater	3	0	2	2	0	1	22	**30**
Butte-Silver Bow	6	0	4	5	0	1	18	**34**
Flathead	4	0	4	2	0	2	47	**59**
Granite	5	0	0	0	0	0	3	**8**
Jefferson	3	2	1	2	0	0	29	**37**
Lake	0	0	1	0	0	3	26	**30**
Lewis and Clark	16	0	6	1	1	2	46	**72**
Lincoln	0	0	0	0	0	0	15	**15**
Madison	5	0	1	0	0	0	27	**33**
Meagher	0	0	0	0	0	0	26	**26**
Mineral	0	0	0	0	0	0	1	**1**

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Missoula/CSKT	-	-	-	-	-	-	-	**-**
Park	7	0	0	0	0	0	27	**34**
Powell	1	1	1	0	0	0	9	**12**
Ravalli	0	0	0	0	0	0	1	**1**
Sanders	1	0	1	1	0	0	9	**12**
Sweet Grass	2	2	1	0	0	0	31	**36**
Total	**55**	**7**	**23**	**13**	**1**	**10**	**435**	**544**

Source: MT DNRC 2022, HIFLD 2022, Montana DES, NBI, MWRA

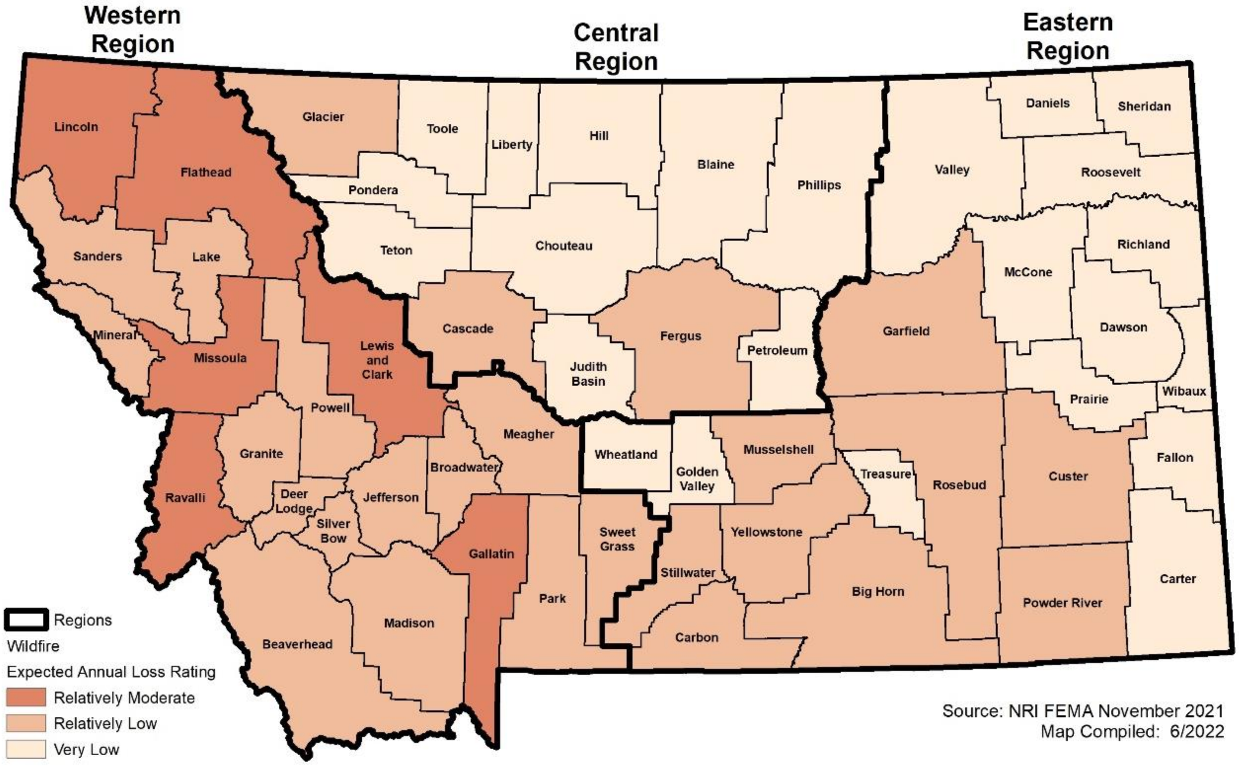
Economy

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. Damage to these assets or disruption of access to them can have far-reaching negative impacts to the local economy in the form of reduced revenues, in addition to the monetary losses resulting from direct building losses. 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.

Tourism and outdoor recreation are vital components of the Western Region economy. Wildland fires can have a direct impact on the Region's scenery and environmental health, adversely affecting the presence of tourism activities and the ability of the regions residents to earn a living from the related industries. The Western Region's scenic beauty and cultural resources are a main draw for tourism, so the entire Region can suffer economic losses from tourists not coming to the area due to wildfires.

Figure 4-122 illustrates the relative risk of EAL rating due to wildfire. Many counties in the Western Region have relatively moderate risk, including Lincoln, Flathead, Lewis & Clark, and Ravalli counties.

Figure 4-122 NRI Wildfire Expected Annual Loss Rating by County



Source: NRI FEMA November 2021
Map Compiled: 6/2022

Historic and Cultural Resources

Historic structures are often at high risk to wildfire due to wood frame construction methods and being constructed long before modern building and fire codes. Cultural resources include the natural and recreational resources also mentioned in the Economy and Natural Resources sections. These resources add not only monetary value and ecosystem goods and services to the Region but can also serve as a source of regional identity and pride for the residents of the Western Region. This makes these vital resources for the various communities which are vulnerable to wildfire.

Natural Resources

Wildfire can be both beneficial and destructive to natural resources. In the forest and rangeland systems of Western Montana fire is an essential component of the Region's ecosystems and is necessary to maintain its native ecology (MT DNRC 2020a). However, in recent decades fire suppression, fuel buildup, climate change, and non-native invasive plant species have altered the natural fire regimes and increased the likelihood of high severity wildfire. These changing conditions have put much of the Region's natural resources at risk (MT DNRC 2020a).

Across the Western U.S, watershed vulnerability to wildfire has increased with the increasing wildfire conditions. Larger and more extreme, high severity wildfires have resulted in degradation to watershed quality. High severity wildfires can result in increased flows (due to increased hydrophobicity of the burned soil); higher amounts of sedimentation and contamination (due to destabilization of topsoil), loss of aquatic habitat, and degradation of aquatic ecology (Montana Free Press 2022; Rhoades et al 2019). As watersheds become more vulnerable to wildfire, more mitigation efforts will be required to protect watershed health.

Recreation is a valuable natural resource in the Region. The Region contains vast areas of highly valued public lands, which include, but are not limited to, the western portion of Glacier National Park, the Bob Marshall-Scapegoat Wilderness complex, the Selway-Bitterroot Wilderness, the Mission Mountain Wilderness, the Cabinet Mountain Wilderness, Gallatin National Forest, Lolo National Forest, Kootenai National Forest, Flathead National Forest, Beaverhead-Deer lodge National Forest, and the Lewis and Clark National Forest, and Bureau of Land Management managed forests and rangelands. Increasing wildfire conditions can put these recreational resources at risk. Increasing wildfire conditions, especially extreme large fires, can threaten access (due to temporary closures), impact air and water quality, and alter visual aesthetics. Taken together, these impacts can potentially deter visitation and hurt the Region's tourist economy (Kim and Jakus 2019).

Timber extraction is an extremely valuable resource in Western Montana and occurs on publicly and privately managed land across much of the Western Region. In Montana, the forestry industry employs some 8,000 people, generates over 500 million dollars in wood sales, and produces approximately 500 million board feet (Montana Business Quarterly, 2018), with the majority of this industry occurring in the Western Region. Increasing wildfire conditions can halt timber sales (due to closures) and damage and potentially destroy harvestable trees, negatively impacting the timber industry. Western Montana is predicted to have larger and more severe forest fires in the coming years (MT DNRC 2020a). Historically, wildfires of all frequencies and severities occurred in the regions forests and were necessary for maintaining stand structure, native forest ecology, and landscape heterogeneity (MT DNRC 2020a). While wildfire activity is known to impact timber resources, it is important to note that timber extraction practices are also known to impact wildfire activity. Commercial thinning and commercial harvest, when done properly, can improve forest health, reduce wildfire risk (MT DNRC 2020a), and reduce wildfire severity (Ager et al 2007). However, it is important to note that logging does not always equate to wildfire risk reduction.

During the Cooney Ridge Fire of 2003 (within the Sapphire Mountains of Western Montana), heavily logged (e.g., clear-cut) privately managed lands displayed more severe wildfire impacts than publicly managed and less intensively logged landscapes (where the landscape exhibited more natural forested conditions) (Stone et al 2004). Across the fire impacted landscape, 98% of the privately managed lands (where the intensive logging was more likely to occur) experienced wildfire, with the majority experiencing high severity wildfire. On the other hand, only 79% of the publicly managed lands (where there was less intensive logging) experienced wildfire, with the majority of the burned areas only experiencing low and moderate severity wildfire. Leftover slash, remaining vegetation, high density tree plantations, growth of fine fuels, and lack of landscape heterogeneity were some of the conditions that contributed to the more extreme wildfire conditions on the privately managed lands. Similar patterns have been observed in other heavily logged areas in the Western U.S (see Zald and Dunn 2018; Odion et al 2004; and Bradley et al 2016). These examples highlight the complexity of the relationship between timber management and fire management. It is also important to note that the fire ecology exhibited by the diverse landscapes of Western Montana is complex and the interaction between forest management, fire ecology, and fire management is also complex. How timber and wildfire are managed should be regionally and ecologically specific and, ideally, should complement each other. Overall, timber management can and should be aligned with fire management, such that it allows forests, their natural fire regimes, and their dependent ecology to be restored and/or persist while concurrently minimizing wildfire risk to local communities and reducing the vulnerability of region's timber industry.

Public and privately managed rangelands across the Western Region provide ample grazing for livestock grazing, making it highly valued for ranching. Increasing wildfire conditions can put ranches and livestock at risk and threaten this Region's industry in the event of large fires. However, it is important to note that, historically, the rangelands throughout the Region required a mosaic of conditions created by wildfire (i.e., a landscape that exhibits different severities of wildfire and time since wildfire) to maintain their native ecology. For instance, wildfire can clear woody shrubs, favor the growth of grasses and forbs, and increase vegetative productivity (Cooper et al 2011); all of which can bolster ranching in the Region. Wildfire should be carefully managed to both maintain the regions natural ecology and to minimize risk to local ranchers.

Wildfire can also threaten the Region's farmlands. Currently, counties with a high proportion and concentration of farmlands are less vulnerable to wildfire. However, agricultural areas in the Region usually have an intermix of farmland and undeveloped rangelands and forests. These would likely be more vulnerable to wildfire. For example, wildfire on undeveloped rangelands could threaten nearby farms and their crops. This is especially possible in the later summer and early fall when wildfire could threaten dry fields of wheat. When wheatfields do catch fire they spread at fast rates, are hard to control, and can be highly destructive (Western Farm Press 2017). Additionally, indirect impacts from wildfire, primarily smoke impacts, can also negatively affect produce harvest, quality, and sales (AEI 2021), this is especially relevant for the Western Region's fruit industry. Overall, increasing wildfire conditions are making the Western Region's farmlands more vulnerable to wildfire.

Development Trends Related to Hazards and Risk

In the past 10 years, Gallatin and Broadwater Counties grew by 37% and 29%, respectively (Table 2-1). Seven counties in the Western Region are expected to grow an additional 20% or more between 2020 and 2040, including Madison (57%), Gallatin (38%), Meagher (37%), Ravalli (26%), Powell (22%), Missoula (20%), and Flathead (20%) Counties (Table 2-2).

This growth affects wildfire hazards and risk two ways. First, there is no doubt that development is increasing vulnerability to wildfire hazards by increasing the value of assets in the planning area, especially in wildland-urban interface areas in the counties listed above. Second, development increases the number of people in high hazard areas, which increases the opportunity for human-caused wildfire ignitions. Figure 4-109 shows the proportion of human and natural caused wildfires in Montana since 2002. Until 2015, natural-caused fires typically outnumbered human-caused fires. Since 2016, the proportions have flipped. In 2020 and 2021, human-caused fires outnumbered natural-caused fires by over 2.5:1.

Regulating growth in the urban-wildland interface is politically complex. Tension exists between protecting private property rights and promoting public safety. Local governments 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 to include ponds, access by apparatus, pumps, and backup generators. Such standards serve to protect residents and property, as well as emergency services personnel. Additionally, as climate change progresses, the wildfire conditions will likely be exacerbated. Regional planners and property owners should also consider efforts to improve the wildfire resiliency of homes, structures, and critical infrastructure currently situated in the WUI to prepare for potential increased risk from wildfire.

4.2.17.8 Risk Summary

In summary, wildfire is a **high** significance hazard for the Western Region. Though variability exists between by jurisdiction, summarized in Table 4-88. Key issues relating to wildfire are as follows.

- The counties with large areas of forests are likely to experience the most acres burned in any given year, while those counties with more rangelands are likely to experience fewer total acres burned.
- Socially vulnerable populations are likely to experience the worst effects of wildfire.
- The eNVC statewide risk assessment tends to skew risk toward populated areas; communities with Community Wildfire Protection Plans should refer to those plans for additional local-level risk analysis.
- Property, structures, and critical infrastructure is at moderate to extreme risk from wildfire throughout the Region.

- Jurisdictions surrounded by more fire-prone landscapes (e.g., forests and rangelands), generally, have structures and critical infrastructure most at risk to extreme wildfire.
- As climate change increases, drought will be more frequent and severe and the detrimental impacts on human health and the built environment from wildfire will likely increase as the fire season becomes year-round.
- Related Hazards: Drought, Flooding, Severe Summer Weather (lightning).

Table 4-88 Risk Summary Table: Wildfire

Jurisdiction	Overall Significance	Additional Jurisdictions	Jurisdictional Differences?
Western Region	High	NA	Yes, by county/tribe
Beaverhead County	Medium	Dillon, Lima	None
Broadwater County	Medium	Townsend	None
Butte-Silver Bow County	Medium	NA	None
CSKT	Medium	NA	NA
Flathead County	High	Columbia Falls, Kalispell, Whitefish	Flathead county has the highest vulnerable population. Also has the highest burn probability in Region
Granite County	High	Drummond, Philipsburg	None; majority of property in extreme to high risk
Jefferson County	High	Boulder, Whitehall	None
Lake County	High	Polson, Ronan, St. Ignatius	None
Lewis & Clark County	High	East Helena, Helena	None
Lincoln County	High	Eureka, Libby, Rexford, Troy	Second highest burn probability in Region
Madison County	Medium	Ennis, Sheridan, Twin Bridges, Virginia City	None, Virginia City has historic structures
Meagher County	Medium	White Sulphur Springs	None
Mineral County	High	Alberton, Superior	None
Park County	Medium	Clyde Park, Livingston	None
Powell County	Medium	Deer Lodge	None
Ravalli County	High	Darby, Hamilton, Pinesdale, Stevensville	Ravalli County's expected loss ratio to extreme wildfire is 70%
Sanders County	High	Hot Springs, Plains, Thompson Falls	None
Sweet Grass County	Medium	Big Timber	None

*Based on feedback from HMPC

5 Mitigation Strategy

Local Plan 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. This section shall include:

(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

(ii) 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.

(iii) 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.

Tribal Requirement §201.7(c)(3): A mitigation strategy that provides the Indian tribal government'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. This section shall include:

(i): A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

(ii): 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.

(iii): An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the Indian Tribal government.

5.1 Mitigation Strategy: Overview

This section describes the mitigation strategy process and mitigation action plan for the Western Montana Region 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 hard work of each jurisdiction's CPT/TPT led to this mitigation strategy and action plan. Section 5.2 below identifies the goals of this plan and Section 5.4 describes the mitigation action plan.

5.2 Mitigation Goals

Up to this point in the planning process, each jurisdiction's CPT/TPT has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals and mitigation actions were reviewed and updated based on these tasks. During the 2022-2023 update of this plan, each CPT/TPT held a series of meetings designed to achieve a collaborative mitigation strategy as described further throughout this section.

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

- Represent basic desires of the community;

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

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

During the mitigation strategy workshops held in January of 2023, the jurisdictions reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. They then reviewed the goals of the previous county and tribal hazard mitigation plans in the Western Region, as well as the State of Montana Hazard Mitigation Plan. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the counties and tribes to update planning goals and to base the development of new or updated mitigation strategies for the counties and tribes in the Region. The participating jurisdictions decided to collaborate and develop a set of new, uniform goals, which were adopted by all counties in the Region:

Goal 1: Reduce impacts to people, property, the environment, and the economy from hazards.

Goal 2: Protect community lifelines and critical infrastructure to ensure the continuity of essential services.

Goal 3: Promote education and outreach to the public around hazards and mitigation.

Goal 4: Promote regional cooperation and leverage partnerships in mitigation solutions.

Goal 5: Sustain and enhance jurisdictional capabilities to enact mitigation activities.

Goal 6: Integrate hazard mitigation into other plans, processes, and regulations.

Goal 7: Ensure local mitigation programs address underrepresented groups and protect socially vulnerable populations.

Goal 8: Incorporate the potential impacts of climate change into all mitigation activities.

Objectives are an optional intermediate step between goals and mitigation actions that define strategies to attain the goals and are more specific and measurable. After discussion, the HMPC decided not to include regional objectives. Each county and tribe were given the opportunity to set objectives to meet their unique situation and compliment the regional goals. See Section 6 of each jurisdictional annex for details.

5.3 Identification and Analysis of Mitigation Actions

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 2022-2023 Regional Plan update, each jurisdiction’s CPT/TPT analyzed viable mitigation options by hazard that supported the identified goals. The CPTs/TPTs were provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- **Plan and Regulations (Prevention):** Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.

- **Structural and Infrastructure Projects:** Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Public Information/Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.
- **Emergency Services:** Actions that protect people and property during and immediately after a disaster or hazard event.

To identify and select mitigation actions in support of the mitigation goals, the HMPC evaluated each hazard identified and profiled in Chapter 3.4. A link to reference documents titled “Mitigation Ideas” and “Mitigation Action Portfolio” developed by FEMA was made available in the meeting presentation. These documents list common alternatives for mitigation by hazard and best practices. The jurisdictions considered both future and existing buildings in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options.

The mitigation strategy is based on existing local and tribal 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 and reservation 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 be addressed through additional personnel or a change in procedure or policy.

Based upon the key issues identified in the risk assessment, including the capability 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, where applicable, was identified to provide additional details on the project so they could be captured in the plan. Final action strategies are summarized in Section 5.4 and detailed within the respective jurisdictional annexes.

5.3.1 Prioritization Process

Once the mitigation actions were identified, the county and tribal 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 assist in evaluating 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?

At the mitigation strategy workshops, the counties and tribes 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 jurisdiction prioritized the new mitigation actions by giving an indication of relative priority, which was then translated into 'high,' 'medium' and 'low.' The results of the STAPLEE evaluation process produced prioritized mitigation actions for implementation within the planning area. Continued actions were also assessed to see if priority changes were needed; most of these remained the same but in some cases priorities where changed.

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

Each mitigation action developed for this plan contains a brief description of the problem and proposed project, the entity with primary responsibility for implementation, a cost estimate, and a schedule for implementation. Development of these project details further informed the determination of a high, medium, or low priority for each. During the plan update, the jurisdictions in the Western Region identified some mitigation actions to be carried forward from previous regional hazard mitigation plan. Priority levels on these actions were revisited and, in some cases, modified to reflect current priorities based on the STAPLEE principles.

5.4 Mitigation Action Plan

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

5.4.1 Progress on Previous Mitigation Actions

This Regional Plan represents a plan update for all counties and tribes. As part of the update process the jurisdictions reviewed actions identified in their previous plans to assess progress on implementation. These reviews were completed using worksheets to capture information on each action including if the action was completed or deferred to the future. Actions that were not completed were discussed for continued relevance and were either continued into the Regional Plan or in some cases recommended for deletion.

The participating jurisdictions have been working steadily towards meeting the goals of their previous plans. While several remain to be completed, many were noted as in-progress. Progress on mitigation actions previously identified in these planning mechanisms are detailed in the jurisdictional annexes. These action plans were also shared amongst the regional plan participants to showcase progress and stimulate ideas amongst the respective planning committees in each county and tribe. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources.

Table 5-1 below summarizes progress implementing mitigation actions by tribe and county (including the municipalities). In total throughout the Western Region, 56 actions have been completed, and 33 were deleted as being no longer relevant or feasible. A total of 767 actions were carried over into the Regional Plan, along with 178 new actions developed for the Regional Plan.

Table 5-1 Mitigation Action Progress Summary by Jurisdiction

County/Reservation	Completed	Deleted	Continuing	New Actions in 2024	Total Continuing and New Actions
Beaverhead	5	-	40	2	42
Broadwater	-	-	36	2	38
Butte-Silver Bow County	5	-	46	2	48
Flathead	2	3	84	69	153
Granite County	5	-	15	2	17
Jefferson	8	5	53	5	58
Lake	-	-	68	4	72
Lewis and Clark	10	3	82	47	129
Lincoln	12	3	45	3	48
Madison	2	8	32	2	34
Meagher	-	-	-	4	4
Mineral	-	-	21	2	23
Park	-	-	29	12	41
Powell	1	1	32	4	36
Ravalli	4	10	31	8	39
Sanders	-	-	53	4	57
Sweet Grass	2	-	55	4	59
Confederated Salish and Kootenai Tribes of the Flathead Reservation	-	-	45	2	47
Total	**56**	**33**	**767**	**178**	**945**

See the jurisdictional annexes for their list of mitigation actions, as well as more details on progress on implementation of previous actions.

5.4.2 Continued Compliance with NFIP

Given the significance of the flood hazard throughout the planning area, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP). Jurisdictions that participate in the NFIP are noted in the respective annexes' Capability Assessment and will continue to make every effort to remain in good standing with the program. This includes continuing to comply with the NFIP's standards for adopting floodplain maps and maintaining and periodically updating local floodplain regulations. Actions related to continued compliance include:

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

Also, to be considered are the flood mitigation actions contained in this Regional Plan that support the ongoing efforts by participating jurisdictions 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 and tribal planning teams, outlining how each jurisdiction 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 each participating jurisdictions are detailed in the jurisdictional annexes in Section 10. 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, tribal, 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 funding availability and/or other criteria. The participating jurisdictions are not obligated by this document to implement any or all these projects. Rather, this mitigation strategy represents the desires of the communities to mitigate the risks and vulnerabilities from identified hazards. The jurisdictions realize that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to their overall goals, as listed in this plan.

Table 5-2 below summarizes the mitigation actions that address each hazard relevant to that jurisdiction.

Table 5-2 Mitigation Actions by Hazard and Jurisdiction

County/ Reservation	Avalanche	Communicable Disease	Cyber-Attack	Dam Failure	Drought	Earthquake	Flooding	Hazmat Incident	Landslide	Severe Summer Weather	Severe Winter Weather	Human Conflict	Tornadoes & Windstorms	Transportation Accidents	Volcanic Ash	Wildfire
Beaverhead County	2	6	7	7	9	11	21	8	3	12	13	14	7	5	9	17
City of Dillon	2	6	7	7	8	11	19	8	3	11	12	14	7	5	9	13
Town of Lima	2	6	6	6	9	10	19	8	3	11	12	13	6	3	8	14
Broadwater County	3	3	2	7	3	10	8	8	6	8	8	5	5	4	3	14
City of Townsend	3	3	2	6	2	10	7	8	5	7	7	4	5	4	3	8
Butte-Silver Bow County	1	5	5	8	3	12	10	8	3	9	9	7	5	6	5	16
Town of Walkerville	1	5	5	5	3	11	9	5	3	9	9	6	5	3	5	14
Confederated Salish & Kootenai Tribes	1	9	10	22	10	16	30	19	12	19	20	17	17	18	17	23
Flathead County	10	16	12	23	20	26	37	19	14	19	19	16	19	15	19	56
City of Columbia Falls	6	11	8	18	17	22	26	15	9	15	15	11	14	11	16	23
City of Kalispell	7	14	9	19	16	26	28	17	11	19	20	13	18	14	19	27
City of Whitefish	7	11	8	18	18	23	24	17	10	16	16	11	16	12	18	24
Granite County	1	1	1	1	1	2	2	2	1	1	1	1	1	2	1	4
Town of Drummond	1	1	1	1	1	2	4	2	1	1	1	1	1	1	1	2
Town of Phillipsburg	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Jefferson County	4	10	9	13	11	14	20	12	9	12	12	13	11	11	11	25
Town of Boulder	3	8	7	8	6	11	14	10	7	9	9	11	8	8	8	13
Town of Whitehall	3	8	8	10	6	12	18	10	7	10	10	11	9	8	9	14

County/ Reservation	Avalanche	Communicable Disease	Cyber-Attack	Dam Failure	Drought	Earthquake	Flooding	Hazmat Incident	Landslide	Severe Summer Weather	Severe Winter Weather	Human Conflict	Tornadoes & Windstorms	Transportation Accidents	Volcanic Ash	Wildfire
Lake County	2	11	10	19	13	17	24	17	15	21	24	18	16	17	16	31
City of Polson	10	10	9	17	11	17	21	14	11	20	21	17	15	14	15	22
City of Ronan	10	10	9	17	11	16	22	13	11	20	21	17	15	13	15	22
Town of St. Ignatius	10	10	9	17	11	16	21	13	11	20	20	17	15	13	15	22
Lewis and Clark County	10	18	14	23	8	26	35	19	15	20	21	27	18	13	18	45
City of Helena	7	10	12	15	8	17	22	15	12	17	18	19	15	11	15	26
Town of East Helena	9	18	13	17	8	25	27	17	14	19	20	27	17	12	17	27
Lincoln County	6	9	11	8	7	6	12	10	6	7	7	6	7	10	7	23
City of Libby	6	9	10	6	6	6	12	10	6	6	6	6	6	10	6	16
City of Troy	6	9	10	6	6	6	10	10	6	6	6	6	6	10	6	14
Town of Eureka	7	10	11	8	7	7	13	9	7	7	7	7	7	9	7	14
Town of Rexford	6	9	7	6	6	6	6	7	6	6	6	6	6	7	6	12
Madison County	2	3	2	8	11	10	17	8	7	6	9	2	5	6	6	11
Town of Ennis	3	4	3	6	10	8	16	7	5	6	8	3	5	5	6	8
Town of Sheridan	3	4	3	6	10	8	13	6	5	5	6	3	5	5	5	7
Town of Twin Bridges	3	4	3	6	10	8	13	6	5	5	6	3	5	5	5	7
Town of Virginia City	3	4	3	6	10	8	13	6	5	5	6	2	5	5	5	7
Meagher County	1	1	3	4	1	3	3	1	1	3	3	3	3	1	3	3
Town of White Sulphur Springs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mineral County	2	7	5	9	8	7	11	7	6	8	8	5	8	7	8	12
Town of Superior	2	7	5	8	8	7	11	7	6	8	8	5	8	7	8	12
Town of Alberton	2	7	5	8	8	7	11	7	6	8	8	5	8	7	8	12
Park County	1	1	3	7	3	10	23	5	4	7	9	7	9	5	7	11
City of Livingston	1	1	3	6	2	9	13	5	4	7	8	7	8	5	7	7
Town of Clyde Park	1	1	3	4	3	7	8	3	2	5	7	5	7	3	5	5
Powell County	2	2	5	11	7	9	12	5	5	6	6	5	6	3	6	10
Town of Deer Lodge	1	1	4	6	6	8	13	4	2	5	5	4	5	2	5	7
Ravalli County	2	6	5	15	9	7	13	8	5	11	11	6	9	8	9	16
City of Hamilton	1	5	4	8	7	5	8	5	3	7	7	4	6	5	6	9
Town of Darby	1	5	4	8	5	5	8	5	3	7	7	4	6	5	6	7
Town of Stevensville	1	5	4	9	6	5	9	6	3	8	8	4	7	6	7	9
Town of Pinesdale	1	1	1	2	1	1	2	1	1	2	2	1	1	1	1	1
Sanders County	4	6	10	18	11	9	19	9	6	14	14	12	14	8	14	28
City of Thompson Falls	4	6	10	15	9	9	17	7	4	15	15	12	13	7	13	21
Town of Plains	4	6	10	15	9	9	19	7	4	14	14	12	13	7	13	21
Town of Hot Springs	4	6	10	15	9	9	17	7	4	14	14	12	13	7	13	21
Sweet Grass County	3	7	8	19	9	12	24	14	12	16	16	14	16	11	16	26
City of Big Timber	2	6	4	8	5	3	9	6	2	6	6	7	6	4	6	8

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

6 Plan 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.

Tribal Requirement §201.7(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan.

Requirement §201.6(c)(5): [The 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 strategy for plan implementation and maintenance, and outlines the method and schedule for monitoring, updating, and evaluating the regional plan. The chapter also discusses methods for incorporating the plan into existing planning mechanisms and how to address continued public involvement. The system for implementation and maintenance was created during the 2022-2023 creation of the regional 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 D, Plan Adoptions. This plan will be updated and re-adopted every five years in concurrence with the required DMA local and tribal 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, jurisdiction, and tribe 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, tribes, 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 and tribes will be able 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, municipalities, and the tribe will be responsible for the plan implementation and maintenance. Each county and tribe, led by their Emergency Management Coordinators, will reconvene their HMPC for plan implementation and maintenance. MT DES staff will assist in the coordination of the regional HMPCs. This HMPC will be the same committee (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 and tribal planning teams 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.

MT DES staff will:

- Assist with procurement of consultant support/additional technical assistance.
- Provide technical assistance and support to the delivery of an effective stakeholder and public engagement/outreach strategy. This includes providing assistance with the planning and facilitation of stakeholder and public outreach/ engagement meetings both in person and virtual. This also includes coordinating with other Montana State agencies (e.g., Dept. of Commerce, Dept. of Natural Resources and Conservation, Dept. of Environmental Quality, etc.) and their field staff and stakeholders to ensure a whole government approach to participation, involvement, and regional planning outcomes. This includes assistance in how underserved communities and socially vulnerable populations will be engaged in tangible activities throughout plan implementation and maintenance and in the next plan update (see also Section 6.3.4).

- Provide technical assistance and support with data and resources needed to meet the mitigation planning requirements.
- Assist during the mitigation action phase of the planning process and help guide communities/stakeholders on the development of holistic and comprehensive mitigation actions.

Each HMPC will not have any powers over respective county or tribal 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, tribal councils, 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

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized. 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 to continue to be eligible for mitigation project grant funding.

Similarly, tribal governments are required by 44 CFR 201.7(d)(3) to review and revise its plan to reflect any changes in development, progress in mitigation efforts, and changes in priorities and to resubmit it for approval within 5 years to continue eligibility for FEMA assistance.

6.3.1 Maintenance Schedule

MT DES will work with the Emergency Management Coordinators to initiate annual plan reviews, in consultation with the heads of participating departments in their own counties and tribes. In order to monitor progress and update the mitigation strategies identified in the action plan, each county and tribe and their standing CPT/TPT 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 future updates. The annual review will be conducted by reconvening each HMPC in November of each year in coordination with MT DES.

This plan will be updated, approved, and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) (for local governments) and §201.7(d)(3) (for tribes) 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 and tribe will inquire with MT DES and FEMA for funds and or technical assistance to assist with the update. The next plan update should be completed and reapproved by MT DES and FEMA Region VIII within five years of the FEMA final approval date. The planning process to prepare the update should begin no later than 12 months prior to that date.

6.3.2 Maintenance Evaluation Process

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

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

To best evaluate any changes in vulnerability as a result of plan implementation, each county and tribe will adhere to the following process:

- A representative from the responsible office identified in each mitigation action 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.

Evaluation is used not only to measure progress, but to evaluate the effectiveness of the plan itself and if goals are being achieved. 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. 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.

The jurisdictional annexes explain in further detail the monitoring system for tracking the initiation and status of projects as well as project closeouts, indicating who will be responsible for implementing and maintaining this system for the respective tribes.

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 or tribal plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As described in each county and reservation annex capability assessment, the jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. Where applicable, these existing mechanisms could include:

- County, tribal or community comprehensive plans
- County, tribal or community land development codes
- County, tribal or community Emergency Operations Plans (EOPs)
- 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 planning efforts
- Future updates to the Montana State Water Plan
- Other plans, regulations, and practices with a mitigation aspect

The jurisdictional annexes note where the previous versions of the individual county and tribal hazard mitigation plans have been incorporated into existing planning mechanisms in the past 5 years. Each annex notes specific opportunities to integrate the regional plan into other mechanisms in the future in Section 7.

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 or tribal 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, to publicize success stories from the plan implementation, and to seek additional public input. The plan maintenance and update process will include continued public and stakeholder involvement through designated committee meetings, web postings, social media postings, press releases to local media, and public hearings.

To ensure the meaningful participation of underserved communities and socially vulnerable populations, including the elderly, youth, veterans, homeless individuals, and low-income families, the HMPC will employ targeted outreach strategies during continued involvement activities. Partnerships with CBOs, NGOs, and individual government agencies—such as the faith-based organizations, and social service providers—will be key to facilitating communication and engagement, as this strategy was successful for outreach in the Western Region as noted in Section 3.3.1. Meetings will be held in accessible locations like senior centers and healthcare clinics, and materials will be provided in multiple languages to overcome barriers like transportation, childcare, and language differences.

These communities will also be encouraged to participate in various activities that will be led by county staff and representatives from CBOs and NGOs. Activities will include public meetings, focus groups, and surveys with each regional CPT or TPT. Their feedback will be used to evaluate mitigation actions and shape future plan updates. The feedback from underserved communities and socially vulnerable populations will also be used to develop HMA grant applications, where applicable. CPTs and TPTs will ensure an open line of communication, and that feedback is recorded and addressed. Additionally, potential training and capacity-building initiatives can empower these communities to take a more active role in future hazard mitigation planning processes. Feedback will be documented and integrated into future updates, with follow-up reports demonstrating how community input has influenced the plan.

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. At a minimum, public notice will be posted to invite public participation through website postings and press releases to local media outlets, primarily newspapers. Per DMA 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. The draft plan will be made available online for public review and comment for a minimum of two weeks, ensuring that community feedback is thoroughly considered.

APPENDIX A: Hazard Mitigation Planning Committee

Name	Agency/Jurisdiction	Title	Participation
Beaverhead County			
Tom Wagenknecht	Beaverhead County	DES Coordinator	Kickoff, Mitigation Workshops, Monthly Meetings
John McGinley	City of Dillon	Mayor	Provided Data Collection Guide
Dina Young	Town of Lima	Clerk-Treasurer	Kickoff, Mitigation Workshops, Mitigation Action Development
Broadwater County			
Brittney Willis	Broadwater County	DES Coordinator	Kickoff, Risk Assessment
LaRinda Spencer	Broadwater Conservation District	Administrator	Kickoff
Vickie Rauser	City of Townsend	City Counciler	Kickoff
Butte-Silver Bow County			
Jim Merrifield	Butte-Silver Bow County	DES Coordinator	Pre-Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Lisa Carey	Butte-Silver Bow County	OEM	Risk Assessment
J.P. Gallagher	Butte-Silver Bow County	Chief Executive	Kickoff
Jeremy Grotbo	Butte-Silver Bow County	GIS Department	Kickoff
Kathy Kenison	Butte-Silver Bow County	IT Manager	Kickoff
Confederated Salish and Kootenai Tribes of the Flathead Reservation			
Dale Nelson	CSKT DES	DES Coordinator	Pre-Kickoff, Kickoff, Risk Assessment, Monthly Meetings
Flathead County			
Juanita Nelson	Flathead County	DES Coordinator	Pre-Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Cindy Murray	Flathead County	General Manager – Water District #1	Kickoff
Lisa Dennison	Flathead County	Emergency Preparedness & Communicable Disease Coordinator	Kickoff
Randy Brodehl	Flathead County	Commissioner	Kickoff
Pete Melnick	Flathead County	County Administrator	Kickoff

Name	Agency/Jurisdiction	Title	Participation
Troy Glasman	Glacier Park Intl. Airport	Fire Chief	Kickoff
Chris Hanley	City of Columbia Falls	Public Works Director	Kickoff
Susan Nicosia	City of Columbia Falls	City Manager	Kickoff, Risk Assessment
Dan Pearce	City of Kalispell	Fire Chief	Risk Assessment, Mitigation Workshops
Jessica Kinzer	City of Kalispell	Assistant Fire Chief	Risk Assessment, Mitigation Workshops
Craig Workman	City of Whitefish	Public Works Director	Kickoff
Tim Schuch	City of Whitefish PD	Detective	Kickoff
Granite County			
Jackie Bolster	Granite County	DES Coordinator	Pre-Kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Maria Stoppler	Granite County Hospital District	CEO	Kickoff
Gail Leeper	Town of Drummond	Mayor	Provided input on Mitigation Strategy
Daniel Reddish	Town of Phillipsburg	Mayor	Risk Assessment
Jefferson County			
Doug Dodge	Jefferson County	DES Coordinator	Pre-Kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Cory Kirsch	Jefferson County	Commissioner	Kickoff
Jesse Hauer	Jefferson County	PHEP Coordinator	Kickoff
LaDana Hintz	Jefferson County	County Planner	Kickoff
Amanda Morgan	Jefferson County Sheriff	Sheriff Admin	Kickoff
Teresa Oyama	Whitehall Public Transportation		Kickoff
Rusty Gulio	City of Boulder	Mayor	Kickoff
Pat Lewis	City of Boulder	Councilmember	Provided data for plan update
Allissa Christensen	Town of Whitehall	Treasurer/Clerk/Floodplain Administrator	Pre-Kickoff, Kickoff, Risk Assessment
Mary Hensleigh	Town of Whitehall	Mayor	Mitigation Workshops, Mitigation Action Development
Lake County			
Mary Clay	Lake County	DES Coordinator	Pre-Kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings

Name	Agency/Jurisdiction	Title	Participation
Kevin Straub	City of Polson	Assistant Fire Chief	Mitigation Workshops, Mitigation Action Development
Dan Miller	City of Ronan	Director of Public Works	Mitigation Workshops, Mitigation Action Development
Daren Incashola	Town of St. Ignatius	Mayor	Provided data for plan update
Lewis and Clark County			
Sierra Anderson	Lewis and Clark County	DES Coordinator	Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings, County Mitigation Action Development Meetings
Worby McNamee	Lewis and Clark County	Interim DES Coordinator/Floodplain Manager	Pre-Kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings, County Mitigation Action Development Meetings
Betsy Kirkeby	Lewis and Clark County	Communications Coordinator	County Mitigation Action Development Meetings
James Thomas	Lewis and Clark County	IT Director	County Mitigation Action Development Meetings
Eric Spangenberg	Lewis and Clark County	GIS Coordinator	County Mitigation Action Development Meetings
Jen Chambers	Lewis and Clark County	Public Works – Director	County Mitigation Action Development Meetings
Dan Karlin	Lewis and Clark County	Public Works – County Engineer	County Mitigation Action Development Meetings
Kevin Horne	Lewis and Clark County	Public Works – Operations Manager	County Mitigation Action Development Meetings
Greg McNally	Lewis and Clark County	Planning Director	County Mitigation Action Development Meetings
Kathy Moore	Lewis and Clark County	Environmental Services Administrator	County Mitigation Action Development Meetings
Kevin Wright	Lewis and Clark County Sheriff	Captain	County Mitigation Action Development Meetings
Brian Robinson	Lewis and Clark County Sheriff	Captain	County Mitigation Action Development Meetings
Scott O'Connell	City of Helena PD/911	System Administrator	County Mitigation Action Development Meetings
Zach Slattery	City of Helena	911 Operations Manager	Kickoff
Edward Johnson	City of Helena	Senior Plans Examiner	Kickoff
Michael Gunderson	City of Helena	Transportation Coordinator	County Mitigation Action Development Meetings

Name	Agency/Jurisdiction	Title	Participation
Ed Coleman	City of Helena	Public Works Deputy Director	County Mitigation Action Development Meetings
Brad Langsather	City of Helena	Open Lands Manager	County Mitigation Action Development Meetings
Troy Sampson	City of Helena	City Facilities Superintendent	County Mitigation Action Development Meetings
Mike Chambers	City of Helena Fire Department	Assistant Chief	Risk Assessment, County Mitigation Action Development Meetings
Jayson Zander	City of Helena Police Department	Lieutenant	County Mitigation Action Development Meetings
Mike Sanders	City of East Helena	Police Chief	County Mitigation Action Development Meetings
Kirk Johnston	City of East Helena	Police Officer	Kickoff
Neal Murray	Helena School District	Safety and Operations Manager	County Mitigation Action Development Meetings, Monthly Meetings
Lincoln County			
Thomas Lane	Lincoln County	DES Coordinator	Pre-kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Amanda Harcourt	Lincoln County	Asbestos Resource Program Director	Kickoff
Samuel Sikes	City of Libby	City Administrator	Risk Assessment
Tracy Rebo	City of Troy	City Clerk/Treasurer	Kickoff
LeeAnn Schermerhorn	Town of Eureka	Mayor	Provided data for plan update
Patti Noble	Town of Rexford	Retired BCP	Kickoff, Risk Assessment
Madison County			
Joe Brummell	Madison County	DES Coordinator	Mitigation Workshops, Monthly Meetings
Jennifer Martens	Madison County	Deputy Emergency Manager	Kickoff
Nici Haus	Town of Ennis	Mayor	Monthly meetings
Ginger Guinn	Town of Ennis	Town Council Clerk	Monthly meetings
Robert Stump	Town of Sheridan	Mayor	Monthly meetings
Ginger Galiger	Town of Sheridan	Town Council Clerk	Kickoff
Joseph Willauer	Town of Twin Bridges	Mayor	Monthly meetings
Kristi Millhouse	Town of Twin Bridges	Town Council Clerk	Monthly meetings
Justin Gatewood	Town of Virginia City	Mayor	Monthly meetings
Nancy Stewart	Town of Virginia City	Town Council Clerk	Monthly meetings
Meagher County			
Jon Lopp	Meagher County	DES Coordinator/Sheriff	Pre-kickoff, Kickoff, Risk Assessment, Mitigation

Name	Agency/Jurisdiction	Title	Participation
			Workshops, Monthly Meetings
Jess Secrest	Meagher County	Chairman – County Planning Board	Kickoff
Pattie Berg	City of White Sulphur Springs	City Councilor	Kickoff
Mineral County			
Lori Dove	Mineral County	DES Coordinator	Pre-kickoff, Kickoff, Mitigation Workshops, Monthly Meetings
Amy Lommen	Mineral County	PHEP & Communicable Diseases	Kickoff
Anna LeDuc	Town of Alberton	Mayor	Provided data for plan update
Dan Campbell	Town of Superior	Superior Ranger District	Kickoff Meeting
Park County			
Greg Coleman	Park County	DES Coordinator	Pre-kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Greg Coleman	City of Livingston	DES Coordinator	Mitigation Workshops
Will Boniger	Town of Clyde Park	CSO/Fire Chief	Mitigation Workshops
Powell County			
Amanda Cooley	Powell County	DES Coordinator	Pre-Kickoff, Kickoff, Risk Assessment
Rand Dickson	Powell County	EMS Director	Kickoff
Jordan Green	City of Deer Lodge	Chief Admin. Officer	Risk Assessment
Ravalli County			
Erik Hoover	Ravalli County	DES Coordinator	Pre-kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Jeff Rodrick	Ravalli County	OEM Deputy Director	Risk Assessment
Rob Livesay	Ravalli County	Planning Director	Kickoff
Bridget Mancini	Ravalli County Fire	Adapted Communities Coordinator	Kickoff
Marshall Bloom	City of Hamilton	Associate Director	Kickoff
Nancy McKinney	Town of Darby	Mayor	Provided data for plan update
Stephen Lassite	Town of Stevensville	Parks Director	Mitigation Workshops, Mitigation Action Development
Erik Hoover	Town of Pinesdale	DES Coordinator	Provided data for plan update
Sanders County			

Name	Agency/Jurisdiction	Title	Participation
Bill Naegeli	Sanders County	DES Coordinator	Pre-Kickoff, Kickoff, Risk Assessment, Mitigation Workshops
Rusty Kinkade	Sanders County	Deputy Emergency Manager	Kickoff
Karren McKinzie	Sanders County	PHEP Coordinator	Kickoff
Neil Harnett	City of Thompson Falls	Public Works Director	Kickoff
Chris Allen	Town of Plains	Mayor	Mitigation Workshops, Mitigation Action Development
Randal Woods	Town of Hot Springs	Mayor	Provided data for plan update
Sweet Grass County			
Clifford Brophy	City of Big Timber	DES Coordinator	Pre-Kickoff, Kickoff, Risk Assessment, Mitigation Workshops
Linda Burch	Sweet Grass County	Planning Board	Kickoff
State of Montana			
Amanda Avard	Montana DES	Preparedness Program Manager	Mitigation Workshops, Monthly Meetings
Andrew Long	Montana DES	Mitigation Coordinator	Risk Assessment
Ed Greiberis	Montana DES	Field Officer	Risk Assessment
Hannah Shultz	Montana DES	Mitigation Coordinator	Pre-kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Joey Zahara	Montana DES	Training & Exercise Coordinator	Risk Assessment
Sara Hartley	Montana DES	State Hazard Mitigation Officer	Pre-kickoff, Kickoff, Risk Assessment, Monthly Meetings
Kristi Kline	Montana Rural Water System	Source Water Protection Specialist	Mitigation Workshop
Stakeholders			
	Environmental Protection Agency		Monthly Meetings
Emily Alvarez	FEMA	Community Planner	Kickoff, Risk Assessment, Monthly Meetings
Katie Baum	FEMA	Community Planner	Kickoff, Risk Assessment, Monthly Meetings
Rob Pressley	FEMA	Community Planner	Kickoff, Risk Assessment, Monthly Meetings
William Hoekema	Border Patrol	Senior Agent	Kickoff
Ryan Madson	Bureau of Reclamation	Emergency Management Coordinator	Kickoff
Toby Tabor	Bureau of Reclamation	Marias-Milk Rivers Division	Kickoff
Shannon Bonney	Bureau of Land Management	Fire Mitigation and Education Specialist	Kickoff

Name	Agency/Jurisdiction	Title	Participation
Teresa Hanley	Bureau of Land Management	Acting State Director	Kickoff
	Headwaters Economics		Kickoff, Risk Assessment, Monthly Meetings
Robert Hart	National Weather Service, Great Falls	Warning Coordination Meteorologist	Kickoff
Shannon Sattleen	NRCS	Blaine Conservation District	Monthly Meetings
Jeannette Blank	Montana Freshwater Partners	Program Manager, NGO Partner	Mitigation Workshops
Jeff Greenwald	USACE	Environmental Planner	Mitigation Workshops,
Laurel Hamilton	USACE	Hydraulic Engineer	Risk Assessment, Mitigation Workshops,
Andrew Dreesen	Deer Lodge Medical Center	Chief Admin. Officer	Kickoff
Andy Beck	Deer Lodge Medical Center	CNO	Kickoff
Monique Schofield	University of Montana – Western	Safety and EMS Officer	Kickoff
Arnold Sorrell	Mission Valley Power		Kickoff
Cathy Barta	Snowy Mountain Development Corporation	Director for Strategic Development	Kickoff
Consultant Team			
Jeff Brislawn	WSP USA	Project Manager	Pre-Kickoff, Kickoff, Risk Assessment, Monthly Meetings
Scott Field	WSP USA	Central Region Lead Planner	Pre-kickoff, Kickoff, Risk Assessment, Mitigation Workshops, Monthly Meetings
Emily Geery	SWCA	Mitigation Specialist	Kickoff
Tim Clute	SWCA	Assistant Project Biologist	Risk Assessment Meeting
Victoria Amato	SWCA	Principal Planner	Risk Assessment Meeting
Debra Shewfelt	RESPEC	Consultant	Risk Assessment Meeting
Megan Burke	RESPEC	Consultant	Kickoff, Risk Assessment Meeting
Thomas Michalek	RESPEC	Consultant	Risk Assessment Meeting

Other Stakeholders Invited to Participate			
Academia	MSU Great Falls College	Medical	Bear Grass Suites Assisted Living
Academia	University of Providence	Medical	Montana VA
Airport	GF Airport Authority	Medical	Meadowlark Manor Assisted Living
Airport	Glacier Park International Airport	Medical	Northfork Wellness
Blaine County	Contract Planner	Medical	Sweet Home Nursing Director
Business	BSNF Railway Co	Medical	Sweet Medical Center - One Health
Business	Great Falls Area Chamber of Commerce	Medical	Boulder-Basin Senior Citizens
Business	Greenfield Industries	Medical	Elkhorn Treatment Center
Business	INDHemp Plant	Medical	Elkhorn Health & Rehab- Clancy
Business	K-Heart Veterinary Service	Medical	Ruby Valley Care Center
Business	Laugh N Learn Childcare	Medical	Youth Dynamics- Boulder
Business	Maltreuop NA Inc	Neighboring County	Chouteau County DES
Business	Montana Flour and Grain	Neighboring County	Judith Basin County DES
Business	Phillips 66 Pipeline Co	Neighboring County	Lewis & Clark County DES
Business	Snowy Mountain Development Corp.	Neighboring County	Meagher County DES
Business/Infrastructure	Fergus Electric	Neighboring County	Teton County DES
Business/Infrastructure	Tiber Dam	Nonprofit	Cascade Conservation District
Business/Infrastructure	Triangle Communications	Nonprofit	Harlem Ministerial Association
Business/Infrastructure	Verizon	Nonprofit	4 Paws Rescue
Business/Infrastructure	West Great Falls Flood Control	Nonprofit	Elkhorn COAD
Chippewa Cree Tribe	Planning Department	Nonprofit	Salvation Army
Chouteau County	Planning Department	Pondera County	Planning Department
City of Great Falls	Planning & Community Development	Schools	Chinook Public Schools
Conservation District	Jefferson County Conservation District	Schools	Harlem School
Conservation District	Ruby Valley Conservation District	Schools	Turner Public Schools
Federal	Bureau of Indian Affairs	Schools	Clancy Elementary Schools
Federal	Indian Health Service	Schools	Whitehall High School
Federal	Malstrom Air Force Base	State of Montana	Farm Service Agency FSA
		State of Montana	Havre Regional Engineer
Federal	U.S. Forest Service	State of Montana	Riverside Correctional Facility- Boulder

Fergus County	Planning Department
Fire District	Big Sky Fire Department
Fire Districts	Montana DNRC
Fire District	Jefferson Valley VFD
Fire Districts	Ravalli County Fire
Fire Districts	Bull Mountain VFD
Fire Districts	Alder Rural Volunteer Fire District
Glacier County	Planning Department
Liberty County	Planning Department
Media	Blaine County Journal
Media	Fort Belknap News
Media	KGVA Radio Station

State of Montana	Montana Bureau of Mines & Geology
State of Montana	Montana Department of Transportation
State of Montana	Montana Dept. of Natural Resources & Conservation
State of Montana	Montana Fish, Wildlife, & Parks
State of Montana	Montana Highway Patrol
Utilities	Northwestern Energy
Utilities	Park Electric Coop
Utilities	Basin Water & Sewer

APPENDIX B: Planning Process Documentation

MONTANA WESTERN REGION
HAZARD MITIGATION PLAN
KICKOFF MEETING

Counties: Beaverhead, Deer Lodge, Flathead, Granite, Lake, Lewis and Clark, Lincoln, Mineral, Powell, Ravalli, Sanders, Silver Bow, Broadwater, Jefferson, Madison, Meagher, Park, Sweet Grass
Tribes: Confederated Salish and Kootenai Tribes of the Flathead Reservation

Thursday, May 26, 2022, 10:30 – 12:00pm

https://mt-gov.zoom.us/j/83530578760?pwd=ODcyN3JnWWZpcmNXYXZjalZRaUEzZz09

Dial by Telephone

+1 646 558 8656 or +1 406 444 9999

Meeting ID: 835 3057 8760

Password: 145239

1. **Introductions**
2. **Hazard Mitigation and Resilience Planning**
3. **Regional Planning Process Overview**
4. **Regional, County, & Tribal Hazard Mitigation Planning Committees**
5. **Review of Identified Hazards**
6. **Coordination with Related Planning Efforts & Recent Studies**
7. **Planning for Public and Stakeholder Involvement**
8. **Information Needs and Next Steps**
9. **Questions and Answers/Adjourn**

Montana Western Region Hazard Mitigation Plan

Kick-Off Meeting Summary

May 26, 2022, 10:30-12:00 pm

Virtual Webinar via Zoom

Introductions and Opening Remarks

The State of Montana has recently undertaken an effort to create regional hazard mitigation plans covering the entire state, splitting the state into 3 separate regions each with its own hazard mitigation plan (HMP). The Western Region held a kickoff meeting for this planning process on May 26th, 2022, facilitated by Wood Environment & Infrastructure Solutions, Inc. (Wood), the consulting firm hired by Montana Disaster and Emergency Services (DES) to facilitate the planning process and develop the regional HMP. The meeting was held virtually via Zoom. Over 160 people attended the webinar, primarily representing county, tribal and municipal governments as well as various stakeholders including representatives from Montana DES as well as the Wood consultant team. Following introductory remarks by Montana DES Mitigation Coordinator, Nicole Erickson, Amy Carr, Lead Planner, (Wood) introduced herself, the Wood team, and Jeff Brislawn, the Wood Project Manager, who explained that this is one of the three regional plans Wood is managing across the State of Montana and thanked everyone for their participation.

The key discussion is summarized below; additional details can be found in the meeting PowerPoint presentation. The meeting was also recorded. An interactive polling tool called Slido was used to gather feedback from the group throughout the meeting. The responses to the Slido Poll questions can be found in the attached document. After an icebreaker test question, the group was polled "Have you participated in a hazard mitigation plan before?" 55% responded Yes and 45% No.

Hazard Mitigation and Resilience Planning

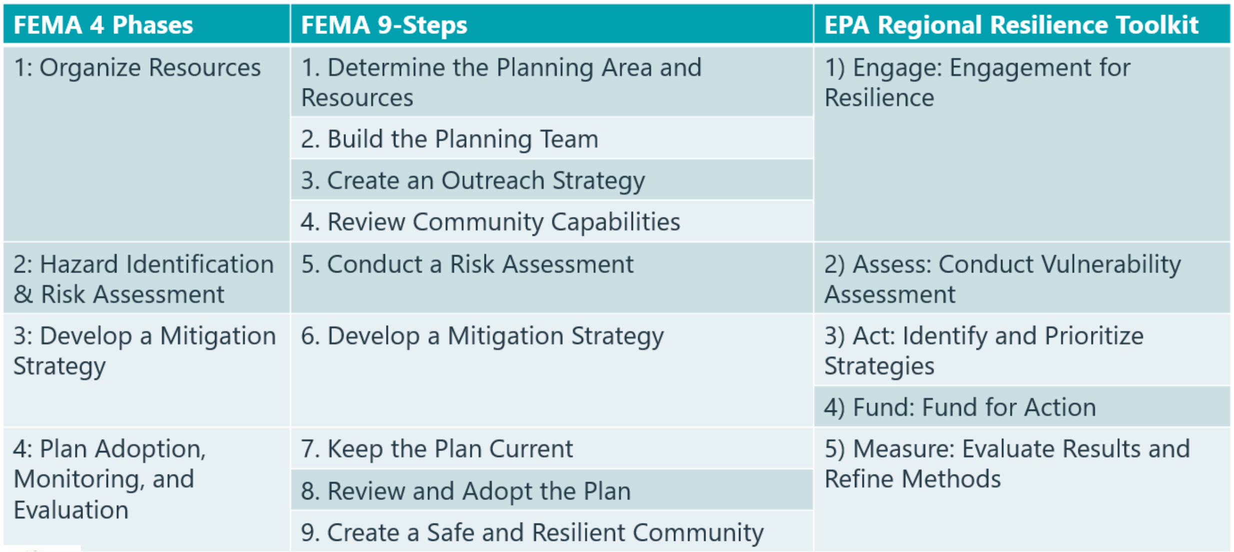
Following introductions, Amy Carr with the Wood team gave a presentation on the concept of hazard mitigation planning and its importance. Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from natural or human-caused hazards. Mitigation Planning guides mitigation activities in a coordinated and economic manner to make Montana more disaster resilient. The U.S. Disaster Mitigation Act of 2000 requires state and local governments to draft and adopt a hazard mitigation plan, and update it every five years, to maintain eligibility for FEMA mitigation assistance grants.

Amy displayed a slide which showed the trends resulting in increased disaster cost. She explained 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. More people are living in hazardous areas and there is an increasing exposure of buildings, people, and infrastructure to risk, as evidenced by the increasing frequencies of billion-dollar disasters nationwide. The COVID-19 Pandemic is a good example of a circumstance that can cause a regional disruption in the community and to the economy.

Amy described how governments have a responsibility to protect their communities and we need these plans for several reasons: the plans reduce future recovery costs, we can plan around predictive events, and they guide mitigation activities in a coordinated manner. It was found that these plans are cost effective, and for every $1 spent on mitigation, $6 is saved in disaster recovery and response cost. Amy then explained that these plans are not a regulatory document and they do not create new laws or regulations. There is no punishment for not completing the actions outlined in the plan, they are used as planning guidelines and to brainstorm solutions to potential problems. Amy concluded this section with an overview of the key elements in the Western Montana Regional Hazard Mitigation Plan. Amy described how the overall purpose of this process is to create one regional plan for the Western Region. Amy emphasized the benefits of regional plans because hazards do not follow jurisdictional boundaries and generally affect multiple cities or counties at once. A regional plan such as this one is beneficial because it can strengthen communication between jurisdictions before a disaster happens. In turn, this creates greater resiliency within the region.

Regional Planning Process Overview

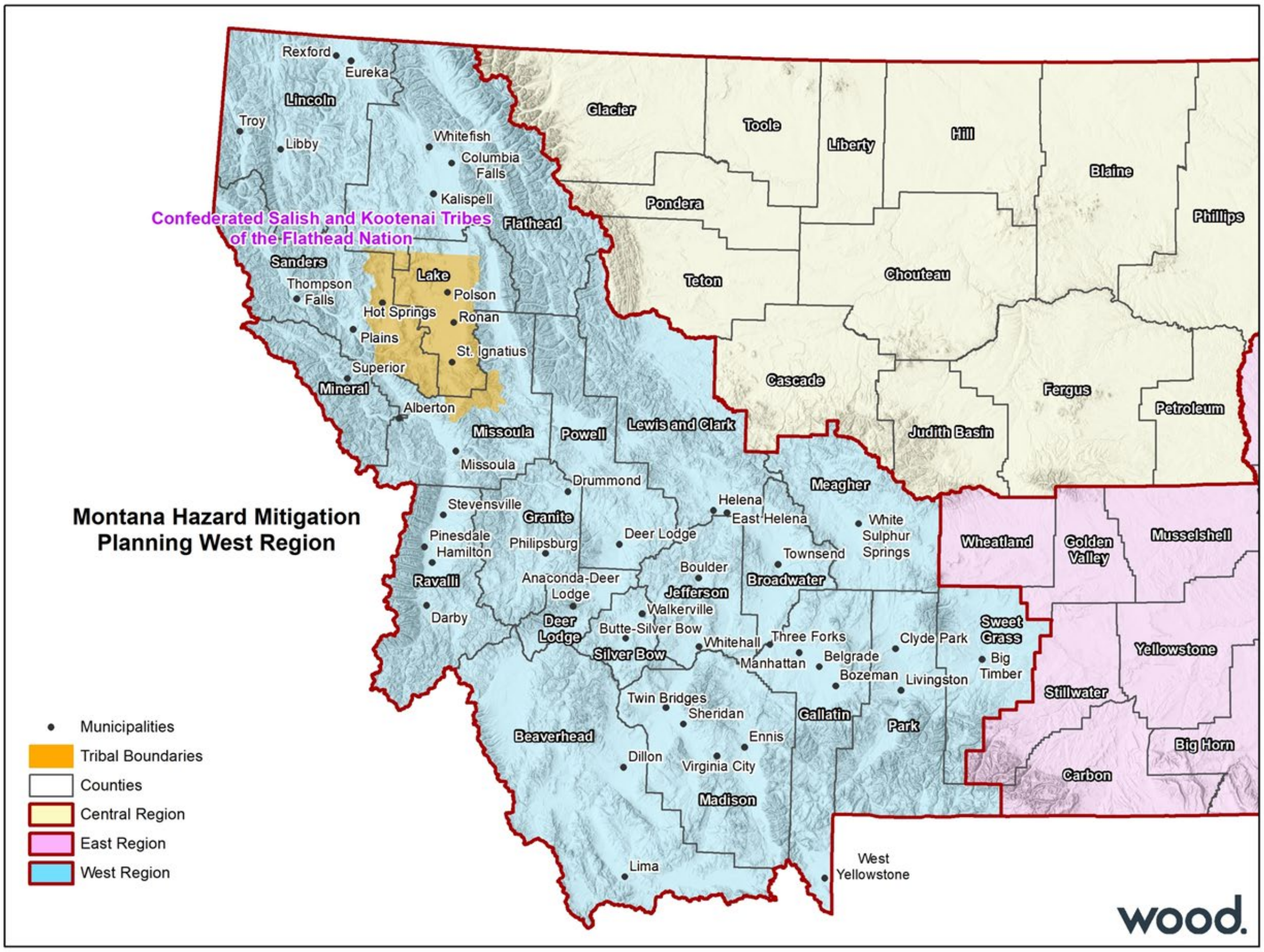
Amy reviewed a slide with the Federal Emergency Management Agency (FEMA) guidance breakdown of the hazard mitigation planning process. FEMA originally outlined 4 phases of the planning process. In 2013, FEMA expanded this process by creating 9 additional steps, which fall into the 4 phases. Wood also considers the 5 Regional Resilience guidelines developed by the U.S. Environmental Protection Agency. Amy described these 5 steps and how they mesh with and complement the FEMA process.



FEMA 4 Phases	FEMA 9-Steps	EPA Regional Resilience Toolkit
1: Organize Resources	1. Determine the Planning Area and Resources	1) Engage: Engagement for Resilience
	2. Build the Planning Team	
	3. Create an Outreach Strategy	
	4. Review Community Capabilities	
2: Hazard Identification & Risk Assessment	5. Conduct a Risk Assessment	2) Assess: Conduct Vulnerability Assessment
3: Develop a Mitigation Strategy	6. Develop a Mitigation Strategy	3) Act: Identify and Prioritize Strategies
		4) Fund: Fund for Action
4: Plan Adoption, Monitoring, and Evaluation	7. Keep the Plan Current	5) Measure: Evaluate Results and Refine Methods
	8. Review and Adopt the Plan	
	9. Create a Safe and Resilient Community	

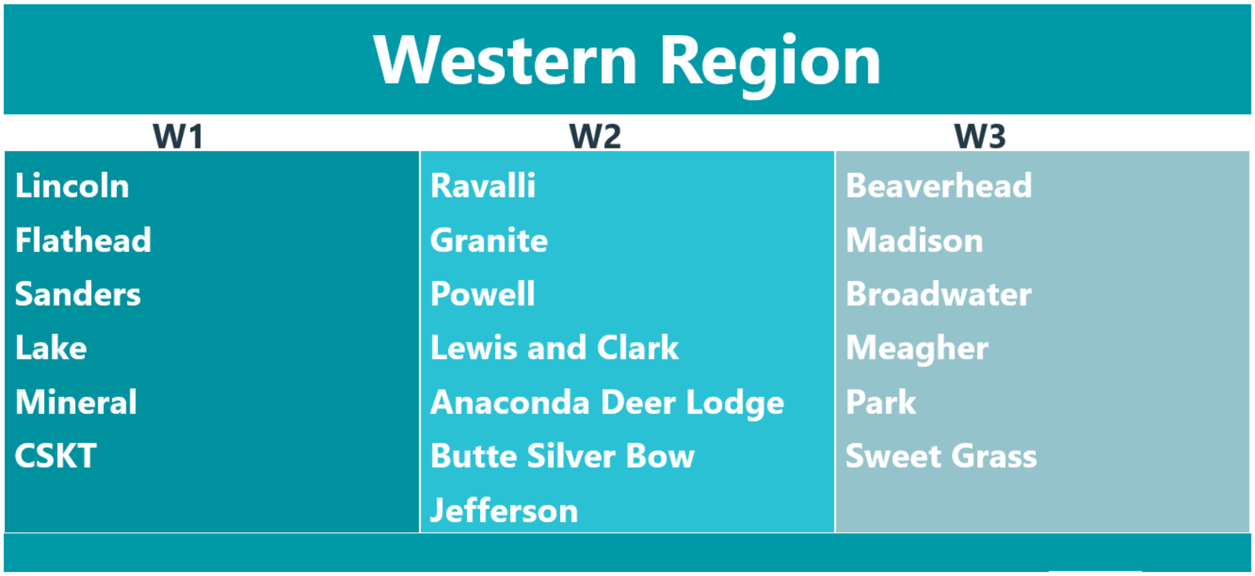
Phase 1, Step 1: Determine the Planning Area and Resources

Amy displayed a slide of the Western Region planning area in Montana. All but two counties in the Western Region are participating in the planning process and adoption of this regional hazard mitigation plan. The figure also depicts the other two regional planning areas (Eastern Region and Central Region) that Wood is consulting.



Phase 1, Step 2: Hazard Mitigation Planning Committee

The Western Region Hazard Mitigation Planning Committee (HMPC) consists of representatives from each of the 52 cities, towns, counties, and tribes which make up the Western Region, shown in the image below. Additionally, tribal, county, and municipal staff, as well as stakeholders within each county and reservation, will be participants in the planning process. Amy 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. Because this is a "regional" process the planning committee is structured somewhat differently from local hazard mitigation plans. There is regional oversight by MT DES and within each region there will be Subregions organized to group counties with similar hazards or geography (shown below; Note: Gallatin and Missoula counites have opted to continue with individual planning efforts and will participate as interested stakeholders but not as jurisdictions in the region plan). Each County or Tribe will be asked to develop a county or tribal planning team that consists of county and tribal staff, municipalities and other regional or organization stakeholders. This is also where a lot of the work will be done related to developing mitigation actions.



Western Region

W1	W2	W3
Lincoln	Ravalli	Beaverhead
Flathead	Granite	Madison
Sanders	Powell	Broadwater
Lake	Lewis and Clark	Meagher
Mineral	Anaconda Deer Lodge	Park
CSKT	Butte Silver Bow	Sweet Grass
	Jefferson	

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 the Western Region's 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.

Phase 1, Step 3: Public Outreach Strategy

Amy emphasized the importance of including the public in the planning process to strengthen community support for the plan and ensure the plan is meeting the specific needs in the region. FEMA requires two opportunities for public involvement during the planning process: during the draft stage and prior to plan approval. Public involvement will include online surveys during the planning effort. Wood will develop these surveys and look to members of the HMPC to advertise the surveys and distribute them to their respective communities. In addition, the County/Tribal Planning Teams are asked to post the draft plan online and solicit comments prior to the submission to the State and FEMA. The Wood team will be responsible for documenting this process; this may involve documenting specific meetings with stakeholders or other organizations. County and Tribal Planning Teams are encouraged to provide additional outreach beyond the regional planning outreach. An example may be noting the Regional Hazard Mitigation Plan at an already scheduled public meeting.

Phase 1, Step 4: Capabilities Assessment

Amy 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. She stated the Wood 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.

Phase 2, Step 5: Risk Assessment

Jeff Brislawn (Wood) discussed phase 2 of the planning process, which involves conducting a risk assessment. Jeff explained the three components of the risk assessment: hazard (what can happen here), vulnerability (what will be affected), and community capability (what are our existing capabilities to reduce risk). 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). Most counties within the Western Region also have existing hazard mitigation plans in place. These resources, as well as HMPC input will be used to develop a list of hazards which will be profiled in the plan.

The vulnerability assessment looks at a range of assets in the Region: residential/commercial structures and critical facilities and infrastructure. The Wood 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.

Phase 3, 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. Jeff emphasizes that the goals should reflect the risk assessment, with specific actions targeting the greatest risk hazards and areas. Goals and objectives will be updated later in the planning process. The region can choose to create one set of goals and objectives for the region, or different goals specific to each County and Tribal Planning Teams or both, depending on the preferences of the HMPC.

Jeff 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. The HMPC will also need to provide information on the status of actions from existing hazard mitigation plans (HMP). Jeff emphasized that there are no expectations to have all, or any, of these previous actions complete. This information will only be used to see what strategies worked best and where improvements can be made.

Phase 4, Steps 7 & 8: Plan Maintenance and Adoption

Jeff explained there will be four drafts of the plan: (1) Internal HMPC Review; (2) Public Review (3) State Review, and (4) FEMA Review. As part of the first review, the HMPC will review and agree upon plan maintenance procedures. Each county, tribe, and municipality within the Western Region will need to adopt the plan to secure the buy-in for the process. Jeff then explained the importance of continual monitoring, evaluating, and updating of the plan to maintain its effectiveness.

Regional, County, & Tribal Hazard Mitigation Planning Committees

Amy then reviewed the role of and responsibilities of each group within the HMPC. The county and tribal DES Coordinators will be the main points of contact with respect to meeting logistics and coordinating local planning teams. Each coordinator will convene a County Planning Team (CPT) or Tribal Planning Team (TPT) within each participating entity. The CPTs or TPTs 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 Planning Teams and assisting with meeting logistics. The CPTs and TPTs are responsible for participating in the planning process, assisting in the updating the plans content and reviewing the draft plans to ensure it meets specific needs and local issues. Finally, each county, municipality and tribe will need to formally adopt the plan by their local governing body. By doing so the plan will maintain eligibility for FEMA mitigation funds. Montana DES will provide oversight and Wood will facilitate the process, gather data, and write the plan.

Amy emphasized the importance of including stakeholders in the planning process. She reviewed a slide listing various stakeholders who will be included in the process, which lists a variety of representatives from the state or federal government, private, non-profit entities who will be affected by the assessment and potential strategies in this HMP. She then outlined the criteria for identifying stakeholders and used Slido to ask the group if there are any other key stakeholders that should be involved in the process. Responses include the Montana National Guard and Senior Citizen Organizations. See attached document for a complete list of responses.

The participation specifics for the participating jurisdictions, which includes all county, municipalities and tribes that have chosen to actively participate in this process and adopt the final approved plan, include:

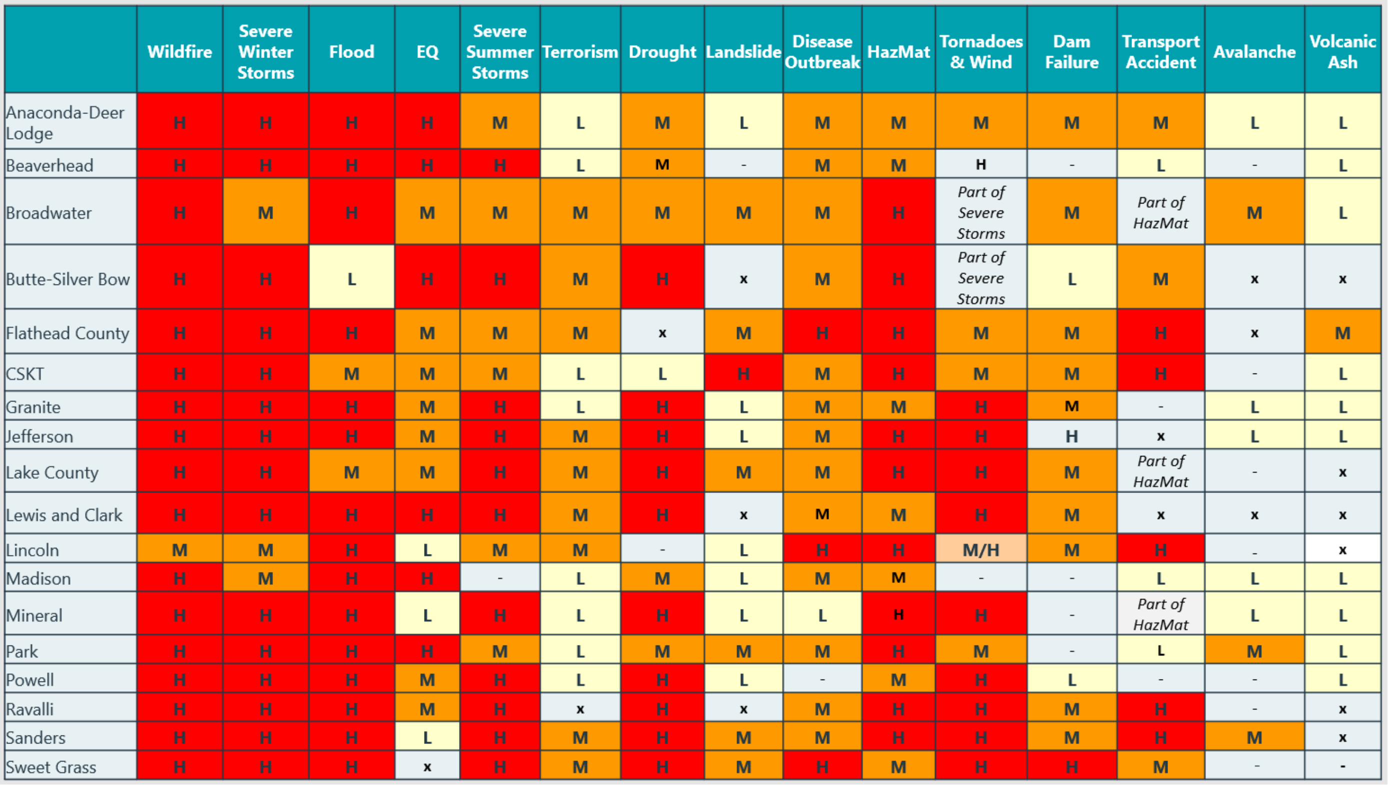
- Attend and participate in planning meetings/workshops
- Provide available data requested of the County and Tribal coordinator and Wood
- Provide input on local mitigation strategy (actions/projects)
- Advertise and assist with public input process
- Review and comment on draft plan
- Coordinate formal 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
- Providing data and information
- Partner on mitigation efforts
- Review the draft plan

Review of Identified Hazards

Amy then reviewed the identified hazards listed in the previous HMPs from jurisdictions in the Western Region. The top 15 hazards identified in all of the previous plans were listed and compared across jurisdictions in the figure below. There were significant differences in the risk ranking of some hazards between previous HMPs, but some hazards, such as wildfire, severe winter storms, and flood were ranked as high risk across most of the jurisdictions. Amy then asked the group what additional hazard should be considered for the regional plan. Some of the responses include dam failure, cyber security, and biological outbreaks. See the attached document for all responses to the poll. Amy then reviewed a slide with the 47 declared disasters in the Western Region and asked the group what other significant hazards events have occurred in the past 5 years. The responses include Havre Snowstorm, Flathead Valley Schools Cyberterrorism Attack, and Caribou Fire in 2017. See attached document for a list of all responses to the poll question. Amy finished this section by discussing several hazard information sources, including the previous local HMPs and the 2018 State of Montana Regional State Hazard Mitigation Plan. Amy also explained that data was going to be collected to determine the county, tribal, and municipal assets that already exist.



	Wildfire	Severe Winter Storms	Flood	EQ	Severe Summer Storms	Terrorism	Drought	Landslide	Disease Outbreak	HazMat	Tornadoes & Wind	Dam Failure	Transport Accident	Avalanche	Volcanic Ash
Anaconda-Deer Lodge	H	H	H	H	M	L	M	L	M	M	M	M	M	L	L
Beaverhead	H	H	H	H	H	L	M	-	M	M	H	-	L	-	L
Broadwater	H	M	H	M	M	M	M	M	M	H	*Part of Severe Storms*	M	*Part of HazMat*	M	L
Butte-Silver Bow	H	H	L	H	H	M	H	x	M	H	*Part of Severe Storms*	L	M	x	x
Flathead County	H	H	H	M	M	M	x	M	H	H	M	M	H	x	M
CSKT	H	H	M	M	M	L	L	H	M	H	M	M	H	-	L
Granite	H	H	H	M	H	L	H	L	M	M	H	M	-	L	L
Jefferson	H	H	H	M	H	M	H	L	M	H	H	H	x	L	L
Lake County	H	H	M	M	H	M	H	M	M	H	H	M	*Part of HazMat*	-	x
Lewis and Clark	H	H	H	H	H	M	H	x	M	M	H	M	x	x	x
Lincoln	M	M	H	L	M	M	-	L	H	H	M/H	M	H	-	x
Madison	H	M	H	H	-	L	M	L	M	M	-	-	L	L	L
Mineral	H	H	H	L	H	L	H	L	L	H	H	-	*Part of HazMat*	L	L
Park	H	H	H	H	M	L	M	M	M	H	M	-	L	M	L
Powell	H	H	H	M	H	L	H	L	-	M	H	L	-	-	L
Ravalli	H	H	H	M	H	x	H	x	M	H	H	M	H	-	x
Sanders	H	H	H	L	H	M	H	M	M	H	H	M	H	M	x
Sweet Grass	H	H	H	x	H	M	H	M	H	M	H	H	M	-	-

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 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. Amy asked the group what other existing or recent plans, reports, or studies should be reviewed for the planning process. Some of the responses include COOP, CWPP, Population Protection Plan, and Evacuation Plans. See a full list of responses to the poll in the attached document.

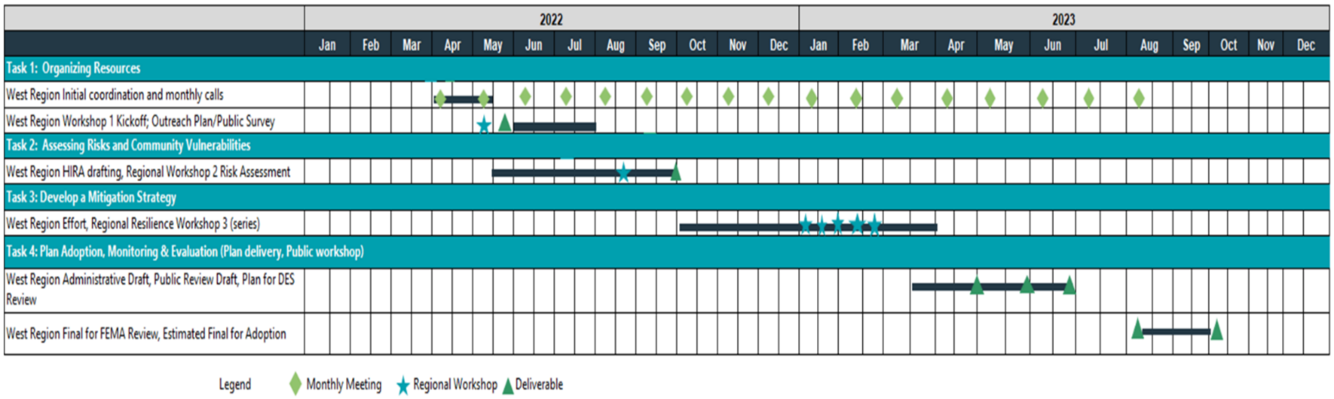
Amy explained that integrating this HMP into other plans is equally as important. She asked the group what opportunities exist to coordinate or integrate the Regional Hazard Mitigation Plan with other planning mechanisms. Some of the responses include Cross County Mutual Aid Agreements and Healthcare Coalitions. See attached document for a complete list of responses.

Planning for Public and Stakeholder Involvement

Amy explained the various tools that will be used for public and stakeholder involvement. Wood will encourage involvement through an online survey, a virtual and interactive engagement room, virtual public meetings, and a draft plan for public review. Counties and jurisdictions will be responsible for discussing the regional plan at county commissioner meetings and tribal/town council meetings. Additionally, jurisdictions will aid in posting the draft plan online and advertising, as well as host additional meetings as desired. Amy also reviewed the project website being developed by Wood to collect and store data for the planning process. Amy then asked the group what other upcoming opportunities for outreach at scheduled public meetings or events exist. Responses included Ravalli County Fair, Hamilton and Stevensville Farmers Market, and Beer Fest. See attached document for a complete list of responses.

Information Needs and Next Steps

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 Wood 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 summer and fall with exact dates to be determined; those meetings will be a combination of hybrid remote and in-person workshops.



Wood will facilitate the gathering of data and updated information from the Planning Teams. Each county, tribe and municipality will be asked to provide data based on various department inputs. This will capture recent hazard impacts, specifically those in the last five years as well as input on capability assessment updates. GIS data collection is already in process; statewide GIS portals/data will be leveraged where possible.

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 and tribal coordinators.

Attachments

Attendance from Meeting, Chat Log, Slido Poll results, and PowerPoint Slide:

Chat Log:

10:22:33 From Lee Starkel to Everyone:
Lee Starkel
10:22:41 From Dallas and Jenny Erickson to Everyone:
I notice the calendar sent out says the meeting starts at 10 AM.
10:22:55 From Dan to Everyone:
Dan Campbell subbing in for Lorie Cotter. Superior Ranger District, Lolo National Forest.
10:23:55 From jhauer to Everyone:
echo in the room with the mic
10:24:36 From MT-DES Mitigation Team to Everyone:
The calendar invite time was incorrect. We are sorry for the error. The meeting will start at 10:30am. Just a reminder if everyone could mute their mics.
10:24:52 From Dallas and Jenny Erickson to Everyone:
Wow! That is wild! Talk about an echo!
10:27:26 From Dallas and Jenny Erickson to Everyone:
Someone needs to mute.
10:27:29 From Barry to Everyone:
Barry Fowler - Clark
10:27:35 From rlivesay to Everyone:
Rob Livesay, Planning Director, Ravalli County
10:27:38 From Melody to Everyone:
Melody Evans, Exec Asst., Liberty Place, Inc.
10:28:02 From Susan Hawthorne MT Volunteer American Red Cross to Everyone:
Susan Hawthorne, American Red Cross DAT Coordinator for Lewis and Clark, Broadwater and Meagher Counties
10:28:07 From Barry to Everyone:
Barry Fowler Clark Fork Valley Hospital Emegency Planning
10:28:10 From Kori Nobel Felix, PacifiCorp Hydro EM to Everyone:
MUTE YOUR PHONES AND COMPUTER AUDIO!!!!!
10:28:14 From Andrew Dreesen, Deer Lodge Medical Center to Everyone:
Andrew Dreesen, Chief Administrative Officer, Deer Lodge Medical Center
10:28:18 From DeDe Rhodes to Everyone:
DeDe Rhodes
10:28:22 From KJOHNSTON to Everyone:
Kirk Johnston

10:28:23 From Diane.Fitzgerald to Everyone:
Diane Fitzgerald, NRCS District Conservationist, Jefferson County.
10:28:27 From Pete Melnick, Flathead County, CAO to Everyone:
Pete Melnick, Flathead County CAO
10:28:39 From MickP to Everyone:
Mick Paffhausen, Engineer, Vigilante Electric Cooperative
10:28:40 From Dina’s iPhone to Everyone:
Dina Young, Town of Lima, Clerk-Treasurer
10:28:40 From KJOHNSTON to Everyone:
Kirk Johnston, Police Officer, East Helena PD
10:28:41 From DAStewart to Everyone:
Alan Stewart, Acting Superintendent, Grant-Kohrs Ranch National Historic Site
10:28:42 From DeDe Rhodes to Everyone:
basin County water and sewer board
10:28:51 From DeDe Rhodes to Everyone:
and Basin vfd
10:28:58 From Ginger Galiger Town of Sheridan to Everyone:
Ginger Galiger, Clerk/Treasurer with the Town of Sheridan
10:29:04 From Leslie Diede - GVHC to Everyone:
Leslie Diede - Greater Valley Health Center, Flathead County
10:29:04 From Emily Geery to Everyone:
Emily Geery, Project Manager, SWCA Environmental Consultants
10:29:06 From Rose Frank to Everyone:
Good morning This is Rose Frank with St Peter's Health in Helena
10:29:06 From Keith to Everyone:
Keith Ouzts, Chief, York VFD
10:29:08 From Dallas and Jenny Erickson to Everyone:
The host can mute all the phones.
10:29:11 From Joe Wojton MTVOAD to Everyone:
Joe Wojton President MTVOAD and Emergency Disaster Service Coordinator for Helena Corps Salvation Army
10:29:17 From Craig Workman (City of Whitefish) to Everyone:
Craig Workman, Whitefish Public Works Director
10:29:18 From Doug Dodge to Everyone:
Doug Dodge, Jefferson County DES/Fire Warden
10:29:23 From Dave Webster to Everyone:
David Webster - EMS director, St. Peter's Health, Helena/L&C county
10:29:26 From Michael (Mike) Kent, BVBoR to Everyone:
Michael (Mike) Kent, State Director for Bitterroot Valley Board of Realtors
10:29:26 From Zach Slattery to Everyone:
Zach Slattery, 911 Operations Manager - City of Helena/Lewis and Clark County Communications Center
10:29:28 From Jen Phillips to Everyone:
Jen Phillips, St. James Healthcare in Butte
10:29:37 From Dustin Kaste - NorthWestern Energy to Everyone:
I believe it is *6 to mute phone when calling in.
10:29:45 From Jess Secrest to Everyone:
Jess Secrest
10:29:46 From Will Kussman to Everyone:
Will Kussman -- St. Peter's Health Helena
10:29:48 From Terry to Everyone:

Terry Wiegand Fire Chief
10:29:48 From Worby McNamee to Everyone:
Worby McNamee, Floodplain Manager, L&C County
10:29:55 From Bill Naegeli to Everyone:
Bill Naegeli Sanders County Emergency Manager
10:29:56 From Monique Schofield to Everyone:
Monique Schofield, Safety and EMS Officer, University of Montana Western
10:29:57 From Chanel Waples to Everyone:
Chanel Waples, 911 Program Manager - Helena-Lewis & Clark County Communications Center
10:30:04 From Vickie Rauser to Everyone:
Vickie Rauser, Townsend City Council
10:30:14 From Amanda Cooley to Everyone:
Amanda Cooley, Powell County Planning Director/Floodplain Administrator
10:30:18 From Lanaina Upham; Glacier County DES to Everyone:
Lanaina Upham, Glacier County DES
10:30:19 From EDWARD JOHNSON to Everyone:
Edward Johnson
10:30:32 From Marshall Bloom to Everyone:
Marshall Bloom, Associate Director, Rocky Mountain Labs, Hamilton, MT
10:30:33 From Christopher Johnson to Everyone:
Christopher Johnson, Hazard Mitigation Planner, Wood
10:30:43 From Jess Secrest to Everyone:
Jess Secrest Meagher County Planning Board Chairman
10:30:47 From Tom & Judy Anderson to Everyone:
Judy Anderson, private landowner Bitterroot Valley
10:30:48 From Lori Dove to Everyone:
Lori Dove
10:30:48 From Michael (Mike) Kent, BVBoR to Everyone:
Still having a bad echo
10:30:57 From Melody to Everyone:
Echo really bad.
10:30:59 From Monique Schofield to Everyone:
Really bad feedback on the call.
10:31:07 From Amanda Morgan to Everyone:
The Admin for the Zoom should be able to mute anyone.
10:31:11 From Tom & Judy Anderson to Everyone:
All I hear is echo
10:31:11 From EDWARD JOHNSON to Everyone:
Edward Johnson Senior Plans Examiner City of Helena Building Department
10:31:12 From Logan Sand, FEMA R8 to Everyone:
phone # ending in 286 needs to mute
10:31:25 From natalie.schoen to Everyone:
Natalie Schoen, Hazard Mitigation Planner, Wood
10:31:27 From Pattie Berg to Everyone:
Someone has 2 microphones on and its causing a lot of feedback
10:31:30 From Kori Nobel Felix, PacifiCorp Hydro EM to Everyone:
HOST/ADMIN NEEDS TO MUTE ALL
10:31:33 From Bruce Tyler to Everyone:
Bruce Tyler St. Peter's Health

10:31:45 From Lisa Dennison to Everyone:
Lisa Dennison, Emergency Preparedness & Communicable Disease Coordinator with the Flathead City-County Health Department.
10:31:49 From Madison County DES to Everyone:
Madison County DES
10:31:55 From kmckinzie to Everyone:
Karren McKinzie - PHEP Coordinator, Sanders County Health Department.
10:31:55 From James Antal, Salvation Army Emergency Disaster Rep MT, WY to Everyone:
James Antal, Salvation Army Emergency Disaster Services Rep MT & WY
10:31:55 From Dallas and Jenny Erickson to Everyone:
Can't understand anyone. Many of you have not MUTED your phones and it is echoing in your phones. 1406****286 is one and maybe the problem.
10:31:57 From Daniel Caufield to Everyone:
Dan Caufield, Chief Operating Officer, VA Montana
10:32:00 From Doug Wheeler, Elkhorn COAD to Everyone:
Doug Wheeler, Elkhorn COAD
10:32:02 From Madison County DES-Jenn Martens to Everyone:
Jennifer Martens - Madison County DES
10:32:07 From Lori Dove to Everyone:
Lori Dove Mineral County DES
10:32:08 From John Rasmann to Everyone:
John Rasmann, Montana DEQ
10:32:10 From David Knoepke to Everyone:
David Knoepke, Director of Transportation Systems City of Helena
10:32:10 From Greg Coleman - Park Co OEM to Everyone:
Greg Coleman, Park County emergency manager.
10:32:20 From   Bruce Tyler to Everyone:
The host can mute everyone.
10:32:22 From Jeff Brislawn, Wood to Everyone:
Jeff Brislawn, Project Manager, Wood
10:32:38 From Erin Carey - BLM to Everyone:
Erin Carey, BLM Missoula Field Manager
10:32:41 From Cory Kirsch-Jefferson County to Everyone:
Cory Kirsch-Jefferson County Commissioner
10:32:44 From Jeremy Fleege to Everyone:
Jeremy Fleege, Environmental Engineer, Montana Resources
10:32:48 From DeDe Rhodes to Everyone:
DeDe Rhodes Basin water and sewer and vfd
10:32:49 From P Lucashu to Everyone:
P Lucashu. Public. Ravalli County
10:33:01 From Susan Nicosia to Everyone:
Susan M Nicosia, City Manager Columbia Falls
10:33:19 From cbrophy to Everyone:
Cliff Brophy, Sweet Grass County DES; Big Timber
10:33:26 From Linda's IPhone to Everyone:
Linda Burch Sweet Grass Co Planning Board and Richard Burch
10:33:37 From abeck to Everyone:
Andy Beck, CNO Deer Lodge Medical Center
10:33:46 From Emily Geery to Everyone:

Is anyone else having trouble hearing?
10:33:49 From Amy Lommen to Everyone:
Amy Lommen, Mineral County Health Department; PHEP and Communicable Diseases
10:33:53 From Craig Johnson to Everyone:
Craig Johnson UYFSA Fire Chief
10:34:04 From Mark Clary to Everyone:
Mark Clary, Lake County
10:34:06 From Tiffany to Everyone:
yes i don't hear anything
10:34:07 From Patti Noble to Everyone:
cannot hear conversation, echos
10:34:08 From Heather Zufelt to Everyone:
Heather Zufelt Nurse Practitioner, Director of Psychiatry. Intensive Behavior Center Boulder MT
10:34:13 From cindy murray to Everyone:
Cindy Murray, General Manager, Flathead County Water District #1 - Evergreen.
10:34:28 From Kevin Larsen- Gallatin County Emergency Management to Everyone:
Kevin Larsen, Operations and Training Manager, Gallatin County Emergency Management. Can't hear anyone speaking......
10:34:48 From jhauer to Everyone:
No one is speaking yet
10:34:49 From kmckinzie to Everyone:
I can't hear what your saying
10:34:56 From Amy Carr to Everyone:
Hi everyone, we'll be getting started in a few minutes
10:35:07 From Mike Stickney, MT Bureau of Mines & Geology to Everyone:
Mike Stickney Montana Bureau of Mines & Geology Earthquake Studies
10:35:08 From Melody to Everyone:
Can anyone hear?
10:35:16 From Roxanna Parker to Everyone:
Can the organizer mute everyone?
10:35:24 From sparky to Everyone:
Teresa Oyama, Liberty Place Inc/Whitehall Public Transportation
10:35:24 From Logan Sand, FEMA R8 to Everyone:
Maybe share a slide saying "please mute yourselves"
10:35:49 From Will Kussman to Everyone:
Good Morning Dan. We are doing pretty good. Busy with people being out and about. Still dealing with staffing issues..... How are things with you?
10:35:55 From rkinkade to Everyone:
Rusty Kinkade
10:36:12 From Tracy Rebo to Everyone:
Tracy Rebo, City Clerk/Treasurer with the City of Troy
10:36:15 From Dustin Kaste - NorthWestern Energy to Everyone:
No one is speaking and until the *268 phone call in number is muted, no one will be able to hear anyone else talk because of the duel audio. Press *6 to mute your phone if calling in.
10:36:16 From Jim Salmonsen to Everyone:
Jim Salmonsen, Montana State Prison
10:36:19 From rkinkade to Everyone:
Deputy OEM Sanders County
10:36:30 From sparky to Everyone:

```
          Teresa Oyama, Transportation Manager, Liberty Place, Inc/Whitehall Public Transportation
10:36:37 From  Dustin Kaste - NorthWestern Energy  to  Everyone:
          *dual
10:36:43 From  Chris Hanley  to  Everyone:
          Chris Hanley, PWD, City of Columbia Falls
10:36:51 From  MT-DES Mitigation Team  to  Everyone:
          Thank you for your patience everyone the host is getting logged on to mute people.
10:36:58 From  Roxanna Parker  to  Everyone:
          Roxanna Parker, Northwest Montana United Way
10:37:09 From  Patti Noble  to  Everyone:
          Patti Noble, retired BCP, Town of Rexford, Lincoln county
10:37:35 From  Dallas and Jenny Erickson  to  Everyone:
          The people that aren't muted will highjack this meeting if they don't mute.  You can watch the echoes on the
phones that are not muted.
10:37:39 From  Chris Hanley  to  Everyone:
          Getting a lot of reverb
10:37:44 From  Pattie Berg  to  Everyone:
          I've seen the same feedback happen when someone is using a bluetooth speaker and their computer speaker.
10:37:47 From  Linda's IPhone  to  Everyone:
          Terrible feedback loop…
10:37:56 From  SteveW  to  Everyone:
          Steve Windbigler Maintenance Director, Evergreen School Dist. #50
10:38:26 From  Jeremy Grotbo  to  Everyone:
          Jeremy Grotbo, City & County of Butte-Silver Bow GIS Dept.
10:38:46 From  Frank Finnegan 15-90 S&R  to  Everyone:
          Frank Finnegan  15-90 S&R
10:39:03 From  Heather Mumby - Cayuse  to  Everyone:
          Heather Mumby, Cayuse Prairie School Clerk and Chair of our Crisis Management Team.
10:39:19 From  Linda's IPhone  to  Everyone:
          Has the meeting started?  Can’t hear anyone now
10:39:34 From  J.P. Gallagher  to  Everyone:
          J.P. Gallagher Butte-Silver Bow Chief Executive
10:40:05 From  Logan Sand, FEMA R8  to  Everyone:
          is there a co-host?
10:40:14 From  LaDana Hintz  to  Everyone:
          LaDana Hintz, Jefferson County Planning Dept.
10:41:19 From  tglasman  to  Everyone:
          Has not started yet . everyone needs to mute there phones/computers
10:41:31 From  Dallas and Jenny Erickson  to  Everyone:
          Good question.  Where are you host?  Many are still unmuted.
10:41:32 From  MT-DES Mitigation Team  to  Everyone:
          We are working on it.
10:41:33 From  DeDe Rhodes  to  Everyone:
          I'm getting a headache
10:41:36 From  Kitty Songer  to  Everyone:
          Kitty Songer, Central Region Healthcare Coalition Coordinator, MHA
10:43:07 From  Matt Haggerty Park Electric  to  Everyone:
          Matt Haggerty Park Electric coop
10:44:17 From  Erik Hoover  to  Everyone:
```

Erik Hoover Ravalli County
10:44:29 From Maria Stoppler, CEO GCHD to Everyone:
Maria Stoppler, CEO Granite County Hospital District
10:44:33 From Tom Moody to Everyone:
Tom Moody, NorthWestern Energy, Kalispell District
10:44:40 From A205478 to Everyone:
Eileen Steilman, Environmental Engineer, REC Silicon
10:44:40 From City of Thompson Falls to Everyone:
Neil Harnett City of Thompson Falls Public works director
10:44:47 From Doug Kuenzli | Env. Manger | Ash Grove to Everyone:
Doug Kuenzli, Environmental Manager, Ash Grove
10:44:48 From Randy Brodehl, Flathead County Commissioner to Everyone:
Randy Brodehl, Flathead County Commissioner
10:45:12 From Arnold Sorrell to Everyone:
Arnold Sorrell, Mission Valley Power
10:45:12 From rkinkade to Everyone:
Rusty Kinkade Deputy OEM Sanders County
10:45:21 From Pattie Berg to Everyone:
Good Morning! Pattie Berg, City Council member/President City of White Sulphur Springs
10:45:31 From jhauer to Everyone:
Jesse Hauer-Emergency Preparedness Jefferson County Health Department
10:45:34 From Tom Wagenknecht to Everyone:
Tom Wagenknecht, Beaverhead County DES, Land Use Sanitation
10:45:58 From iPhone to Everyone:
Tim schuch Whitefish Police
10:46:00 From Brent McDaniel - Avista to Everyone:
Brent McDaniel, Hydro Safety Specialist, Avista
10:47:00 From Thomas Lane to Everyone:
what was the slido code?
10:47:05 From Craig Workman (City of Whitefish) to Everyone:
What was the slido.com code?
10:47:23 From kmckinzie to Everyone:
What was the participant code for slido.com?
10:47:24 From Amy Carr - Wood E&IS to Everyone:
slido.com #WestHMP
10:47:34 From dale.nelson@cskt.org to Everyone:
Dale Nelson Emergency management CSKT
10:48:16 From Terry to Everyone:
Terry Wiegand Fire Chief Blankenship RFD
10:48:44 From Bridget Mancini to Everyone:
Bridget Mancini
10:49:14 From Bridget Mancini to Everyone:
Ravalli County Fire Adapted Communities Coordinator- DNRC
10:49:21 From Rosenbaum, Nick to Everyone:
Nick Rosenbaum Montana Dept of Transportation Equipment Shop Superintendent
10:49:34 From J.P. Gallagher to Everyone:
golf
10:49:36 From LaRinda Spencer to Everyone:
LaRinda Spencer, Broadwater Conservation District Administrator

10:49:41 From Patti Noble to Everyone:
Working in the yard
10:49:46 From Susan Hawthorne MT Volunteer American Red Cross to Everyone:
Having coffee with a friend
10:49:49 From DeDe Rhodes to Everyone:
cutting wood in the mountains
10:49:57 From aharcourt to Everyone:
Amanda Harcourt Director of the Asbestos Resource Program for Lincoln County
10:50:12 From Linda's IPhone to Everyone:
Linda Burch Sweet Grass Co Planning Board and Richard Burch
10:50:36 From Linda's IPhone to Everyone:
Scuba diving
10:50:37 From Randy Brodehl, Flathead County Commissioner to Everyone:
Working budget
10:51:00 From Linda's IPhone to Everyone:
Yes
10:51:04 From tglasman to Everyone:
Troy Glasman- Glacier Park International Airport Fire Department Chief ARFF/OPS
10:51:05 From kmckinzie to Everyone:
NO
10:51:12 From Craig Johnson to Everyone:
Yes
10:51:13 From Ginger Galiger Town of Sheridan to Everyone:
No
10:51:13 From J.P. Gallagher to Everyone:
no
10:51:22 From Randy Brodehl, Flathead County Commissioner to Everyone:
yes
11:02:47 From Dallas and Jenny Erickson to Everyone:
Who are "stake holders"? Is the public included?
11:03:44 From MT-DES Mitigation Team to Everyone:
If you are on this meeting you were identified as a Stakeholder by your community.
11:07:25 From Randy Brodehl, Flathead County Commissioner to Everyone:
Have to sign off. rlb
11:10:07 From cbrophy to Everyone:
Sweet Grass DES has a LEPC meeting to head to. Thanks for info, looking forward to working with everyone
11:15:21 From Daniel Caufield to Everyone:
Sharing Job opportunity for Emergency Manager replacing Paul Reyes - https://www.usajobs.gov/job/656738500
11:16:45 From Dallas and Jenny Erickson to Everyone:
Will these slides be sent out to everyone for review?
11:17:06 From Juliana Prosperi, Wood E&IS to Everyone:
Yes. We will be providing the slides following the meeting!
11:17:23 From Dallas and Jenny Erickson to Everyone:
Thanks!
11:18:11 From Amy Carr - Wood E&IS to Everyone:
Note HMGP and Post Fire grants are considered competitive in the State of Montana
11:25:06 From Craig Johnson to Everyone:
Any fuel reduction grants for private property?

11:26:08 From MT-DES Mitigation Team to Everyone:
Craig if you can send me an email. We can discuss this.
11:26:27 From MT-DES Mitigation Team to Everyone:
Nicole.Erickson@mt.gov
11:26:40 From Craig Johnson to Everyone:
Thank you
11:27:55 From Michael Kropp DEQ PWS Kalispell to Amy Carr - Wood E&IS(Direct Message):
Seems like DEQ PWS should be on that list of stakeholders.
11:28:11 From Ginger Galiger Town of Sheridan to Everyone:
Schools
11:29:00 From DeDe Rhodes to Everyone:
communication is key
11:29:40 From Vickie Rauser to Everyone:
Have another meeting. Thanks for what I've seen so far.
11:31:24 From Michael Kropp DEQ PWS Kalispell to Everyone:
Department of Environmental Quality Public Water Supply
11:32:39 From Logan Sand, FEMA R8 to Everyone:
stakeholder can help disseminate information out through their networks
11:33:10 From Michael (Mike) Kent, BVBoR to Everyone:
And also help with education to the public
11:33:55 From Mike Stickney, MT Bureau of Mines & Geology to Everyone:
No earthquakes?
11:34:08 From Pattie Berg to Everyone:
What if your county isn't listed?
11:34:09 From Juliana Prosperi, Wood E&IS to Everyone:
Earthquakes is abbreviated as EQ
11:34:32 From Barry to Everyone:
Why isn't Missoula County in this process?
11:34:58 From Bruce Tyler to Everyone:
How old are these rankings. I would argue that "Disease" might be increased to H all things considered.
11:35:06 From MT-DES Mitigation Team to Everyone:
They have decided to opt-out of the process this time around.
11:36:09 From Michael Kropp DEQ PWS Kalispell to Everyone:
Compromised water systems
11:36:38 From Chelsia Elmore to Everyone:
supply chain disruptions
11:38:09 From Linda's IPhone to Everyone:
Low Level flooding and drought
11:39:19 From Craig Johnson to Everyone:
GeoEngineering airiael spraying
11:40:10 From Chelsia Elmore to Everyone:
cyber attacks healthcare systems 2019, 2021
11:41:52 From jhauer to Everyone:
Air shed pollution from not only from our areas burning, but other areas burning
11:42:37 From MickP to Everyone:
Are the each county hazard mitigation plans available to the public?
11:42:56 From MT-DES Mitigation Team to Everyone:
Yes they are public documents.
11:46:25 From DeDe Rhodes to Everyone:

rcap

11:48:43 From Dallas and Jenny Erickson to Everyone:
What is CWPP?

11:49:00 From MT-DES Mitigation Team to Everyone:
Community Wildfire Protection Plan

11:49:58 From Craig Johnson to Everyone:
Long term electrical blackouts

11:52:02 From Barry to Everyone:
I may have missed something, but who or from where is the Wood team

11:52:49 From Jeff Brislawn, Wood to Everyone:
We have an office in Helena and several of us are based in CO.

11:52:57 From MT-DES Mitigation Team to Everyone:
The Wood team is the consulting team that MT-DES choose to complete this planning process.

11:54:55 From DeDe Rhodes to Everyone:
basin days in august

11:55:45 From Chelsia Elmore to Everyone:
regional response Task Force mtgs

11:57:32 From DAStewart to Everyone:
MT Folk Festival

11:57:53 From   Bruce Tyler to Everyone:
National Park entrances

11:58:26 From Pam Lucashu to Everyone:
Where can we access the zoom recorded call?

11:58:42 From MT-DES Mitigation Team to Everyone:
I will be sending it out next week.

11:59:07 From Patti Noble to Everyone:
how can we get a list of our county contacts for the plan development?

11:59:12 From Susan Hawthorne MT Volunteer American Red Cross to Everyone:
Great information, looking forward to moving forward. Need to run, thank you

11:59:46 From DeDe Rhodes to Everyone:
Tuesday or Wednesday is best for me.

12:00:40 From Juanita Nelson - Flathead County OES to Everyone:
How soon can we expect to receive the Data Collection Guides?

12:01:21 From Ewood to Everyone:
Great job Amy and Wood Team!

12:01:29 From Mark Clary to Everyone:
Mark Clary

12:01:35 From kkenison to Everyone:
Kathy Kenison, IT Manager, Butte-Silver Bow

12:01:37 From Mark Clary to Everyone:
Lake County OEM

12:01:43 From Rand Dickson to Everyone:
Rand Dickson, Powell EMS Director.

12:01:44 From Dan to Everyone:
Thank you Amy!

12:01:46 From Madison County DES to Everyone:
Thank you!

12:01:47 From Abigail Byers, RN, St Luke Community Healthcare to Everyone:
Abigail Byers abyers@stlukehealthcare.org St Luke Community Healthcare Director of Nursing.

12:02:07 From Joe Wojton MTVOAD to Everyone:
Great Job I look forward to the rest of the process
12:02:08 From DeDe Rhodes to Everyone:
thank you.   you have given me a lot to think about.
12:02:12 From Spencer Gilchrist (CAP) to Everyone:
Spencer Gilchrist, commander, montana civil air patrol
12:02:18 From Chelsia Elmore to Everyone:
Chelsia Elmore, Logan Health System Emergency Manager, Flathead, Lincoln, Lake, Glacier, Toole, Pondera counties
12:02:20 From Teresa Oyama to Everyone:
Will this presentation be available to download, print?
12:02:42 From MT-DES Mitigation Team to Everyone:
Teresa this presentation will be sent out to everyone.
12:02:45 From Pattie Berg to Everyone:
If a community doesn't participate in ths, does it affet potential fema funding?
12:02:53 From Pattie Berg to Everyone:
affect
12:03:11 From Ed Shindoll to Everyone:
Ed Shindoll Fire Chief Broadwater County Rural Fire District

MT Western Region Kickoff

Poll results

Table of contents

Wordcloud poll

wood.

If you didn’t have to be in the meeting today, what would you rather be doing?

0 7 1

At work anyway

Getting more work done 😜

enjoying the sunshine

Reading in the hammock

Nothing

practicing the banjo!

rubbing chetos on myself

be in another meeting

Building my shop

visting the bahamas

working

camping

Working outside

skiing

More meetings

Fly fishing

my work

Other work

Mountain Biking

Golfing

Hiking

sleeping

Fshing

Outside in the sun

Video games

Beach

working out

Traveling

Cigars

in lAS vEGAS

Building

time w family

Fishing

Visiting grandkids

Riding Motorcycles

Work

Spending time with family

Nap

Winning the Lottory

cleaning my garage

Hunting

Hitting mute on phines

I would still be working

Multiple-choice poll

Have you participated in a hazard mitigation plan before?

085

Open text poll

What key stakeholders should be involved in this process?

(1/3)

045

- non ngo
- MT National Guard
- Railroad
- Redundant communication capacities
- Dam safety
- major industries
- News papers
- Senior citizen orgs/HOAs
- Volunteer groups.
- Any of the FEMA ESF’s
- Landowners, Conservation Districts, Sheriffs office, Red Cross, Fire departments, churches
- State and federal law Enforcement
- irrigation districts
- Agriculture food production
- Elected officials Administrators Planning and Zoning Public Works Emergency responders- police, fire, ambulance Public utilities
- Fairgrounds
- DES, County Commissioners, Planning Staff, Fire Departments, Law

What key stakeholders should be involved in this process?

(2/3)

045

enforcement, Schools, Utility providers and Cell phone providers

- Churches and religious organizations
- Private Industry
- American Red Cross
- Hospitals Schools Law enforcement
- Local Electric Co-ops, communications companies,
- Law Enforcement , Fire, medical , Search and Rescue
- Hospital, Law Enforcement, Fire, local government, red cross,
- Developers
- Healthcare coalitions LEPC
- Police, fire and health care
- Hospitals
- public health departments
- VOADS/COADS
- Neighboring Municipalities
- Local fire departments, Building associations, Realtor Associations,
- Healthcare Coalitions
- Ski resorts
- Healthcare / Hospitals
- Non profit's disaster response agencies

Open text poll

wood.

What key stakeholders should be involved in this process?

(3/3)

0 4 5

- Police & Fire, community leaders,
- Search and Rescue
- City's and Towns
- EMS
- County DES Land Mgt Agencies
- Public Health
- Schools
- county planners
- Hospitals
- Public works
- County OEM
- Fire, law, DES, local government, healthcare, schools
- hospitals/fqhc's
- Electric cooperatives
- Federal and State partners.
- natural resources and water conservation/efficiency
- Healthcare
- Medical Equipment Providers
- Major land owners
- Everyone is a stakeholder
- Hospitals
- Hospitals and Healthcare systems
- Conservation districts

slido

What additional hazards should be considered for the Regional Plan?

(1/2)

031

- Out of staters moving in
- cyber-attacks infostructure, grid, Dam , hazmat storage
- Outbreaks at major housing installations (e.g., universities, prisons, etc.).
- Nuclear ordinance/radioactive release
- Blackouts
- Food supply loss
- Mass causality’s
- catastrophic ildfire, Forest Degradation, widespread power outages, communication
- Industrial Accidents
- Active Killer?
- Electric Grid issues
- Supply Chainssupply chain
- Pandemics, disease, terrorism
- Resource Shortages
- Irrigation dams, multiple in Ravalli County in most of the west side canyons
- cyber attacks
- Power outages
- Train Derailment
- Power or communications disruption

Open text poll

What additional hazards should be considered for the Regional Plan?

(2/2)

031

- Pandemic should probably move up the scale.
- Bank erosion
- Dams
- Erosion/rockfall/landslide
- Cyber security
- Running out of drinking water
- Food supply disruptions
- Bio Hazards - Labs
- Mutual Aid
- Dams
- flash flood/debris flow
- Cyber attacks
- Dams
- domestic terrorism and civil disruption
- Pandemics
- Dams

Open text poll

What other significant hazards events have occurred in the past 5 years? (Note which jurisdiction(s) was impacted in your response)

(1/2)

0 2 3

- Population growing faster that resources available
- City/county streets and infrastructure can’t keep up with growing community’s
- Cyberterrorism
- Elicit drug haz mat. All counties
- Drought
- Power grid failure
- Level 4 Lab in Ravalli County leak
- Havre snow storm
- COVID is the obvious one
- Urban avalanche Increased human trafficking Drought
- Migration of Californians
- earthquakes, fires
- Flathead Valley Schools Cyberterrorism Attack (2018?)
- Woods Creek, Deep Creek Fire 2021
- Long hot summers lately
- Ice jams at bridges due to runoff/freeze cycle
- Mt Jumbo Avalanche
- Multiple Wind Events with multi-day power outages in NW Montana (Lincoln, Flathead, Lake, Sanders)

Open text poll

What other significant hazards events have occurred in the past 5 years? (Note which jurisdiction(s) was impacted in your response)

(2/2)

023

- Homeless and biohazards
- Forest fires
- Unknown, I am one of those "people from out of state!"
- Caribou Fire 2017. Lost approximately 11 homes and 27 structures
- draught, most of Montana
- 2017 Lincoln earthquake
- Large events
- train derailment
- predators

Open text poll

022

What other existing or recent plans, reports, or studies should be reviewed for this planning process?

(1/2)

- COOP, Wildfire plan, CWFPP, Population protection plan. evacuation plans, county emergency plan utilizing life liines
- County’s need to TALK to electrical companies before approving subdivision.
- community economic development plans (CEDS)
- Healthcare Coalition HVAs, Preparedness & Response Plans and Annexes
- Hospital Evacuation Plans
- Growth Policy, Subdivision Regulations, Sanitation plans
- Utility Masterplans (Water, Sewer)
- Growth Policy
- After Action Reviews
- COOP, EOP, EAP, CWPP
- Public Health Annexes to County EOP’s
- PER'S
- NRCS Targeted Implementation Plans for fuel mitigation
- Active shooter response
- Emergency Action Plans for Dams
- Ravalli County is in the process of updating it's CWPP

0 2 2

What other existing or recent plans, reports, or studies should be reviewed for this planning process?

(2/2)

- Growth plan
- Growth Plans Comprehensive
  Transportation plans
- growth policy
- CIP
- Military
- EAP
- Population Protection Plans
- Capital improvement plans (CIP)
- CWPP

Open text poll

What opportunities exist to coordinate or integrate the Regional Hazard Mitigation Plan with other planning mechanisms?

013

- Cross county mutual aid agreements
- site design standards and setback reqs.
- Functional and Tabletop EAP exercises
- Growth Policy
- Flathead County Regional Plan
- Growth policy update, and revisions to subdivisions reqs.
- TEP/IPP
- Growth Policy, Comprehensive Plan, Fire Protection Plan, CWPP
- County hazard mitigation plans
- Healthcare Coalitions
- NRCS fuel reduction plans, existing and potential
- Never re-invent the wheel.
- Ravalli County CWPP
- CWPP

Open text poll

009

Are there any upcoming opportunities for outreach at scheduled public meetings or events?

- out door concerts.
- Baseball Games
- Beer fests
- Library events
- July 4th Parade
- LEPC
- blood drive
- Ravalli County Fair Hamilton and Stevensville Farmers Market
- Pride parade in Helena
- Rodeo

Attendees

Name	**Jurisdiction**	**Title**
Adriane Beck	Missoula County DES	DES Coordinator
Amanda Cooley	Powell County DES	DES Coordinator
Amanda Harcourt	Lincoln County Asbestos Resource	Director
Amanda Morgan	Jefferson County	Sheriff Admin/Dispatch Super Assist
Andy Beck	Deer Lodge Medical Center	CNO
Arnold Sorrell	Mission Valley Power	
Bill Naegeli	Sanders County DES	DES Coordinator
Brent McDaniel	Avista Corp	Hydro Safety Specialist
Bridget Mancini	Ravalli County Fire	Adapted Communities Coordinator
Brittney Willis	Broadwater County DES	DES Coordinator
Bruce Tyler	St. Peter's Health	
Chanel Waples	Helena-Lewis and Clark Comm. Center	911 Program Manager
Chris Hanley	City of Columbia Falls	Public Works Director
Clifford Brophy	Sweet Grass County	DES Coordinator
Cory Kirsh	Jefferson County	County Commissioner
Craig Johnson	UYFSA	Fire Chief
Craig Workman	City Whitefish	
Dale Nelson	CSKT DES	Des Coordinator
Dan Caufield	VA Montana	Chief Operating Officer
Dave Webster	St. Peter's Ambulence- Helena	Director, St. Peter's Ambulence
David Knoepke	City of Helena	Director of Transportation Systems
DeDe Rhodes	Basin Water & Sewer	
Diane Fitzgerald	Natural Resource Conservation Service	
Doug Dodge	Jefferson County	DES Coordinator
Doug Kuenzli	Ash Grove	Environmental Engineer
Doug Wheeler	Elkhorn COAD	Helena
Dustin Kaste	North Western Energy	EAP Coordinator
Edward Johnson	City of Helena	Senior Plans Examiner
Eileen Steilman	REC Silicon	Environmental Engineer
Erik Hoover	Ravalli County	DES Coordinator
Erin Carey	BLM Missoula	Field Manager
Frank Finnegan		BSB 15-90 Search & Rescue
Ginger Galiger	Town of Sheridan	Town Council Clerk
Greg Coleman	Park County DES	DES Coordinator
Hannah Shultz	Montana DES	Mitigation Coordinator
Heather Zufelt	Intensive Behavior Center-Boulder	
Helen Auch	Jefferson County	Commissioner Admin
J.P. Gallagher	City and County of Butte-Silver Bow	Chief Executive
Jackie Bolster	Granite County DES	DES Coordinator
James Antal	Salvation Army	Emergency Disaster Services Rep

Jennifer Huttinga	Jefferson County Farm Agency	
Jennifer Martens	Madison County	EM Deputy
Jeremy Fleege	Montana Resources	Environmental Engineer
Jeremy Grotbo	City and County of Butte-Silver Bow	DIS Department
Jess Secrest	Meagher County Planning Board	Chairman
Jesse Hauer	Jefferson County	PHEP Coordinator/ County Safety
Jim Salmonsen	Montana State Prison	
John Rasmann	Montana DEQ	
Juanita Nelson	Flathead County DES	DES Coordinator
Karren McKinzie	Sanders County Health Department	PHEP Coordinator/County Safety
Kathy Kenison	City and County of Butte-Silver Bow	IT Manager
Kevin Larsen	Gallatin County EM	Operations and Training Manager
Kitty Songer	Central Region Healthcare Coalition	MHA
LaDana Hintz	Jefferson County	County Planner
Lanaine Upham	Glacier County DES	
LaRinda Spencer	Broadwater Conservation District	Administrator
Lisa Dennnison	Flathead City-County Health Dept	Emergency Preparedness & Comm
Lori Dove	Mineral County DES	DES Coordinator
Maria Stoppler	Granite County Hospital District	CEO
Mark Clary	Lake County DES	DES Coordinator
Marshall Bloom	Rocky Mountain Labs	Associate Director
Mary Hensleigh	Town of Whitehall	Mayor
Matt Haggerty	Park Electric Coop	
Megan Burke	RESPEC	Consultant
Michael Kroop	Montana DEQ	Public Water Supply
Mike Stickney	MT Bureau of Mines & Geology	Earthquake Studies
Monique Schofield	University of Montana- Western	Safety and EMS Office
Neil Harnett	City of Thompson Falls	Public Works Director
Nick Rosenbaum	Montana DOT	Equipment Shop Superintendent
Patrick Lonergan	Gallatin County DES	DES Coordinator
Patti Noble	Town of Rexford	Retired BCP
Pattie Berg	City of White Sulphur Springs	City Counciler
Rand Dickson	Powell County DES	EMS Director
Randy Brodehl	Flathead County	Commissioner
Robert Pressly	FEMA	Community Planner
Roxanna Parker	Northwest Montana United Way	
Rusty Gulio	City of Boulder	Mayor
Sara Hartley	Montana DES	SHMO
Steve Windbigler	Evergreen School District #50	Maintenance Director
Susan Nicosia	City of Columbia Falls	City Manager
Teresa Oyama	Whitehall Public Transportation	Serves Whitehall and boulder
Terry Wiegand	Blankenship Rural Fire Dept	Fire Chief
Tim Schuch	Whitefish Police	
Tom Moody	Northwestern Energy	Kalispell

Tom Wagenknecht	Beaverhead County DES	DES Coordinator
Tracy Rebo	City of Troy	City Clerk/Treasurer
Troy Glasman	Glacier Park International Airport	Fire Chief
Vickie Rauser	City of Townsend	City Counciler
Will Kissman	St. Peter’s Health- Helena	
Worby McNamee	Lewis and Clark County DES	Interim DES Coordinator

MONTANA WESTERN REGION
HAZARD MITIGATION PLAN
RISK ASSESSMENT MEETING

Counties: Anaconda-Deer Lodge, Beaverhead, Broadwater, Butte-Silver Bow, Flathead, Granite, Jefferson, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Mineral, Park, Powell, Ravalli, Sanders, Sweet Grass
Tribes: Confederated Salish and Kootenai Tribes of the Flathead Reservation

Monday, September 12, 2022, 10:00 – 12:00pm

MS Teams Meeting Link: Click here to join the meeting

Meeting ID: 287 331 008 266
Passcode: ZaseQR

Or call in (audio only): +1 406-318-5487
Phone Conference ID: 744 833 900#

AGENDA

1. **Introductions**
2. **Review of the hazard mitigation planning process**
3. **Highlights from returned Data Collection guides**
4. **Highlights of Hazard Identification and Risk Assessment (HIRA)**
5. **Next Steps**
6. **Questions and Answers/Adjourn**

Montana Western Region
Regional Hazard Mitigation Plan
Risk Assessment Meeting Summary

September 12, 2022, 10:00 am – 12:00 pm
Virtual Meeting via Microsoft Teams

Introductions and Opening Remarks

This document summarizes the risk assessment meeting held for the Montana Western Region Hazard Mitigation Plan. The meeting was conducted by Wood Environment & Infrastructure Solutions, Inc. (Wood), the consultant firm hired to facilitate the planning process and develop the updated plan. The purpose of the meeting was to review the highlights of the updated Hazard Identification and Risk Assessment and revisit the plan's goals with the Western Region Hazard Mitigation Planning Committee. This meeting was delivered as a virtual web meeting via Teams. Slido was used periodically to gather input from the planning team, including attendance.

Amy Carr, Lead Planner at Wood, began the meeting with introductions. Emergency Management Coordinators and other representatives from counties and the Confederated Salish and Kootenai tribes in the Western Region attended the meeting, along with representatives from State of Montana Department of Emergency Service (DES) and key stakeholders (see attendance list attached). The primary focus of this meeting was to review the various hazards that can impact the Western Region and get input from participating jurisdictions on the hazard ranking significance.

Review of the Hazard Mitigation Planning Process

A PowerPoint presentation was presented by Amy Carr and Jeff Brislawn Project Manager with Wood, accompanied by Tim Clute and Emily Geery with SWCA, who presented the wildfire slides. Amy started the meeting by outlining the FEMA nine-step planning process and discussed the project status, now in step 5. Amy also discussed the Disaster Mitigation Act of 2000, which set the guidelines for Hazard Mitigation Plan development. These Hazard Mitigation plans need to be updated every five years to maintain eligibility for mitigation project funding. Amy then reviewed the progress so far. Due to technical difficulties, the public survey for the Western Region will remain open until October 8th to allow addition time for community members to submit their responses. Amy asked the HMPC to send screenshots and links of how the public survey was communicated to their respective jurisdictions to herself or Andrew Long, DES Coordinator.

Highlights from Returned Data Collection Guides

Amy continued by reviewing highlights from the Data Collection Guides responses. Many counties commented on the increasing growth and development within their communities and concerns with an increase within the wildland urban interface (WUI) areas. S Others noted minimal development and population growth occurring, including Powell and Anaconda-Deer Lodge Counites.

Amy reminded the HMPC to fill out and return the data collection guides as soon as possible if they have not already, as the information in those guides is used to help inform the risk assessment and get a better understanding of the impacts each hazard has on unique jurisdictions.

Cliff Brophy with Sweet Grass County DES noted that he has a large file of information that goes along with the data collection guide form and that he will coordinate with Andrew Long to provide that information after the meeting. Amy asked if there was any additional information that the HMPC wanted to add not covered in the data collection guides, to which Juanita Nelson with Flathead County noted that radio and cell phone coverage is a major issue for communities in the region. Even main transportation corridors do not have adequate cell phone coverage.

Highlights of Hazards Identification and Risk Assessment (HIRA)

Amy then reviewed the 48 disaster declarations declared in the Western Region since 1953, 31 of which were for wildfires. She also explained that 12 of the 48 disaster declarations have been in the last 5 years. Amy then discussed how the asset inventory update was conducted for the Western Region, including a parcel level analysis, critical facilities/infrastructure analysis, and estimate of populations potentially exposed to hazards.

Amy outlined the general risk assessment requirements before beginning a detailed discussion of each hazard. She presented details on each hazard that will be included in the draft risk assessment chapter of the new Regional HMP. Refer to the Risk Assessment PowerPoint presentation and forthcoming draft update of the Hazard Identification and Risk Assessment (HIRA) chapter for specific details on each hazard.

Several valuable details were learned during the risk assessment conversation among participants. Amy emphasized that there are some gaps in the data, but the risk assessment was conducted with the best available data and asked jurisdictions for any local data they may have. Highlights of the discussions are noted by hazard in the tables below; italicized notes indicate Slido poll responses to the question asked following the discussion of each hazard: "What do you think the significance of <hazard> is for your jurisdiction."

Hazard or Topic	Meeting Discussion
Flooding	• Jeff Brislawn presented the flood hazard slides • 8 federally declared flooding events in the Western Region since 1953 • Ravalli County DES noted that The Bitterroot and Flathead Rivers is not a tributary to the Missouri. Anything west of the continental divide is not. • Thomas Lane noted that the Kootenai feeds the Columbia River • *One suggestion from City of Helena (Lewis and Clark) to move to medium*
Dam Incidents	• Jeff explained that dams are classified by the damage they would cause if they broke, not by the condition that they are in • No comments from HMPC • *One suggestion to move Flathead to medium, one to keep it at low* • *Two suggestions to move Butte-Silver Bow to medium*
Wildland Fire	• Tim Clute with SWCA presented wildfire slides • Tim explained that the blanks on the maps are due to lack of data ranking by the MT DNRC, but it is likely that the rankings in these areas will be high to extreme • Doug Dodge noted that Jefferson, Lewis and Clark, and Broadwater counites have complete wildfire risk mapping in their 2020 CWPP. Doug also noted that he would like to see the wildfire risk analysis reflect local CWPP findings as those don't align with some of the findings from SWCA • Juanita Nelson also noted that beyond just parcels at risk there is the economic impact to be expected, such as the large tracts of privately owned timberlands in Flathead County which could present a huge loss. Juanita noted that Flathead County's most recent CWPP is posted online. • *Two suggestions to move Lewis and Clark to high.* • *Two suggestions to move Butte-Silver Bow to high.* • *One suggestion to move Park to high.* • *One suggestion to move Sweet Grass to high.* • *One suggestion to move Powell to high* • *One suggestion to move Anaconda-Deer Lodge to high*
Drought	• Amy Carr noted that there has been 252 USDA Disaster Designations in the Western Region from 2012-2021 • Juanita noted that she disagrees with the Highly Likely Probability of drought for Flathead County

	- *Two suggestions to move Flathead to medium.* - *One suggestion to move Lewis and Clark to medium.* - *One suggestion to move Lincoln to high.* - *One suggestion to move Ravalli to medium.* - *One suggestion to move Sweet Grass to high* - *One suggestion to move Anaconda-Deer Lodge to high*
Summer Weather	- Amy noted that Ravalli County experienced the most significant property loss in the Western Region due to summer weather (hail). - Erik Hoover with Ravalli County said much of the HMPC was not in their same positions during that time, but he recalls the major damages to vehicles and roofs. He noted that Ravalli County would go as medium rather than high ranking - Juanita Nelson commented that most of the property damage in Flathead County during the summer is due to wind, which is covered in another section. - *One suggestion to move Broadwater to high.* - *One suggestion to move Lewis and Clark to high.* - *One suggestion to move Ravalli to medium.*
Tornadoes and Windstorms	- Amy noted that most reported events occurred in Lewis and Clark, Beaverhead, and Broadwater counties. - No comments from HMPC. - *Two suggestions to move Butte-Silver Bow to low* - *One suggestion to move Lewis and Clark to low and one to stay medium.* - *One suggestion to move Flathead to medium.* - *Two suggestions to change Anaconda-Deer Lodge to low.*
Winter Storm	- Amy noted that severe winter storms are highly likely to occur on a yearly basis in the region. - No further comments from the HMPC. - *One suggestion to move Lewis and Clark to low.* - *One suggestion to move Flathead to high, one to stay medium.* - *One suggestion to move Butte-Silver Bow to high, one to stay medium.*
Avalanche	- Juanita Nelson noted that John Stevens Canyon/Hwy 2 Corridor are vulnerable to avalanche, with the BNSF and Amtrak Rail Lines present. - *Two suggestions to move Flathead to medium* - *One suggestion to move Lincoln to medium*
Landslide/Rockfall/Debris	- Juanita echoed her previous comment for rockfalls as well and explained that recent events have been minor and primarily impact traffic - Worby McNamee noted that a minor incident that occurred; the North Hills debris flow in 2019 - Madison County DES said they had a minor incident last summer as well - Ravalli County noted rock falls have been common along several primary routes in the County. Erik said Highway 93 has had several rock flows that impacted the transportation system/supply chain. He noted a frequency of 1-2 events a year at minimum in the past 5 years.

	• Thomas Lane noted that Lincoln County also experiences these events • *Two suggestions to move Lewis and Clark to low* • *One suggestion to move Park to medium* • *One suggestion to move Lincoln to medium* • *One suggestion to move Flathead to low*
Earthquake	• Amy noted that Montana is one of the most seismically active states in the U.S., particularly in the western portion of the state. • No comments from the HMPC • *One suggestion to move Lewis and Clark to low, one to stay high* • *One suggestion to move Broadwater to medium* • *One suggestion to move Flathead to medium, one to stay high*
Volcanic Ash	• Amy highlighted that MT could be vulnerable to ashfall after an eruption from the Cascades in WY, OR, and CA. • No comments from HMPC. • *One suggestion to move Lewis and Clark to medium, one to stay low*
Communicable Disease	• Amy noted that the US experiences a pandemic once every 20 years on average. • Juanita with Flathead County noted that they experienced major growth due to COVID-related migrations from urban areas • Ravalli has more people coming to their communities • Madison has seen major growth as well • Lisa Carey noted that Butte cancelled events like Folk Festival and St. Patrick's days due to COVID, which had a major impact to businesses • *One suggestion to move Lewis and Clark to low, one to stay medium.* • *One suggestion to move Ravalli to low.*
Transportation	• Transportation accidents are highly likely to occur across the planning area and shared charts and maps with aircraft, train, and car accidents in the Western Region. • No comments from representatives. • *Two suggestions to move Butte-Silver Bow to high.* • *One suggestion to move Park to medium.* • *One suggestion to move Lincoln to medium.* • *One suggestion to move Ravalli to low.* • *One suggestion to move Broadwater to medium.*
HazMat	• Doug Dodge noted that the response capability should impact overall significance rating for HAZMAT. He explained that rural jurisdictions are going to have a harder time dealing with a HAZMAT situation due to lack of resources and increased response time, so they should be ranked higher. Larger jurisdictions might have higher frequency of occurrence but will be able to respond quickly and are therefore less likely to experience a disaster due to an event. • *Two suggestions to move Butte-Silver Bow to medium.* • *One suggestion to move Lincoln to medium.* • *One suggestion to move Broadwater to medium.*
Cyber-attack	• No comments from HMPC

	- *All jurisdictions agreed that medium was an appropriate ranking across the Region*
Human Conflict	- There has been a growth in terrorist attacks and active shooter incidents over the past 10-15 years in the US. - No general comments from HMPC. - *One suggestion to move Ravalli to low.*

Next steps

Amy summarized the next steps in the process. Wood will finalize the HIRA and share with the counties and jurisdictions once completed. The tasks for each county and jurisdiction are listed below:

- Please return plan update guide input where outstanding
- Provide input on mitigation action status on form (when available)
- Start thinking of ideas for new mitigation actions
- Stay informed by email of upcoming meetings (TBD)
- Review results public survey results
- Review draft HIRA section of plan when available
    - For yellow highlighted gaps where applicable
    - Review for jurisdiction specifics, mitigation ideas

Amy explained each jurisdiction will need at least one new action per hazard and to provide an update on the status of previous mitigation strategies, even if they have not been started or completed. The focus of the next meeting will be to develop new mitigation actions. The HIRA Draft for HMPC review should be available in October, and the next round of planning meetings will take place in January or February. The counties and jurisdictions will receive an email from DES to inform them of the date for the next meeting. Amy 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.

Project Milestones	Anticipated Timeline
Meeting #2 HIRA review	September
HIRA Draft for HMPC review	October
Meeting #3 Mitigation Strategy	January – February
HMPC Review Draft	April 2023
Public Review Draft	May 2023
MT DES Review Draft	June 2023
Final Plan for FEMA Review (estimated)	June – August 2023
Final Approved HMP for local adoption	August – October 2023

ATTENDEES

Name	**Jurisdiction**	**Title**
Amanda Avard		
Amanda Cooley	Powell County DES	DES Coordinator
Amy Carr	Wood Environment & Infrastructure	Project Lead – Western Region
Andrew Long	Montana DES	Mitigation Coordinator
Audrey Walleser-Martin	Montana DES	Western Region DFO
Brittney Willis	Broadwater County DES	DES Coordinator
Chris Johnson	Wood Environment & Infrastructure	Hazard Mitigation Planner
Clifford Brophy	Sweet Grass County DES	DES Coordinator
Dale Nelson	CSKT DES	DES Coordinator
Dan Pearce	City of Kalispell	Fire Chief
Doug Dodge	Jefferson County	DES Coordinator/Fire Warden
Emily Geery	SWCA	Fire and Forestry Planner
Erik Hoover	Ravalli County DES	DES Coordinator
Greg Coleman	Park County DES	DES Coordinator
Hannah Shultz	Montana DES	Mitigation Coordinator
Jackie Bolster	Granite County DES	DES Coordinator
Jeff Brislawn	Wood Environment & Infrastructure	Project Manager
Jeff Rodrick	Ravalli County	Office of Emergency Management
Jessica Kinzer	City of Kalispell	Assistant Fire Chief
Jim Merrifield	Silver Bow County DES	DES Coordinator
Jon Lopp	Meagher County DES	Sheriff
Jordan Green	City of Deer Lodge	Chief Administrative Officer
Juanita Nelson	Flathead County DES	DES Coordinator
Juliana Prosperi	Wood Environment & Infrastructure	Project Lead – Eastern Region
Kyle Sturgill-Simon	Montana DES	Western DFO
Laurel Hamilton	USACE	Omaha District
Lisa Carey	City and County of Butte-Silver Bow	Office of Emergency Management
Megan Burke	RESPEC	Consultant
Mack Chambers	Wood Environment & Infrastructure	GIS Specialist
Mike Chambers	City of Helena	Assistant Fire Chief
Natalie Schoen	Wood Environment & Infrastructure	Hazard Mitigation Planner
Patti Noble	Town of Rexford	Retired BCP
Shari Pool	Montana DES	Mitigation Coordinator
Sierra Anderson	Lewis and Clark County DES	DES Coordinator
Susan Nicosia	City of Columbia Falls	City Manager
Thomas Lane	Lincoln County DES	DES Coordinator
Tim Clute	SWCA	Fire and Forestry Planner
Tom Michalek	RESPEC	Bozeman

Name	Jurisdiction	Title
Worby McNamee	Lewis and Clark County DES	Interim DES Coordinator

Attachments: Sign in summary from Meeting Chat Log, Slido Poll results, and PowerPoint Slide Deck

Meeting Chat Log

[9/12 9:54 AM] Patti Noble (Guest)
Patti Noble, Town of Rexford Lincoln County

[9/12 9:55 AM] 287331008266 (Guest)
Samuel Sikes, City Administrator, Libby

[9/12 9:57 AM] Walleser-Martin, Audrey
Audrey Walleser - Western District DFO

[9/12 9:58 AM] Carr, Amy
Amy Carr, Wood E&IS, Lead Planner

[9/12 9:58 AM] Cliff Brophy (Guest)
Clifford Brophy - Sweet Grass Co DES Coordinator

[9/12 9:58 AM] Schoen, Natalie
Natalie Schoen, Wood, Hazard Mitigation Planner

[9/12 9:58 AM] Worby McNameeSierra Anderson- DES Coordinator- L&C County & Worby McNamee-L&C County Floodplain Manager

[9/12 9:59 AM] Jessica (Guest)
Jessica Kinzer-Asst. Fire Chief-Kalispell Fire Department

[9/12 9:59 AM] Emily Geery
Emily Geery - Project Manager - SWCA Environmental Consultants

[9/12 9:59 AM] Mike Chambers
Mike Chambers, Assistant Fire Chief, Helena Fire Department

[9/12 9:59 AM] Juanita Nelson - Flathead County (Guest)
Juanita Nelson - Flathead County Emergency Management Planner

[9/12 9:59 AM] Johnson, Christopher A
Christopher Johnson, Hazard Mitigation Planner/GIS Analyst, Wood E&IS

[9/12 10:00 AM] Chambers, Mack
Mack Chambers, GIS Analyst, Wood E&IS

[9/12 10:00 AM] Jon Lopp
Jon Lopp, Meagher Co DES

[9/12 10:00 AM] Carey, Lisa
Lisa Carey -Butte-Silver Bow Office of Emergency Management

[9/12 10:01 AM] Prosperi, Juliana
Juliana Prosperi, Wood E&IS, Eastern Region HMP Task Leader

[9/12 10:02 AM] Tim Clute
Tim Clute – SWCA

[9/12 10:04 AM] Shultz, Hannah
https://www.slido.com/
[9/12 10:05 AM] Shultz, Hannah
Code: Hazards

[9/12 10:05 AM] Sturgill-simon, Kyle
Kyle Sturgill-Simon – MTDES

[9/12 10:06 AM] Ravalli County OEM (Guest)
Erik Hoover and Jeff Rodrick Ravalli County OEM

[9/12 10:06 AM] Carey, Lisa
Are we able to download and print the power point?

[9/12 10:07 AM] Thomas Lane
Thomas Lane, Lincoln County EMA

[9/12 10:07 AM] Amanda Cooley
Amanda Cooley - Powell County - Planning Director

[9/12 10:07 AM] Susan (Guest)
Susan Nicosia, City Manager, City of Columbia Falls

[9/12 10:07 AM] Thomas (Tom) Michalek
Tom Michalek, RESPEC Bozeman

[9/12 10:07 AM] Johnson, Christopher A
Hi Lisa, We will have the powerpoint, a recording of the meeting, and a meeting summary sent out after the meeting

[9/12 10:07 AM] Prosperi, Juliana
Lisa - we will provide a handout of the slides Amy is presenting today following today's workshop!

[9/12 10:07 AM] Laurel Hamilton USACE (Guest)
Laurel Hamilton - USACE Omaha District

[9/12 10:08 AM] Carey, Lisa
Thank you

[9/12 10:08 AM] Dan Pearce
Dan Pearce- Fire Chief, City of Kalispell

[9/12 10:08 AM] Dale Nelson Emergency manager CSKT
Dale Nelson, Emergency Manager CSKT

[9/12 10:13 AM] Cliff Brophy (Guest)
I have a large file with much of the information that goes with the form. Email servers would not allow me to send it with the form. Is there a drop box or postal box I can send the email or a flash drive?

[9/12 10:13 AM] Cliff Brophy (Guest)
Cliff Brophy, DES

[9/12 10:15 AM] Long, Andrew
Cliff i work with you to find a way to send that into us. ill get back to you after the meeting.

[9/12 10:15 AM] Cliff Brophy (Guest)
Perfect!!!!

[9/12 10:18 AM] Juanita Nelson - Flathead County (Guest)
Radio and cell phone coverage is a major issue for all of us. Even main transportation corridors do not have adequate cell phone coverage.

[9/12 10:29 AM] Jordan Green
Jordan Green, Chief Administrative Officer, City of Deer Lodge

[9/12 10:31 AM] Ravalli County OEM (Guest)
The Bitterroot River is not a tributary to the Missouri

[9/12 10:32 AM] Ravalli County OEM (Guest)
Neither is the Flathead

[9/12 10:34 AM] Carr, Amy

Thanks for comment and noting that. We will make sure that is revised and stated correctly in the draft plan.

[9/12 10:34 AM] Ravalli County OEM (Guest)
The Kootenai may not be either, you probably should check on that one

[9/12 10:35 AM] Ravalli County OEM (Guest)
Anything west of the Continental Divide is not

[9/12 10:37 AM] Thomas Lane
Kootenai feeds the Columbia

[9/12 10:54 AM] Doug Dodge
Jefferson, Lewis & Clark, and Broadwater have complete wildfire risk mapping in our 2020 CWPP. I would like to see the wildfire risk analysis reflect local CWPP findings, as those don't agree with some of your findings.

[9/12 11:01 AM] Carr, Amy
Thanks for pointing this out, Doug. Would you be able to share that data and CWPP with us?

[9/12 11:01 AM] Juanita Nelson - Flathead County (Guest)
It's not just the parcels at risk, but also the economic impact.

[9/12 11:02 AM] Juanita Nelson - Flathead County (Guest)
Flathead County has large tracts of privately owned timberlands

[9/12 11:02 AM] Doug Dodge
It's critical that the data developed in the CWPP is reflected in this plan. We can't have conflicting risk assessments, for example.

[9/12 11:03 AM] Juanita Nelson - Flathead County (Guest)
Flathead County's most recent CWPP is posted online

[9/12 11:03 AM] Doug Dodge
Will send it again. I sent it when this kicked off.

[9/12 11:10 AM] Emily Geery
Hi Doug - we're able to access the 2020 CWPP Update online. We

[9/12 11:10 AM] Juanita Nelson - Flathead County (Guest)
Disagree with the Highly Likely Probability of drought for Flathead County

[9/12 11:11 AM] Emily Geery
We'll follow up with you on this topic offline.

[9/12 11:11 AM] Brislawn, Jeff P
Good catch we will adjust that.

[9/12 11:13 AM] Juanita Nelson - Flathead County (Guest)
Most of our property damage from Severe Summer Weather is due to wind

[9/12 11:15 AM] Ravalli County OEM (Guest)
Ravalli County would go with Medium for this

[9/12 11:26 AM] Juanita Nelson - Flathead County (Guest)
John Stevens Canyon/Hwy 2 Corridor with BNSF and Amtrak Rail Line.

[9/12 11:28 AM] Worby McNamee
Minor- North Hills debris flow in 2019

[9/12 11:28 AM] Juanita Nelson - Flathead County (Guest)
Avalanche and Rockfalls

[9/12 11:28 AM] Madison County DES (Guest)
Minor incident last summer

[9/12 11:28 AM] Ravalli County OEM (Guest)
rock falls have been common along several primary routes in ravalli county

[9/12 11:28 AM] Thomas Lane
Yes, both rock and land slider are common in the county

[9/12 11:29 AM] Juanita Nelson - Flathead County (Guest)
recent history of rockfalls has been minor - primarily traffic hazards

[9/12 11:43 AM] Juanita Nelson - Flathead County (Guest)
Flathead County had major growth due to COVID

[9/12 11:43 AM] Ravalli County OEM (Guest)
We still have more people coming to our communities

[9/12 11:44 AM] Madison County DES (Guest)
Major growth as well

[9/12 11:44 AM] Carey, Lisa
Butte cancelled events like folk festival and st patrick days. major impact to businesses

[9/12 11:47 AM] Cliff Brophy (Guest)
I have a report of pipeline leak, going to jump off. Will catch up with someone later to finish Sweet Grass input.

[9/12 11:47 AM] Cliff Brophy (Guest)
Thanks!!

[9/12 11:48 AM] Johnson, Christopher A
Thank you for joining us!

[9/12 11:52 AM] Doug Dodge
Response capability should impact overall significance rating in HAZMAT

[9/12 11:58 AM] Susan (Guest)
I have to jump off to go to another meeting. Thank you for the detailed data. Look forward to getting slides.

[9/12 12:03 PM] Thomas (Tom) Michalek
Please send the recording/Powerpoint to me as well. Tom.michalek@respec.com, if you don't have my email. Thanks!

[9/12 12:05 PM] Madison County DES (Guest)
Joseph Brummell Madison CO DES

[9/12 12:05 PM] Carey, Lisa
Jim Merrifield BSB OEM

[9/12 12:05 PM] Jackie Bolster
Jackie Bolster - Granite County DES

[9/12 12:05 PM] Worby McNamee
Sierra Anderson-DES Coordinator, sianderson@lccountymt.gov

[9/12 12:05 PM] Brislawn, Jeff P
Jeff Brislawn, Project Manager, Wood

[9/12 12:06 PM] Carey, Lisa
Thank you!

[9/12 12:06 PM] Doug Dodge
Doug Dodge, Jefferson County DES Coordinator

MT Western Region HMPC Meeting #2

01 - 17 Sep 2022

Poll results

Table of contents

Table of contents

Open text poll

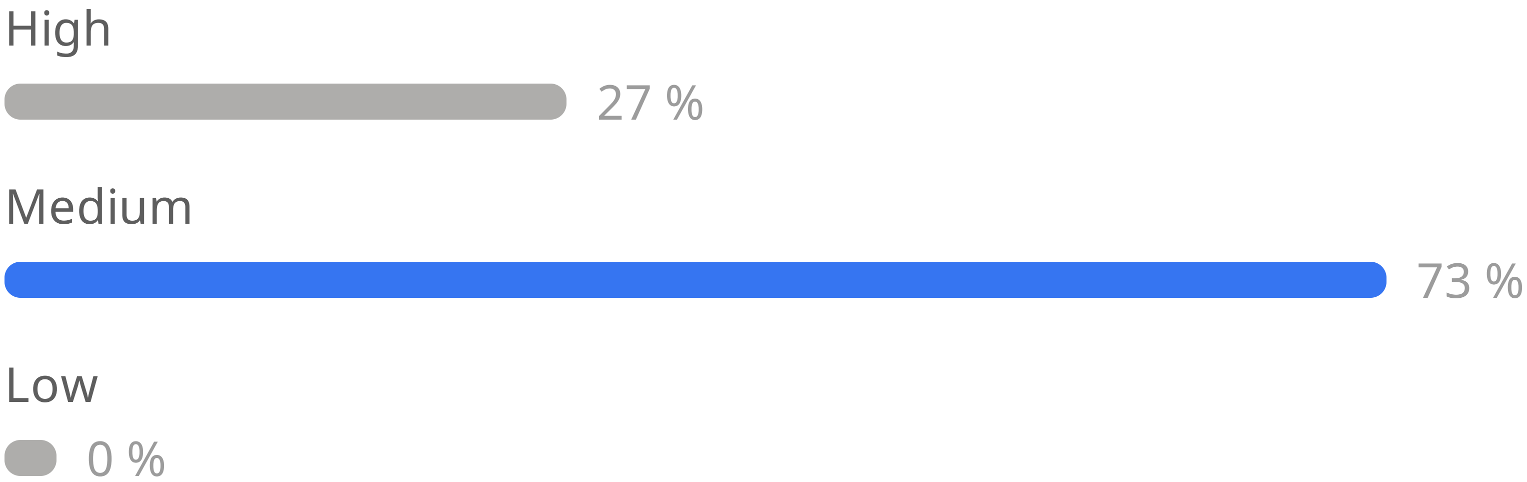
What jurisdiction do you represent?

016

- Town of Eureka
- Butte-Silver Bow County
- City of Libby
- Philipsburg, Granite County
- Flathead county, Columbia Falls
- City of Helena
- City of Deer Lodge
- Kalispell
- Broadwater County
- Powell County
- Park County, City of Livingston, Town of Clyde Park
- Flathead
- Meagher County
- Sweet Grass County
- Ravalli County
- Butte-Silver Bow
- Lincoln County
- Lewis and Clark County

What do you think the significance of flooding is for your jurisdiction?

015



What do you think the significance of dam failure is for your jurisdiction?

014

High

0 %

Medium

36 %

Low

64 %

Multiple-choice poll

What do you think the significance of wildland and rangeland fire is for your jurisdiction?

0 1 6

Multiple-choice poll

What do you think the significance of drought is for your jurisdiction?

016

High	50 %
Medium	50 %
Low	0 %

Multiple-choice poll

What do you think the significance of severe summer weather is for your jurisdiction?

014

High

21 %

Medium

79 %

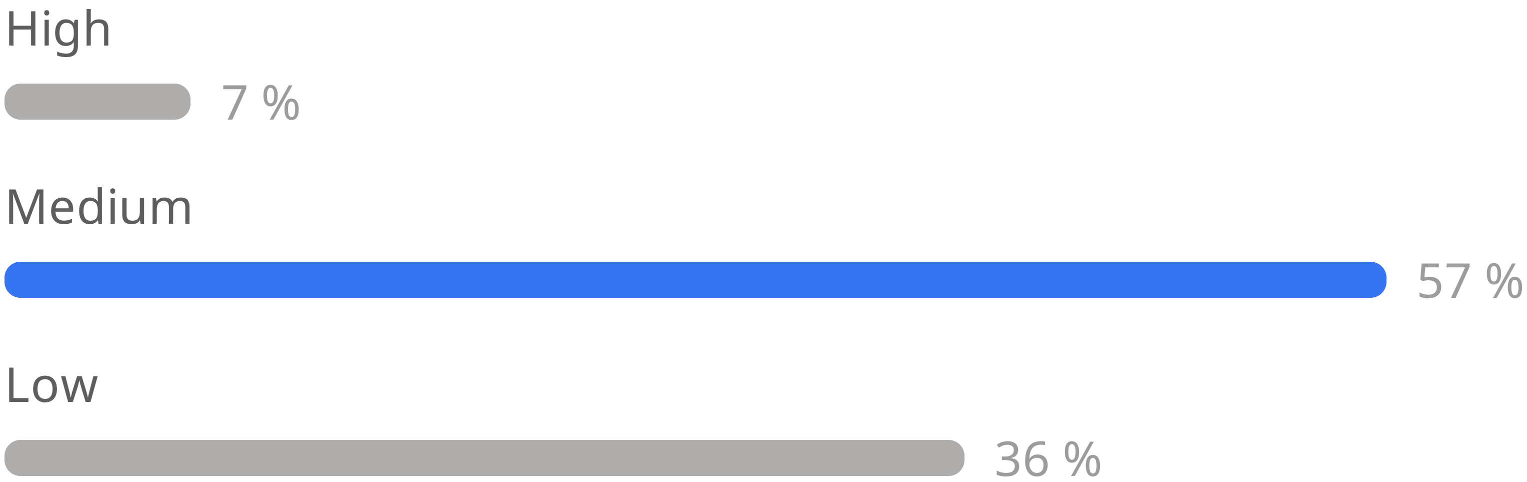
Low

0 %

Multiple-choice poll

What do you think the significance of tornadoes & windstorms is for your jurisdiction?

0 1 4



Multiple-choice poll

wood.

What do you think the significance of severe winter weather is for your jurisdiction?

0 1 4

High

14 %

Medium

79 %

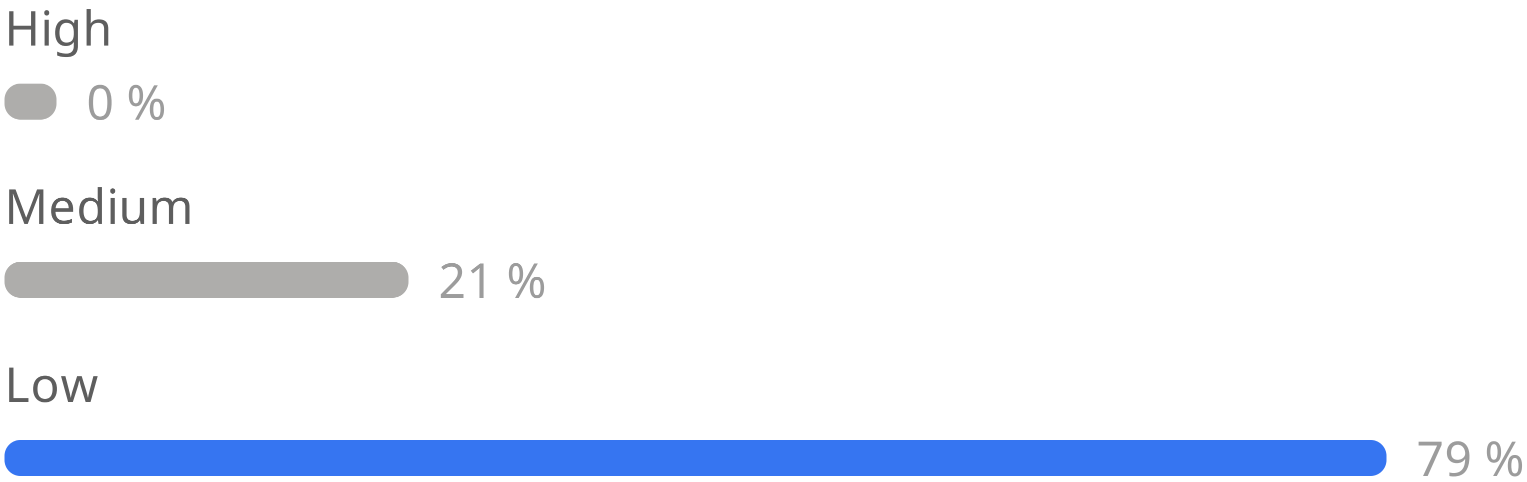
Low

7 %

slido

What do you think the significance of avalanche is for your jurisdiction?

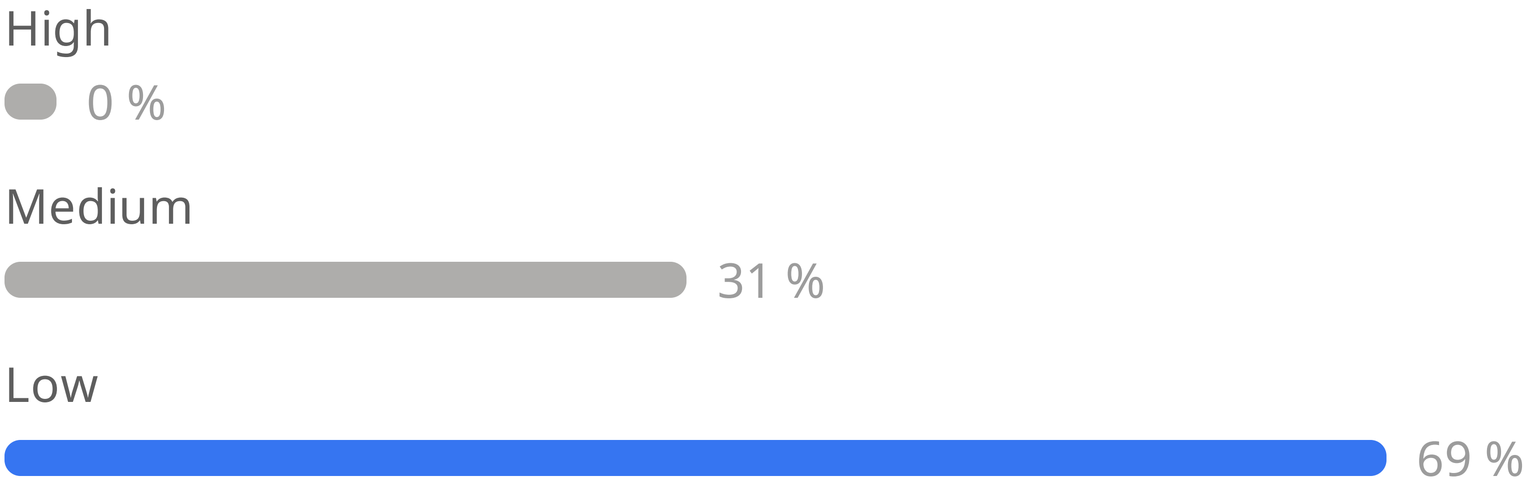
014



Multiple-choice poll

What do you think the significance of landslide is for your jurisdiction?

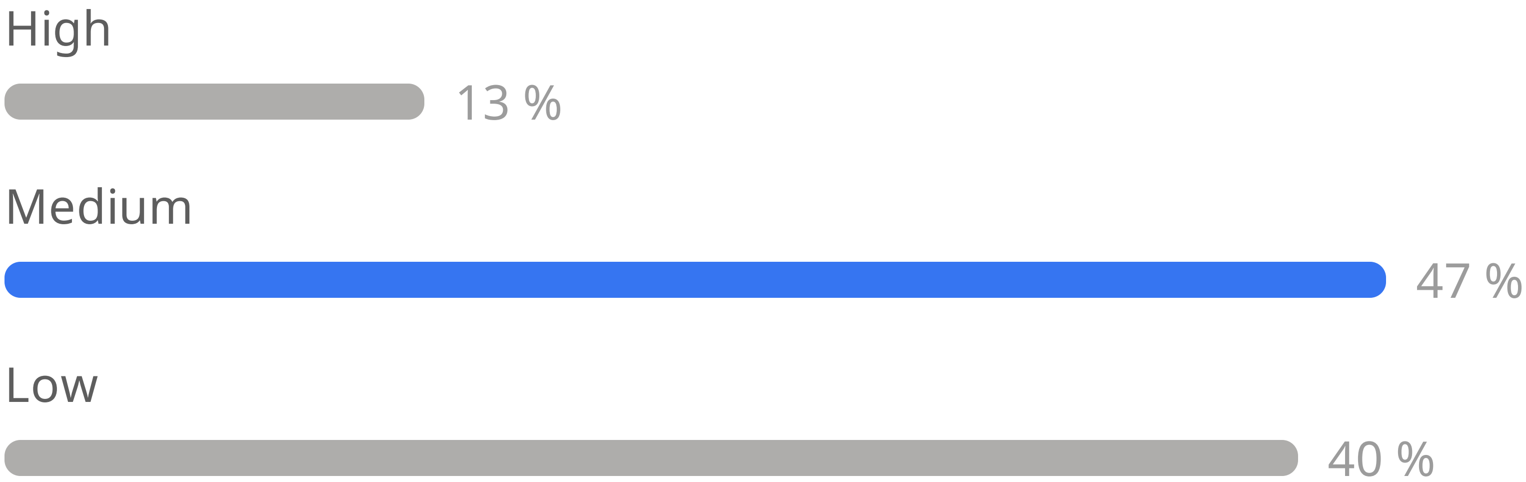
013



Multiple-choice poll

What do you think the significance of earthquake is for your jurisdiction?

015



Multiple-choice poll

What do you think the significance of volcanic ash is for your jurisdiction?

014

High

0 %

Medium

7 %

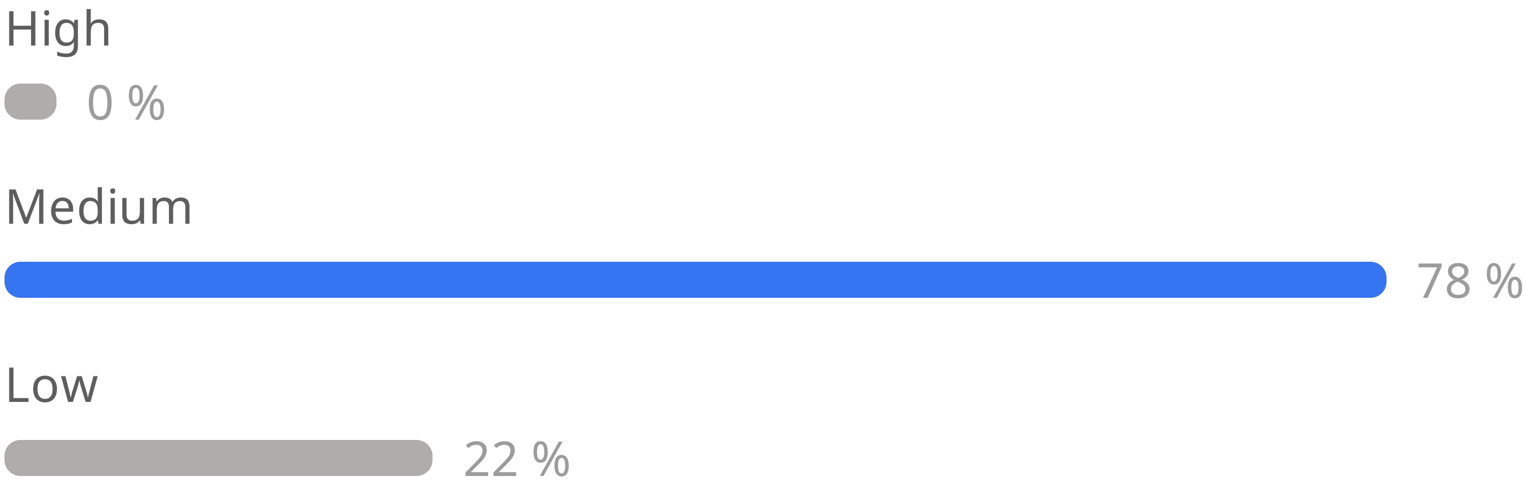
Low

93 %

Multiple-choice poll

What do you think the significance of communicable disease is for your jurisdiction?

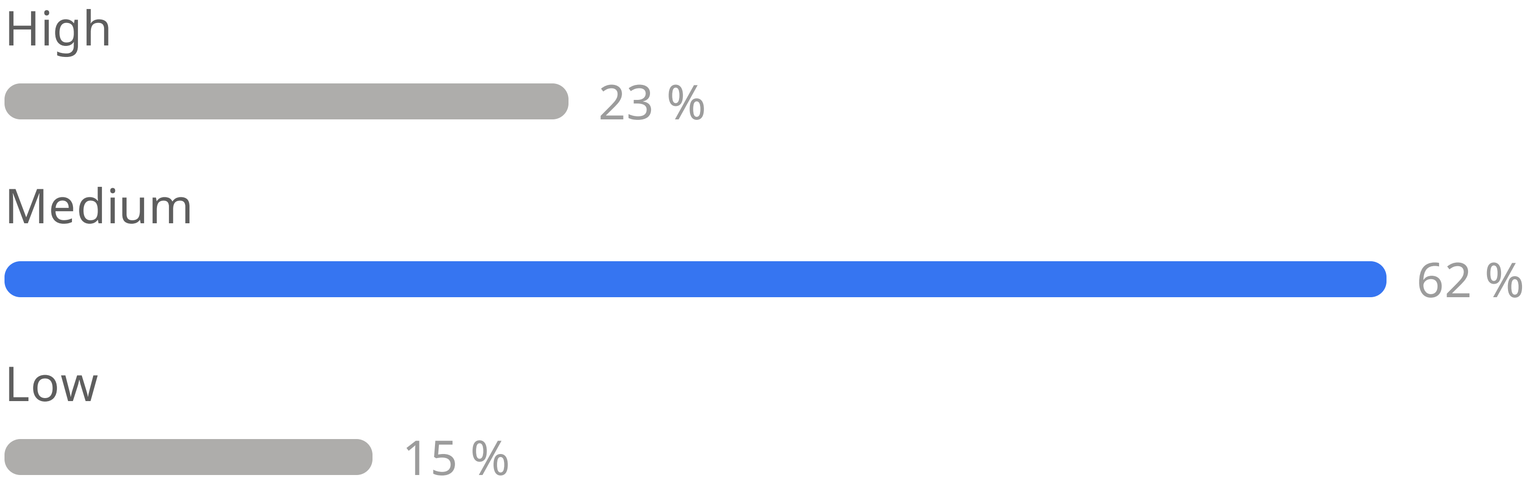
009



Multiple-choice poll

What do you think the significance of transportation accidents is for your jurisdiction?

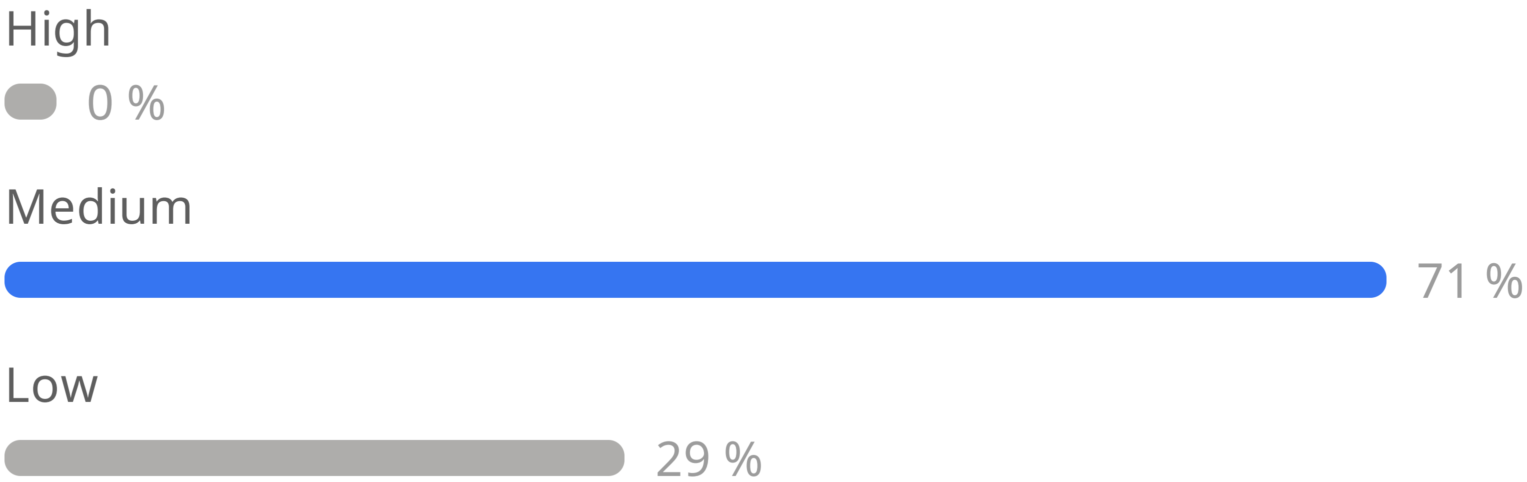
013



Multiple-choice poll

What do you think the significance of hazardous material incidents is for your jurisdiction?

014



Multiple-choice poll

What do you think the significance of cyber-attack is for your jurisdiction?

013

High

0 %

Medium

100 %

Low

0 %

Multiple-choice poll

wood.

What do you think the significance of human conflict is for your jurisdiction?

013

slido

Montana Western Region Hazard Mitigation Plan Mitigation Strategy Meeting Agenda

Date: Tuesday, January 17, 2023
10:00 am-3:00 pm MST

Meeting at: Fort Harrison (HFRAC)
1956 Mount Majo St, Helena MT 59636

Project: Montana Western Region Hazard Mitigation Plan

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 the Montana Western Region based on HMPC input and pertinent plan goals. Prioritization of mitigation projects will be conducted as well, and next steps to plan finalization, including future plan implementation and maintenance, will be discussed. Lunch will be provided.

Attendees: Montana Western Region Hazard Mitigation Planning Committee and Stakeholders

---

1. Introductions
2. Planning process update
3. Review of possible mitigation activities and alternatives
4. Discuss criteria for mitigation action selection and prioritization
5. Funding mitigation options
6. Review of progress on existing actions in the plan (working lunch- provided)
7. Brainstorming Session: Development of new mitigation actions (group process)
8. Prioritize mitigation actions (group process)
9. Discuss plan implementation and maintenance
10. Discussion of draft HIRA
11. Next steps

Montana Western Region Hazard Mitigation Plan Mitigation Strategy Meeting Agenda

Date: Wednesday, January 18, 2023
10:00 am-3:00 pm MST

Meeting at: Flathead County Dispatch and EOC
625 Timberwolf Parkway, Kalispell MT 59901

Project: Montana Western Region Hazard Mitigation Plan

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 the Montana Western Region based on HMPC input and pertinent plan goals. Prioritization of mitigation projects will be conducted as well, and next steps to plan finalization, including future plan implementation and maintenance, will be discussed. Lunch will be provided.

Attendees: Montana Western Region Hazard Mitigation Planning Committee and Stakeholders

---

1. Introductions
2. Planning process update
3. Review of possible mitigation activities and alternatives
4. Discuss criteria for mitigation action selection and prioritization
5. Funding mitigation options
6. Review of progress on existing actions in the plan (working lunch- provided)
7. Brainstorming Session: Development of new mitigation actions (group process)
8. Prioritize mitigation actions (group process)
9. Discuss plan implementation and maintenance
10. Discussion of draft HIRA
11. Next steps

Montana Western Region Hazard Mitigation Plan Mitigation Strategy Meeting Agenda

Date: Friday, January 20, 2023
10:00 am-3:00 pm MST

Meeting at: City-County Complex (Courthouse)
414 E Callender Street, Livingston MT
59047

Project: Montana Western Region Hazard Mitigation Plan

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 the Montana Western Region based on HMPC input and pertinent plan goals. Prioritization of mitigation projects will be conducted as well, and next steps to plan finalization, including future plan implementation and maintenance, will be discussed. Lunch will be provided.

Attendees: Montana Western Region Hazard Mitigation Planning Committee and Stakeholders

---

1. Introductions
2. Planning process update
3. Review of possible mitigation activities and alternatives
4. Discuss criteria for mitigation action selection and prioritization
5. Funding mitigation options
6. Review of progress on existing actions in the plan (working lunch- provided)
7. Brainstorming Session: Development of new mitigation actions (group process)
8. Prioritize mitigation actions (group process)
9. Discuss plan implementation and maintenance
10. Discussion of draft HIRA
11. Next steps

Montana Western Regional Hazard Mitigation Plan

Mitigation Strategy Meeting Summary

January 17-20, 2023, 10:00 am – 2:30 pm

Introduction

This document summarizes a series of in-person workshops held in Western Montana over the week of January 16th-20th, 2023. The purpose of these workshops was to review the existing mitigation strategies in the existing local hazard mitigation plans and begin the process of developing the updated regional mitigation strategy. Andrew Long, Western Region Project Manager with Montana Disaster and Emergency Services (DES), kicked off each meeting and thanked everyone for their participation, before introducing Jeff Brislawn and Christopher Johnson with WSP. Those in attendance went around the room and introduced themselves to the group. There are sign in sheets listing all those who attended the 3 workshops included as a separate attachment. Various representatives from the participating counties and jurisdictions were present, as well as stakeholders and partner organizations.

Review of the Planning Process

The FEMA planning process steps were recapped; WSP has completed the first draft of the Risk Assessment process and is now beginning the mitigation strategy portion. This meeting addressed mitigation strategizing and discussed the draft regional goals developed for the plan.

The progress on the plan update process to date was reviewed. Highlights include:

- Kickoff webinar held May 26, 2022
- Risk Assessment meeting held September 12, 2022
- Online Public Survey closed October 2022 with 174 responses
- HIRA Draft out for HMPC review

Review of Possible Mitigation Activities

Jeff and Chris gave an overview of what kinds of activities and alternatives can be considered for hazard mitigation. Through hazard mitigation we're trying to reduce the future demand for, and rising costs of, disaster response and recovery. There are several ways to categorize mitigation actions. One way to think of mitigation actions is the four A's:

- Altering a hazard,
- Averting a hazard,
- Avoiding a hazard,
- Adapting to a hazard

FEMA suggests these four categories for mitigation actions:

- Plans and Regulations,
- Structure and Infrastructure Projects,

- Education and Awareness, and
- Natural Systems Protection.

The Community Rating Systems also categorizes actions as follows:

- Prevention
- Structural projects
- Public information
- Natural resource protection
- Property protection
- Emergency services

Resources for more details on mitigation action types, categories, and example projects were provided, including a list of best practices and alternatives for mitigating various hazards, and a short discussion on climate change and adaptation considerations. Example hazard-specific mitigation projects were discussed including FEMA funding-eligible projects for wildfire, flooding, winter storm, and other hazards.

Prioritizing Mitigation Actions

Jeff and Chris explained the prioritization of actions in more detail. FEMA suggests using the STAPLEE method for prioritization.

- **S**ocial – What are the potential social impacts of an action?
- **T**echnical – What is the technical feasibility to implement the action?
- **A**dministrative – What are the administrative capabilities to implement the action?
- **P**olitical – Is there the political will to implement the project?
- **L**egal – Do you have the legal authority?
- **E**conomic – Is the project economically feasible?
- **E**nvironmental – What are the environmental impacts of benefits from the project?

Other things to consider when thinking of new mitigation actions include:

- Life safety and vulnerable populations
- Addressing high risk hazards
- Protect critical facilities and assets
- Actions that help meet multiple goals and objectives

Funding Mitigation Options

During this portion of the meeting, Jeff and Chris gave an overview of the many different options available to seek funding for mitigation actions included in the plan. This includes FEMA mitigation grants and funding sources, as well as other federal and state grants, local budgets, capital improvements budges, public-private partnerships, and fees and levies. Andrew Long and Sara Hartley with Montana DES gave some detailed presentations of various other grants available and the details of application, as well as emphasizing Montana DES's role in assisting local jurisdictions with pursuing grant funding. Representatives from the US Army Corps of Engineers were also in attendance at the meetings, and they gave the group an overview of various programs the Corps offers to provide technical assistance and actual construction projects to help achieve mitigation goals. Several mitigation success stories throughout the State were also discussed.

Review of Progress on Existing Mitigation Actions

Prior to the meeting, a Mitigation Action Tracker was sent to the HMPC listing each county's mitigation actions from their respective previous plans. Each HMPC representative was asked to provide comments on the status of each action. At this point in the meeting, the group was tasked with grouping themselves together based on the County they represent and working through the Tracker together to fill in some of the statuses and provide more information on the progress that has been made to date. This information will be compiled with any trackers that were received back from the HMPC prior to the mitigation workshops, as well as additional information received over the weeks following the workshops. The Tracker is attached to this meeting summary and each jurisdiction is asked to **send back a completed tracker to WSP by February 11th**.

The mitigation action statuses are categorized as one of the following: Completed, Annual Implementation (ongoing), Continue-In Progress, Continue-Not Started, and Deleted. Some examples of "Deleted" actions may be due to lack of project applicability over time, shifting priorities or vulnerabilities throughout the years, or even inability to complete a project in an area where the community does not have control/jurisdiction (e.g. state owned or federal land). Annual Implementation items are actions that a jurisdiction is conducting on an ongoing basis, but the jurisdiction wants to continue forward into the updated plan to maintain visibility on the action.

Developing New Mitigation Actions

Each participating jurisdiction is required to develop at least one new action for the 2023 plan. Ideally, jurisdictions should develop actions that address all the hazards addressed in the plan, or at a minimum each High significance hazard. All jurisdictions that participate in the National Flood Insurance Program (NFIP) will need to have a mitigation action addressing continued NFIP compliance.

During this time goals and objectives were discussed and key differences between "goals," "objectives" and "actions" were defined: goals and objectives are usually more general and broad guidelines while actions are specific, and project driven. It was agreed that there would be Regional Goals adopted for the plan, with individual counties developing their own objectives should they so choose. The regional goals were confirmed during this third meeting as follows, based on the conversation:

1. Reduce impacts to people, property, the environment, and the economy from hazards.

2. Protect community lifelines and critical infrastructure to ensure the continuity of essential services.

3. Promote education and outreach to the public around hazards and mitigation.

4. Promote regional cooperation and leverage partnerships in mitigation solutions.

5. Sustain and enhance jurisdictional capabilities to enact mitigation activities.

6. Integrate hazard mitigation into other plans, processes, and regulations.

7. Ensure local mitigation programs address underrepresented groups and protect socially vulnerable populations.

8. Incorporate the potential impacts of climate change into all mitigation activities.

It was noted that goals should also be considered during the development of new actions, and that actions should attempt to address one or more goals. Other items to consider in the development of new actions are the public survey results, the HIRA, and FEMA Community Lifelines and critical facilities.

The following are resources with ideas and examples of mitigation actions and implementation:

- FEMA's Mitigation Idea: https://www.fema.gov/media-library/assets/documents/30627
- FEMA's Mitigation Action Portfolio: https://www.fema.gov/sites/default/files/2020-08/fema_mitigation-action-portfolio-support-document_08-01-2020_0.pdf

Chris led a series of exercises for all those present to come up with at least one new mitigation action, and then to review and prioritize those actions as a group using the STAPLEE criteria. Post-it notes were passed out and attendees were asked to spend ten minutes to write at least one mitigation action. After each individual completed this, they were then asked place their post-it at the front of the room. Once all the actions were posted at the front of the room, each individual was given 4 dot stickers and asked to read through the actions and keep in mind the STAPLEE criteria (Social, Technical, Administrative, Political, Legal, Economic, and Environmental). Using their 4 dot stickers and they were asked to place the stickers on the actions and "vote" for the actions they think should be the highest priority based.

A total of 42 potential new mitigation actions were written on the post it notes and transcribed following the meeting into a spreadsheet and shared as attachments to this meeting summary. Each HMPC member that suggested a new action is asked to fill out a New Mitigation Action Form with more details on the action and how it will be implemented over time. The group was directed to continue brainstorming and to connect with others in their respective jurisdictions to develop additional new mitigation actions for the regional plan.

Next Steps

The next steps in the HMP update process were briefly discussed and the project milestones and prospective timeline for task completions were presented. This is the final formal meeting of the HMPC.

Project Milestone	**Anticipated Timeline**
• Return Mitigation Action Status Trackers	February 10th
• Return New Mitigation Actions	February 10th
• HMPC Review Draft	March-April
• Public Review Draft	April
• MT DES Review	May-June

• FEMA Review (estimated)	July-August
• Final Approved HMP for local adoption	August-September

Questions and Answers/Adjourn

Each meeting adjourned around 2:30 pm. Points of Contact for this HMP update effort:

Jeff Brislawn
Project Manager
WSP
jeff.brislawn@wsp.com
303-704-5506

Christopher Johnson
Western Region Lead Planner
WSP
Christopher.johnson@wsp.com

Andrew Long
Western Region Project Manager
Montana DES
Andrew.long@mt.gov
(406)-202-4532

Sara Hartley
State Hazard Mitigation Officer
Montana DES
sara.hartley@mt.gov

Training/Event/Meeting
Sign in Sheet Page 1 -2

JURISDICTION USING SOFT MATCH:	
POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long	
EVENT/OR MEETING NAME: Western Mitigation Actions Workshop	
LOCATION: Helena/ Ft. Harrison	
DATE AND TIME: Tuesday 01/17/2023 10am-3pm	

Name /Title: Brett Lloyd	**E-mail or Phone #:** blloyd@lccountymt.gov	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: LCPH	**Address:** 1930 9th Ave Helena	[✓ Yes] / No					
Name / Title: Rocky Infanger	**E-mail or Phone #:** wolfcreekchief877@hotmail.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Fire Council /TCFSWG	**Address:** 2107 Craig River Rd Wolf Creek MT 59648	Yes / No					
Name /Title: Jackie Bolster	**E-mail or Phone #:** jbolster@co.granite.mt.us	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Granite Co	**Address:** PO Box 925 Philipsburg	Yes / [✓ No]					
Name / Title: Gail Leeper/Mayor	**E-mail or Phone #:** leeperma@gmail.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Town of Drummond	**Address:** P.O. Box 195 Drummond, MT	Yes / [✓ No]					
Name /Title: Mayor Daniel Reddish	**E-mail or Phone #:** 406 reddish@gmail.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Town of Philipsburg	**Address:** Box 524 Philipsburg MT 59858	Yes / [✓ No]					
Name / Title: Sierra Anderson/DES Coord. Lewis & Clark	**E-mail or Phone #:** sianderson@lccountymt.gov (406)438 1438	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Lewis & Clark Co.	**Address:** 316 N Park Helena MT 59601	[✓ Yes] / No					
Name /Title: Joseph Bromnell	**E-mail or Phone #:** jbromnell@madisoncountymt.gov	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Madison Co	**Address:** 7 Plaza Loop, VC 55755	Yes / No					
Name /Title: Doug Dodge	**E-mail or Phone #:** ddodge@jeffersoncounty-mt.gov	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Jefferson County	**Address:** PO Box H Boulder, MT 59634	[✓ Yes] / No					
Name /Title: Kevin Ore / East Helena	**E-mail or Phone #:** kore@easthelenamt.us	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: City East Helena	**Address:** 306 E Main Po. Box 1170 59635	Yes / [✓ No]					

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Helena/ Ft. Harrison

DATE AND TIME: Tuesday 01/17/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

Name /Title: Mike Chambers Asst. Chief	**E-mail or Phone #:** mchambers@helenamt.gov	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Helena Fire Dept.	**Address:** 300 Neill Ave.	Yes / [✓ No]					
Name / Title: Jeff Brislawn/Project Mgr	**E-mail or Phone #:** Jeff.brislawn@wsp.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: WSP	**Address:**	Yes / [✓ No]					
Name /Title: Christopher Johnson/Planner	**E-mail or Phone #:** christopher.johnson@wsp.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: WSP	**Address:**	Yes / [✓ No]					
Name / Title: Travis Ball /Engr	**E-mail or Phone #:** travis.d.ball@usace.army.mil.	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: USACE	**Address:**	Yes / [✓ No]					
Name /Title: Nate Robbins	**E-mail or Phone #:** darby-Nate@USA.Net	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Town of Darby	**Address:** PO Box 37 Darby, MT 59829	Yes / No					
Name / Title: Tom [illegible]	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Beaverhead County	**Address:** 2 S. Pacific Street #12, Dillon	Yes / No					
Name /Title: John McGinley mayor	**E-mail or Phone #:** mayor@dillonmt.org	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: City of Dillon	**Address:** 125 N Idaho Dillon MT	Yes / No					
Name /Title: Worby McNamee FPA	**E-mail or Phone #:** 406-447-8375	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: L&C County	**Address:** 316 Park Ave.	Yes / No					
Name /Title: Dan Karlin	**E-mail or Phone #:** dkarlin@lccountymt.gov	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: LC County	**Address:** 3402 Cooney Dr	Yes / No					

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Helena/ Ft. Harrison

DATE AND TIME: Tuesday 01/17/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

Name /Title:	Organization:	E-mail or Phone #:	Address:	EMPG/Federally Funded?	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
DOMINIC FARRENKOPF / MAYOR	HAMILTON, MT	dfarrenkopf@cityofhamilton.net	223 S. 2ND ST. HAMILTON, MT 59840	Yes / No					
Brad Mohn Fire Chief	City of Hamilton	bmohn@cityofhamilton.net	223 S. 2nd Hamilton, MT	Yes / No					
JORDAN GREEN / CAO	CITY OF DEER LODGE	jgreen@cityofdeerlodgemt.gov	300 MAIN ST, DEER LODGE, MT 59722	Yes / No	70	7			
Amanda Cooley - Planning Director	Powell County	acooley@powellcountymt.gov	409 Milwakee Deer Lodge, MT	Yes / No	70	7			
Andrew Long	MT DES	Andrew.Long@mt.gov		[✓ Yes] / No					
				Yes / No					
				Yes / No					
				Yes / No					
				Yes / No					

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Kalispell

DATE AND TIME: Wednesday 01/18/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

MONTANA DISASTER + EMERGENCY SERVICES
DES

Name /Title: Bill Naegeli	**E-mail or Phone #:** bnaegeli@co.sanders.mt.us	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: Sanders Co.	**Address:** Box 519 thompson Falls MT. 59873	[✓ Yes] / No	225				
Name / Title: Juanita Nelson EM Planner	**E-mail or Phone #:** Juanita.Nelson@flatheadoes.mt.gov	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: Flathead County	**Address:** 625 Timberwolf Pkwy Kalispell	[✓ Yes] / No					
Name /Title: Dale S. Nelson	**E-mail or Phone #:** dale.nelson@cskt.org	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: CSKT DES	**Address:**	Yes / [✓ No]	60				
Name / Title: Jeff Rodrick	**E-mail or Phone #:** jrodrick@rc.mt.gov	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: Ravalli Co OEM	**Address:**	[✓ Yes] / No					
Name /Title: Erik Hoover	**E-mail or Phone #:** ehoover@rc.mt.gov	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: Ravalli County	**Address:**	[✓ Yes] / No					
Name / Title: Jeremy VanPelt	**E-mail or Phone #:** jeremy.vanpelt@bnsf.com	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: BNSF Railway	**Address:** 500 Depot St Whitefis	Yes / No					
Name /Title: Russell Jessop	**E-mail or Phone #:** waterruss@live.com	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: Town of Pinesdale	**Address:** PO Box 410228 Pinesdale Mt 59841	Yes / No					
Name /Title: Neil Harnett PWD	**E-mail or Phone #:** tfpworks@blackfoot.net	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: City Thompsonfalls	**Address:** P.O Box 1756 Thompsonfalls 59873	Yes / No					
Name /Title: Chris Allen	**E-mail or Phone #:** mayor@townofPlains.com	**EMPG/Federally Funded?**	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Organization: Plains, Mt.	**Address:** P.O. Box 864 Plains, Mt 59859	Yes / No					

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Kalispell

DATE AND TIME: Wednesday 01/18/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

Name /Title:	Organization:	E-mail or Phone #:	Address:	EMPG/Federally Funded?	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Dan Miller PWD	City of Ronan	publicworks@cityofronan.org	207 MAIN St SW	Yes / [✓ No]	110				
Thomas Lam EMD	Lincoln County	LCEMA@libby.org		[✓ Yes] / No					
Karl Weeks	City of Columbia Falls	cffire@cityofcolumbiafalls.com	130 6th St W Col. Falls MT 59912	Yes / No					
Patricia Noble	Town of Rexford	PNOBLE1030@Gmail.Com	Rexford, MT	Yes / [✓ No]					
Justin Juelfs		JJuelfs@MT.GOV		Yes / No					
Kevin Straub Asst. Chief	Polson City Fire	KStraub@CityofPolson.Com	106 1st Street East Polson Mt.	Yes / No					
Will Silverman / Backup OEM	Lake Co.	wsilverman08@gmail.com	Lake Co. Courthouse, Polson, MT	Yes / No					
Michael Gray / PWD	Town of Hot Springs	publicworks@townofhotsprings.com	109 Main St, Hot Springs, MT 59845	Yes / No					
Jeff Brislawn / Project Mgr	WSP	Jeff.brislawn@wsp.com		Yes / [✓ No]					

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Kalispell

DATE AND TIME: Wednesday 01/18/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

Name /Title: Jen Rankosky Health Officer **Organization:** Flathead City County Health Dept	**E-mail or Phone #:** jrankosky@flathead.mt.gov **Address:** 1035 1st Ave W. Kalispell MT 59901	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name / Title: Lisa Dennison, RN **Organization:** Flathead C-C Health Dept	**E-mail or Phone #:** ldennison@flathead.mt.gov **Address:** 1035 1st Ave. West Kalispell, MT 59901	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name /Title: Andrew Long **Organization:** MT DES	**E-mail or Phone #:** Andrew.Long@mt.gov **Address:**	**EMPG/Federally Funded?** [✓ Yes] / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name / Title: **Organization:**	**E-mail or Phone #:** **Address:**	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name /Title: **Organization:**	**E-mail or Phone #:** **Address:**	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name / Title: **Organization:**	**E-mail or Phone #:** **Address:**	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name /Title: **Organization:**	**E-mail or Phone #:** **Address:**	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name /Title: **Organization:**	**E-mail or Phone #:** **Address:**	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Name /Title: **Organization:**	**E-mail or Phone #:** **Address:**	**EMPG/Federally Funded?** Yes / No	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Kalispell

DATE AND TIME: Wednesday 01/18/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

Name /Title: Stephon Lassiter	**E-mail or Phone #:** 406-493-2344	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Town of Stevensville	**Address:** 206 Buck St Stevensville MT 59870	**Yes / No**					
Name / Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					
Name /Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					
Name / Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					
Name /Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					
Name / Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					
Name /Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					
Name /Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					
Name /Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	**Yes / No**					

Training/Event/Meeting
Sign in Sheet Page 1 -2

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Livingston

DATE AND TIME: Friday 01/20/2023 10am-3pm

Name /Title: Organization:	E-mail or Phone #: Address:	EMPG/Federally Funded?	Trip Miles	Total Hours	Cost p/m	2022 Hourly $ for Volunteers	Total Soft Match
Andrew Long MTDES	andrew.Long@mt.gov 	[✓ Yes] / No					
Kris Novotny City of Big Timber	pwbtmt@itstriangle.com 	Yes / No					
Cliff Brophy Sweet Grass Co.	sgdes@itstriangle.com Big Timber MT 59011	[✓ Yes] / No					
Melanie Roe Sweet Grass County	sgcommish@itstriangle.com Big Timber Mt 59011	[✓ Yes] / No					
Darra Perdaems Park County Health Dept	DPerdaems@parkcounty.org 414 E Callender Livingston 59047	[✓ Yes] / No					
Travis Ball USACE	travis.j.ball@usace.army.mil 	Yes / No					
Jeff Greenwald USACE	jeffrey.r.greenwald@usace.army.mil Belgrade, MT	Yes / No					
Jan Lopp Meagher Co.	JLopp@Meagherco.net 101 CrawFord St, white Sulphur Springs MT	[✓ Yes] / No					
Will Buniger/CSO Clyde Park Town	wBuniger@hotmail.com 209 Park st Clyde Park mT	Yes / No					

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Helena/ Ft. Harrison

DATE AND TIME: Tuesday 01/17/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

Name /Title: Jim Merrifield	**E-mail or Phone #:** 406 490-6373	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: [illegible] BSBEOC	**Address:** 3619 Wynne	Yes / No					
Name / Title: John Ries	**E-mail or Phone #:** 406 -498-3973	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Walkerville	**Address:** 36 Daly Walkerville	Yes / No					
Name /Title: Lisa Carey/ Deputy DES	**E-mail or Phone #:** lcarey@bsb.mt.gov	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: BSB OEM	**Address:** 3619 Wynne Butte 59701	[✓ Yes] / No	180				
Name / Title: Dina Young	**E-mail or Phone #:** lima@3rivers.net	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Town of Lima	**Address:** PO Box 184 Lima 59739	Yes / No					
Name /Title: Capt Brian Robinson	**E-mail or Phone #:** brobinson@lccountymt.gov	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Lewis & Clark Sheriff	**Address:** 406 Fuller Ave Helena	Yes / No					
Name / Title: UNDERSHERIFF COLBERT	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: LCSO	**Address:** 406 FULLER AVE HELENA	Yes / No					
Name /Title: Emily Geery, Planner	**E-mail or Phone #:** 505-250-7681	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: SWCA Env. Cons.	**Address:** 1225 Highland St. Helena	Yes / No					
Name /Title: Jenny Chambers, Director	**E-mail or Phone #:** 406-447-8034	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: [illegible] Clk Coty	**Address:** Cooney Drive, Helena MT	Yes / No					
Name /Title: Mary JANACARO Hensleigh	**E-mail or Phone #:** mayor@townofwhitehall.org	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Town of Whitehall	**Address:**	Yes / No					

JURISDICTION USING SOFT MATCH:

POINT OF CONTACT OR LEAD INSTRUCTOR: Andrew Long

EVENT/OR MEETING NAME: Western Mitigation Actions Workshop

LOCATION: Livingston

DATE AND TIME: Friday 01/20/2023 10am-3pm

Training/Event/Meeting
Sign in Sheet Page 1 -2

MONTANA DISASTER + EMERGENCY SERVICES DES

Name /Title: Jeff Brislawn / Project Manager	**E-mail or Phone #:** Jeff.brislawn@wsp.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: WSP - Consultant	**Address:**	Yes [✓ No]					
Name / Title: Christopher Johnson / Hazard mitigation Planner	**E-mail or Phone #:** christopher.johnson@wsp.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: WSP	**Address:**	Yes / No					
Name /Title: Jeannette Blank	**E-mail or Phone #:** jblank@freshwaterpartners.org	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: MT Freshwater Partners	**Address:** PO Box 338 Livingston 59047	Yes / No					
Name / Title: Grant Gager	**E-mail or Phone #:** ggager@~~[illegible]~~livingstonmontana.org	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: City of Livingston	**Address:** 220 E. Park St	Yes / No					
Name /Title: Jacob Lacy	**E-mail or Phone #:** Jacob.lacy@respec.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: Respec	**Address:** 3810 Valley commons Dr, Bozeman, 59718	Yes / No					
Name / Title: MIKE ROTAR	**E-mail or Phone #:** mike.rotar@respec.com	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: RESPEC	**Address:** 3810 VALLEY COMMONS #4, BOZEMAN 59718	Yes [✓ No]					
Name /Title: Kyle Stargill-Simon	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization: MTDES	**Address:**	[✓ Yes] / No					
Name /Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	Yes / No					
Name /Title:	**E-mail or Phone #:**	**EMPG/Federally Funded?**	**Trip Miles**	**Total Hours**	**Cost p/m**	**2022 Hourly $ for Volunteers**	**Total Soft Match**
Organization:	**Address:**	Yes / No					

Western Region Coordination Call

04 - 06 Oct 2022

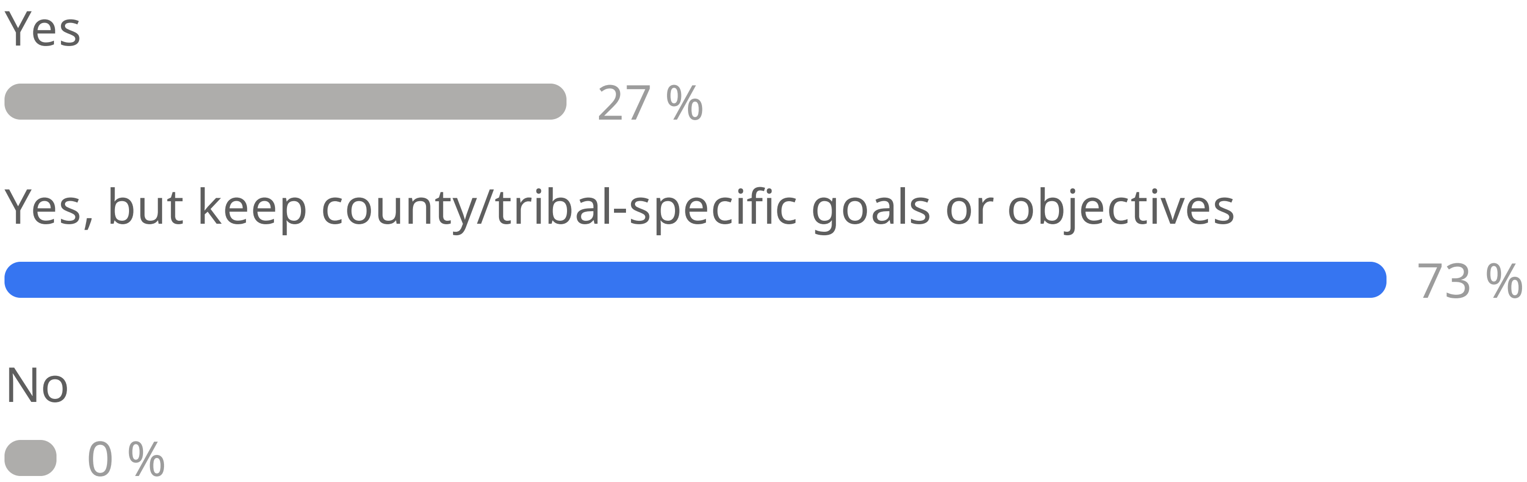
Poll results

Table of contents

Multiple-choice poll

Do you support the creation of overarching goals for the Western Region HMP?

011



Yes

27 %

Yes, but keep county/tribal-specific goals or objectives

73 %

No

0 %

Multiple-choice poll

From the sample goal statements provided, which ones do you prefer?

010

Sample 1

100 %

Sample 2

0 %

Sample 3

0 %

Combination of certain goal statements from the samples

0 %

Goals consistent with the Central Region Draft Goals

0 %

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					■			
EMERGENCY SERVICES								
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?

Montana Western Region Hazard Mitigation Plan Public Input Survey

The State of Montana Disaster and Emergency Services (MT DES) is coordinating the creation of a new Regional Hazard Mitigation Plan that will encompass all counties, municipalities, and tribal nations in the Western Region. The Regional Plans will build off existing local hazard mitigation plans in the Region and be developed in accordance with the Disaster Mitigation Act of 2000 and regional resilience planning guidance.

The Regional Hazard Mitigation Plan analyzes each county, municipality and Tribe's vulnerabilities to natural and human-caused hazards and identifies mitigation actions that can be taken to minimize property damage and improve life safety prior to a hazard event.

The purpose of this survey is to collect information from the public and stakeholders to better understand the vulnerabilities within the Western Region as well as solicit input on needs to best mitigate, or reduce, the impacts of hazards before they occur. The feedback will be shared with local planning committees to inform the planning process.

Please complete this survey by **October 7, 2022**.

We highly recommend filling out the online version at:

https://survey123.arcgis.com/share/a9be3dcd43dd4e13b350f0ab9079fbbf

Alternately please take a few moments to complete and return the form where it was distributed or provide to your County or Tribal emergency management office.

Community Information

1. Which County or Reservation do you live in?

☐ Beaverhead County
☐ Broadwater County
☐ Butte-Silver Bow County
☐ Flathead County
☐ Confederated Salish and Kootenai Tribes of the Flathead Reservation
☐ Granite County
☐ Jefferson County
☐ Lake County
☐ Lewis and Clark County
☐ Gallatin County
☐ Granite County
☐ Lincoln County
☐ Madison County
☐ Meagher County
☐ Mineral County
☐ Missoula County
☐ Park County
☐ Powell County
☐ Ravalli County
☐ Sanders County
☐ Sweet Grass County
☐ Other

2. Where in the county do you live?

☐ Unincorporated

☐ Municipality

☐ Reservation

3. List the specific community name:

Hazard Significance

4. The hazards addressed in the Western Region Hazard Mitigation Plan update are listed below. Please indicate the level of significance (low, medium, or high) you perceive for each hazard for in the community you live.

Hazard	**Low**	**Medium**	**High**
Avalanche	☐	☐	☐
Dam Failure	☐	☐	☐
Drought	☐	☐	☐
Earthquake	☐	☐	☐
Flooding	☐	☐	☐
Landslide	☐	☐	☐
Severe Summer Weather (extreme heat, thunderstorms, hail, lightning)	☐	☐	☐
Severe Winter Weather (extreme cold, heavy snow, blizzard)	☐	☐	☐
Tornadoes and Windstorms	☐	☐	☐
Wildland and Rangeland Fire	☐	☐	☐
Volcanic Ashfall	☐	☐	☐
Hazardous Materials Incidents	☐	☐	☐
Human Conflict (Terrorism, Civil Unrest, etc.)	☐	☐	☐
Communicable Disease	☐	☐	☐
Cyber-Attack	☐	☐	☐

Other? (Note in space below other hazards of concern that are not listed above)	☐	☐	☐

Specific Hazard Issues/Problems

5. Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction (County, Tribal Nation or Municipality) to which it applies:

Pre-Disaster Mitigation Actions

Mitigation includes actions that can be taken to reduce or eliminate the long-term risk to hazards.

6. Indicate the level of significance the following mitigation action categories.

Category	**Low**	**Medium**	**High**
Local Planning and Regulations (Addressing hazards in Plans and Policies)	☐	☐	☐
Structure and Infrastructure projects (Improving Buildings and Infrastructure)	☐	☐	☐
Natural Systems Protection (Protecting Sensitive Areas)	☐	☐	☐
Education and Awareness Programs	☐	☐	☐
Enhancing Administration and Procedures	☐	☐	☐

7. The following types of mitigation actions may be considered in the Western Region. Please indicate the types of mitigation actions that you think should have the highest priority in the Western Region Hazard Mitigation Plan.
☐ Indoor/Outdoor Warning
☐ Wildfire Fuels Treatment projects
☐ Wildfire Defensible Space
☐ Critical Facilities Protection
☐ Generators for Critical Facilities
☐ Land Use Planning
☐ Public Education/Awareness on Hazards

☐ Stormwater Drainage Improvements
☐ Forest Health/Watershed Protection
☐ Stream Stabilization/Restoration
☐ Flood Mitigation
☐ Access to Flood Insurance
☐ Education and Discounts on Flood Insurance
☐ Floodprone Property Buyout
☐ Water Conservation
☐ Landslide Mitigation
☐ Rockfall Mitigation
☐ Evacuation Route Development
☐ Dam safety
☐ Public Health Incident Preparedness
☐ Improve Reliability of Communications Systems
☐ Severe Weather Shelters (Tornado, Winter Storm)
☐ Windbreaks And Snow Fences
☐ Electrical Power Grid Resiliency

Pre-Disaster Mitigation Action Ideas

8. Please comment on any other pre-disaster hazard mitigation actions that the planning committee should consider for reducing future losses caused by natural disasters:

Contact Information (Optional)

Optional: Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process:

Mitigation Planning Information

Hazard mitigation is the use of long- and short-term strategies to reduce or alleviate loss of life, injuries, and property damage that can result from disasters such as floods, wildfires, tornadoes, and earthquakes. By reducing exposure to these hazards, the state will save lives and property and minimize the social, economic, and environmental disruptions that follow hazard events. Studies have found that every dollar spent on hazard mitigation saving an average of $6 in avoided future losses.

The State of Montana Disaster and Emergency Services (MT DES) is coordinating the creation of new Regional Hazard Mitigation Plans that will encompass all counties, municipalities, and tribal nations in Montana. This will support consistency across the state, lighten the administrative burden on local and tribal governments, be cost effective, and ensure comprehensive eligibility for FEMA mitigation grant funding. The Regional Plans will build off existing local hazard mitigation plans and be developed in accordance with the Disaster Mitigation Act of 2000.

Planning Regions

State | Eastern Region | Central Region | Western Region

We need your input!

The State of Montana Disaster and Emergency Services (MT DES) is coordinating the creation of new Regional Hazard Mitigation Plans that will encompass all counties, municipalities, and tribal nations in Montana. This will support consistency across the state, lighten the administrative burden on local and tribal governments, be cost effective, and ensure comprehensive eligibility for FEMA mitigation grant funding.

The Western Region Plan and jurisdiction plan annexes are now available for public review and comment at Western Montana Regional HMP Public Engagement Space - VirtualPlatform (woodplc.com).

Please take a look and let us know your thoughts.

Contact:

Andrew Long, Mitigation Coordinator ~ Andrew.Long@mt.gov ~ (406) 202-4532

For general questions, you can contact MT DES by calling (406) 324-4777 or by sending an email to mtdes@mt.gov.

Montana Disaster & Emergency Services
1956 Mt. Majo Street, PO Box 4789
Fort Harrison, MT 59636-4789

From: Guerrero, Crystal
To: Glacier OEM; des@glaciercountymt.org; sarah.wolftail@blackfeetnation.com; Melinda Burns; dcoverdell; tetondes31@gmail.com; bcall@cascadecountymt.gov; GViolette; des4; rhayes@jbcounty.org
Cc: MT DES Mitigation; Hartley, Sara; Long, Andrew; Perez, Tomas; Bleile, John; Greiberis, Ed; Brinkley, Kyrsten; Campbell, Colin; Gates, Jeff; Johnson, Christopher; Field, Scott; Prosperi, Juliana
Subject: Western MT Regional HMP Public Comment Period
Date: Friday, March 22, 2024 4:57:25 PM

Hello Central Region,

The MT DES - Mitigation Bureau has been working with each region to develop Regional Hazard Mitigation Plans. As a neighboring county, we would like to extend the opportunity for you to review and provide comment to the Western Regional Plan. The Virtual Public Platform can be accessed via the below link:

- Western Region: https://virtualconsultation.wsp.com/VirtualSpace/174019

This *Public Comment Period* will be extended to ***Friday, March 29, 2024*** to allow for you to view the plans. If you have any questions or need assistance navigating the platforms, please feel free to reach out to me or anyone on the Mitigation Team.

Thank you,

Crystal Guerrero
Mitigation Coordinator
Montana Department of Military Affairs
Disaster & Emergency Services
(p) 406-202-8250
(e) crystal.guerrero@mt.gov

DES Montana Disaster & Emergency Services

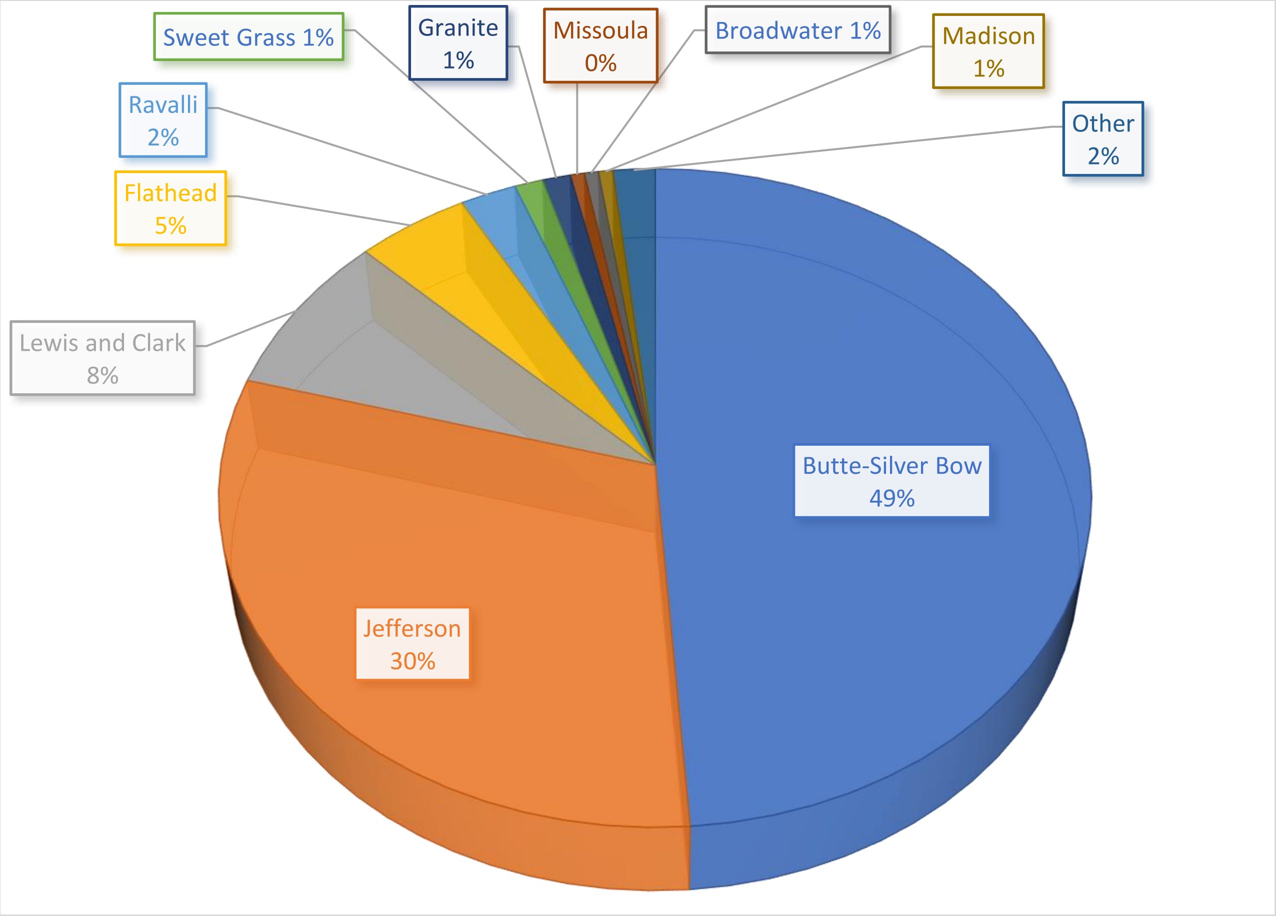
APPENDIX C: Public Input

Public Survey

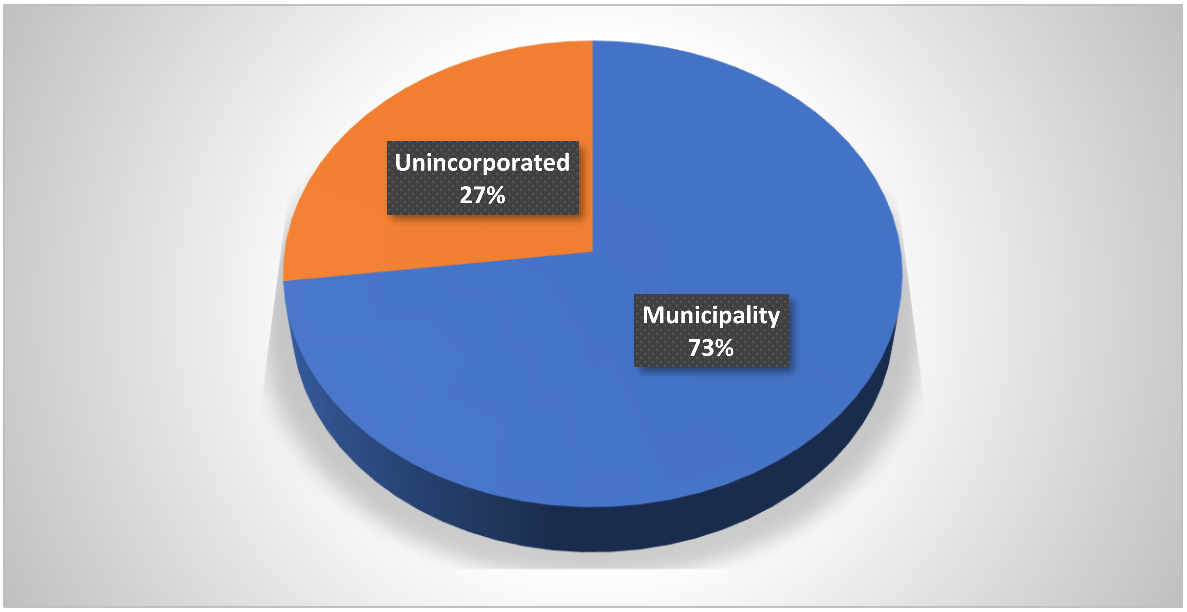
Public and stakeholder input was collected at the beginning of the planning process through an online survey from September through October 7, 2022. The survey was advertised by the County and participating jurisdictions through social media.

The survey provided an opportunity for public input during the planning process prior to finalization of the plan update to all communities, including vulnerable populations. The public survey received responses from 174 individuals. Responses to the survey are shown below. Based on this survey, the public perceives the most significant hazards to be wildfire, severe winter weather, and drought.

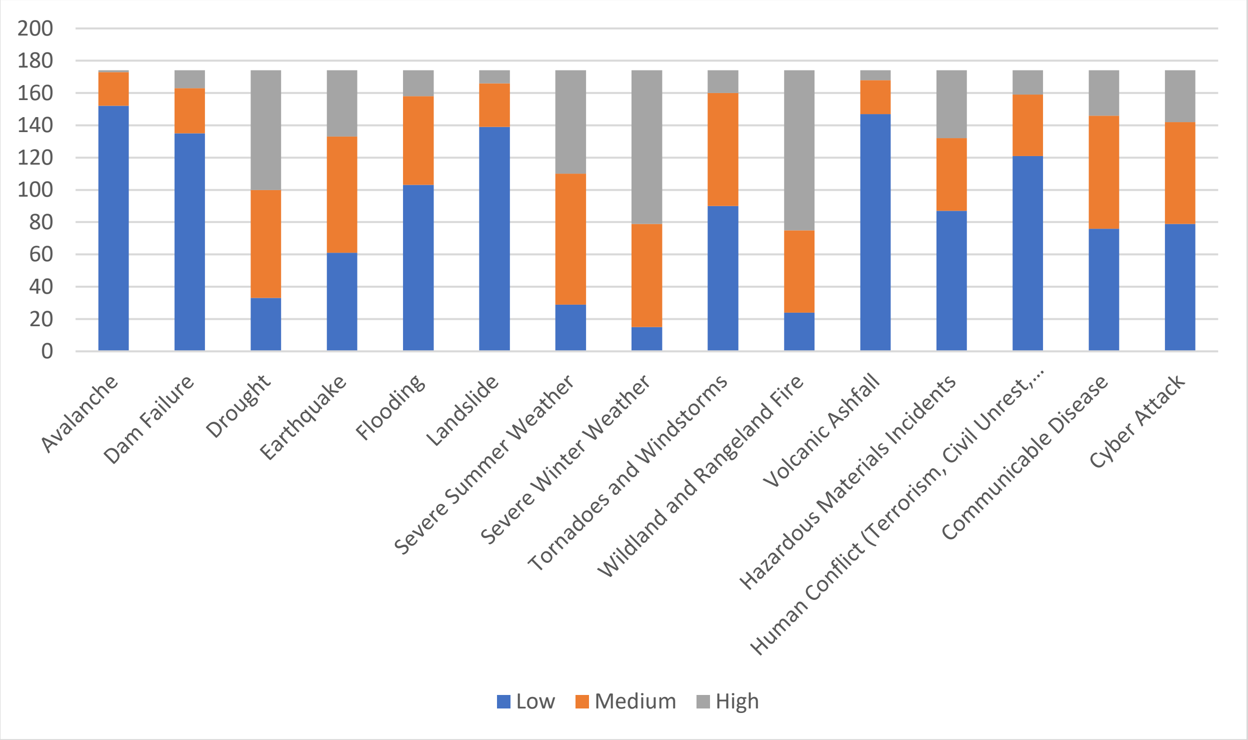
Which County or Reservation do you live in?



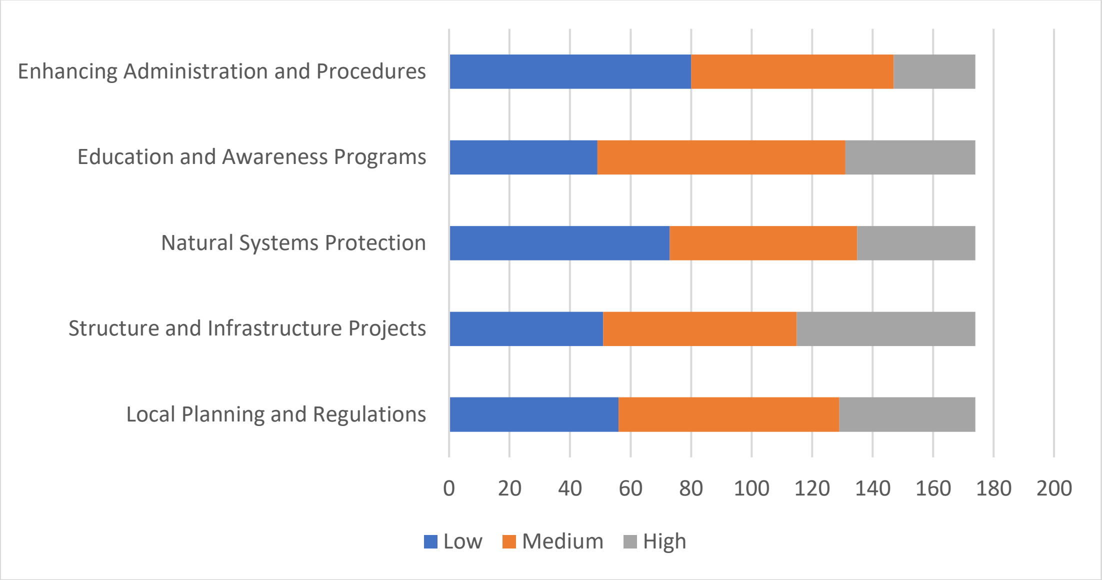
Where in the County do you live?



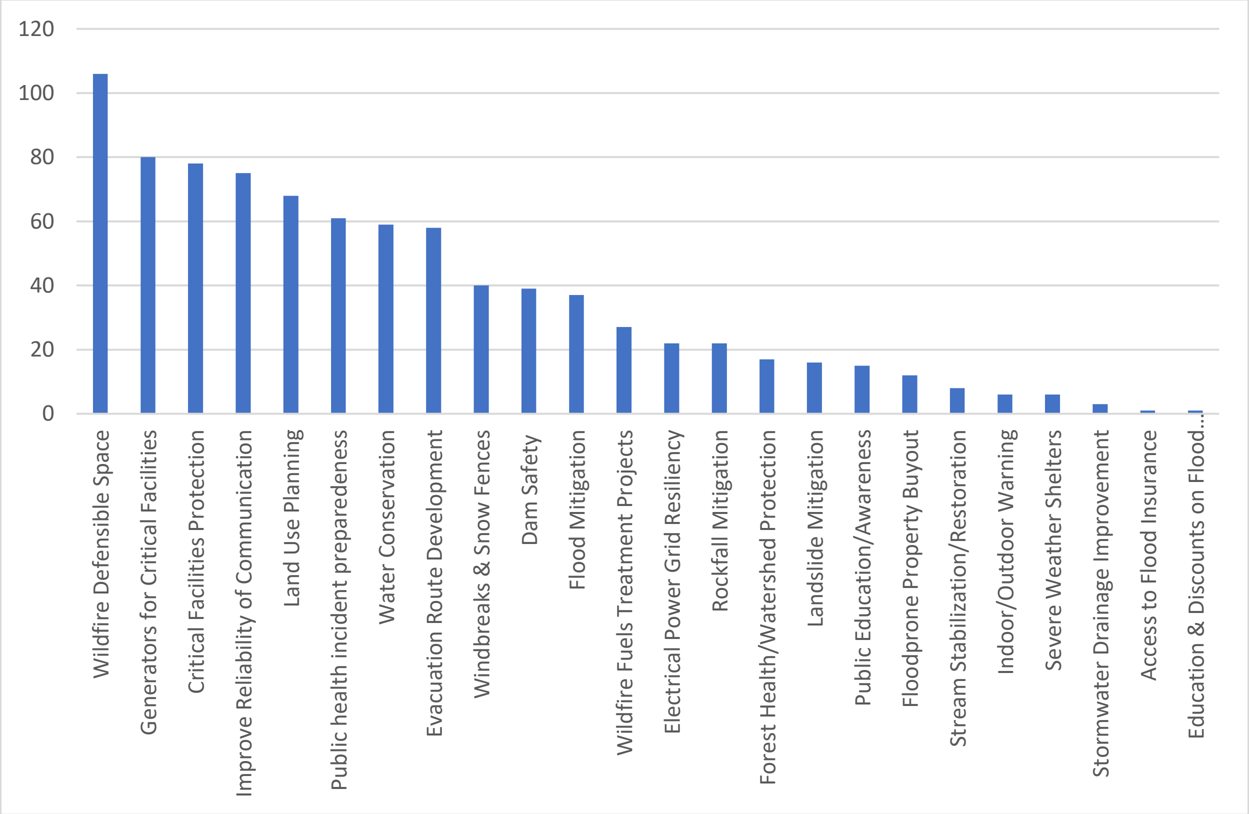
Please indicate the level of significance you perceive for each hazard for the community you live in.



Please indicate the significance you perceive for the following mitigation action categories.



Please indicate the types of mitigation actions that you think should have the highest priority.



Public Draft Comment Period

Prior to finalizing, a draft of the regional plan was made available to the public for review and comment in October and November 2023. The plan and annexes were made available on the MTDES website as well via an online public engagement space, shown in Figure C-1. The counties and tribes used social media, website posts, and email blasts to announce the public comment period. An online feedback form was provided to collect specific comments.

Seven public comments were received on the draft plan. They were reviewed with the HMPC but did not result in any substantive changes to the HMP or its Annexes.

Figure C-1 Regional Hazard Mitigation Plan Virtual Public Engagement Space

Central Montana Regional Hazard Mitigation Plan

The State of Montana Disaster and Emergency Services (MT DES) is coordinating the creation of new Regional Hazard Mitigation Plans that will encompass all counties, municipalities, and tribal nations in Montana. This will support consistency across the state, lighten the administrative burden on local and tribal governments, be cost effective, and ensure comprehensive eligibility for FEMA mitigation grant funding.

The Central Region Plan is now available for public review and comment. Please share your feedback with us.

Hazard Identification

The Central Region plan profiles these natural and human-caused hazards:

- Communicable Disease
- Cyber Attack
- Dam Failure
- Drought
- Earthquake
- Flooding
- Hazardous Material Incidents
- Landslide
- Severe Summer Weather
- Severe Winter Weather
- Human Conflict (Terrorism, Civil Unrest, etc.)
- Tornadoes & Windstorms
- Transportation Accidents
- Volcanic Ash
- Wildfire

Review the Draft Plan

Click on the link above to download the draft 2023 Central Montana Regional Hazard Mitigation Plan. Please review it and let us know what you think.

Comment Form

We Want Your Feedback!

Please use the comment form above this panel to provide feedback on this project and the draft plan. All comments will be reviewed with the planning team for possible incorporation into the final plan.

Thank you for your time!

APPENDIX D: PLAN ADOPTION AND APPROVAL

Note: This appendix provides documentation of the required record of adoption which will be incorporated when available. When the plan is adopted in 2024 a scanned version of the adoption resolutions will be inserted for each participating jurisdiction within Beaverhead, Broadwater, Butte-Silver Bow, Flathead, Granite, Jefferson, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Mineral, Park, Powell, Ravalli, Sanders, and Sweet Grass counties as well as the Confederated Salish and Kootenai Tribes of the Flathead Nation. A sample adoption resolution is provided here. The final FEMA approval packed will be included for future reference regarding the five-year expiration date and suggestions for improvement in the next update.

Mitigation Plan Adoption Sample Resolution

Resolution # ______

Adopting the 2024 Montana Western Region Hazard Mitigation Plan

Whereas, *(name of county or community) 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, *(name of county or community) resides within the Planning Area, and fully participated in the mitigation planning process to prepare this Hazard Mitigation Plan; and*

Whereas, *the Montana Division of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials have reviewed the 2023 Montana Regional Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and*

Now, therefore, be it resolved, *that the (name of board or council), hereby adopts the Montana Regional Hazard Mitigation Plan, as an official plan; and*

Be it further resolved, *the County of _________ will submit this Adoption Resolution to the Montana Division of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials to enable the Plan's final approval.*

Passed: ___(date)______________

____

Certifying Official

Confederated Salish and Kootenai Tribes of the Flathead Reservation Adoption Records

Confederated Salish and Kootenai Tribes of the Flathead Reservation

Broadwater County Adoption Records

Broadwater County

City of Townsend

Beaverhead County Adoption Records

Beaverhead County

City of Dillon

Town of Lima

Butte-Silver Bow County Adoption Records

Butte-Silver Bow County

Town of Walkerville

Flathead County Adoption Records

Flathead County

City of Columbia Falls

City of Kalispell

City of Whitefish

Granite County Adoption Records

Granite County

Town of Drummond

Town of Philipsburg

Jefferson County Adoption Records

Jefferson County

City of Boulder

Town of Whitehall

Lake County Adoption Records

Lake County

City of Polson

City of Ronan

Town of St. Ignatius

Lewis and Clark County Adoption Records

Lewis and Clark County

City of Helena

City of East Helena

Lincoln County Adoption Records

Lincoln County

City of Libby

City of Troy

Town of Eureka

Madison County Adoption Records

Madison County

Town of Ennis

Town of Sheridan

Town of Twin Bridges

Town of Virginia City

Meagher County Adoption Records

Meagher County

City of White Sulphur Springs

Mineral County Adoption Records

Mineral County

Town of Alberton

Town of Superior

Park County Adoption Records

Park County

City of Livingston

Town of Clyde Park

Powell County Adoption Records

Powell County

City of Deer Lodge

Ravalli County Adoption Records

Ravalli County

City of Hamilton

Town of Darby

Town of Stevensville

Town of Pinesdale

Sanders County Adoption Records

Sanders County

City of Thompson Falls

Town of Plains

Town of Hot Springs

Sweet Grass County Adoption Records

Sweet Grass County

City of Big Timber

APPENDIX E: REFERENCES

Analysis of the Cyber Attack on the Ukrainian Power Grid: https://blog.isa.org/lessons-learned-forensic-analysis-ukrainian-power-grid-cyberattack-malware

ArboNET: https://www.cdc.gov/mosquitoes/mosquito-control/professionals/ArboNET.html

Arboviral Diseases Branch: https://www.cdc.gov/ncezid/dvbd/specimensub/arc/index.html

Armed Conflict Location and Event Data Project: https://acleddata.com/

Association of State Dam Safety Officials: https://damsafety.org/

Building Resilient Infrastructure and Communities: https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

Bureau of Indian Affairs: https://www.bia.gov/

Bureau of Land Management: https://www.blm.gov/

Bureau of Reclamation: https://www.usbr.gov/

Centers for Disease Control and Prevention: https://www.cdc.gov/index.htm

Community Wildfire Protection Plans: https://dnrc.mt.gov/Forestry/Community-Local-Government/MT_CWPP_Guideline_FINAL.pdf

Count Love: https://countlove.org/

County Assessor Data: http://www.assessordata.org/

Dam incident Database: https://damsafety.org/incidents

Digital Flood Insurance Rate Maps: https://www.floodsmart.gov/hurricane-season/texas?gclid=EAIaIQobChMIzLXnws7SgAMVXoxoCR17PQn9EAAYAiAAEgJM7fD_BwE&gclsrc=aw.ds

Disaster Mitigation Act of 2000 (Public Law 106-390): https://www.fema.gov/sites/default/files/2020-11/fema_disaster-mitigation-act-of-2000_10-30-2000.pdf

Emsisoft: https://www.emsisoft.com/en/

Environmental Protection Agency: https://www.epa.gov/

EPA Regional Resilience Toolkit: https://www.epa.gov/smartgrowth/regional-resilience-toolkit

Existing Local and Tribal HMPs: https://www.fema.gov/emergency-managers/risk-management/hazard-mitigation-planning/status

Federal Bureau of Investigation: https://www.usa.gov/agencies/federal-bureau-of-investigation

FBI Internet Crime Report 2021: https://www.ic3.gov/Media/PDF/AnnualReport/2021_IC3Report.pdf

FBI report Active Shooters Incidents, 20-Year Review 2000-2019: https://www.fbi.gov/file-repository/active-shooter-incidents-20-year-review-2000-2019-060121.pdf/view

FEMA Community Rating System: https://www.fema.gov/floodplain-management/community-rating-system

FEMA National Risk Index: https://hazards.fema.gov/nri/determining-risk

FEMA Hazard Mitigation Plan: https://www.fema.gov/emergency-managers/risk-management/hazard-mitigation-planning

FEMA Hazard Mitigation Assistance: https://www.fema.gov/grants/mitigation

FMEA NRI Technical Documentation 2021: https://hazards.fema.gov/nri/determining-risk

FEMA Region 8: https://www.fema.gov/about/organization/region-8

Flood Mitigation Assistance: https://www.fema.gov/grants/mitigation/floods

Fourth National Climate Assessment: https://nca2018.globalchange.gov/

Georgetown University Medical Center, 2022 "New Study Finds Climate Change Could Spark The Next Pandemic": https://www.enn.com/articles/70219-new-study-finds-climate-change-could-spark-the-next-pandemic

Global Terrorism Database: Global Terrorism Database (umd.edu)

Hazard Mitigation Grant Program: https://www.fema.gov/grants/mitigation/hazard-mitigation

Headwater Economics 2022: https://headwaterseconomics.org/

Homeland Infrastructure Foundation-Level Data, 2022: https://hifld-geoplatform.opendata.arcgis.com/

Integrated Benefits Institute: https://www.ibiweb.org/

Montana Bureau of Mines and Geology: https://www.mbmg.mtech.edu/#gsc.tab=0

Montana Cybersecurity Report: https://www.pinecc.com/montana-cyber-security-report

Montana Department of Natural Resources & Conservation: https://dnrc.mt.gov/

Montana Department of Transportation: https://www.mdt.mt.gov/

Montana Department of Justice: https://dojmt.gov/

Montana Department of Justice Office of Consumer Protection: https://www.montanalawhelp.org/resource/office-of-consumer-protection-mt-department-of-justice

Montana Disaster & Emergency Services: https://des.mt.gov/

Montana Climate Assessment 2017; Bozeman and Missoula MT: Montana State University and University of Montana, Montana Institute on Ecosystems. https://montanaclimate.org/

Montana Corona Virus Relief Fund: https://commerce.mt.gov/Coronavirus-Relief

Montana Forest Action Plan (2020): https://www.montanaforestactionplan.org/

Montana Climate Solutions Plan (2020): https://deq.mt.gov/files/DEQAdmin/Climate/2020-09-09_MontanaClimateSolutions_Final.pdf

Montana Ecological Services Field Office: https://www.fws.gov/office/montana-ecological-services/species

Montana Hazard Mitigation Website: mitigationplanmt.com.

Montana State Library: https://msl.mt.gov/

Montana Wildfire Risk Assessment: https://mwra-mtdnrc.hub.arcgis.com/documents/montana-wildfire-risk-assessment-report/explore

NASA: https://www.nasa.gov/

National Bridge Inventory: https://www.fhwa.dot.gov/bridge/nbi.cfm

National Centers for Environmental Information: https://www.ncei.noaa.gov/

Natural Hazard Mitigation Saves, 2019 Report: https://www.nibs.org/projects/natural-hazard-mitigation-saves-2019-report

National Inventory of Dams: https://nid.sec.usace.army.mil/#/

National Flood Insurance Program: Flood Insurance | FEMA.gov

National Pipeline Mapping Systems: https://www.npms.phmsa.dot.gov/

National Response Center Incident Report Database: https://www.epa.gov/emergency-response/national-response-center

National Risk Index: https://www.fema.gov/flood-maps/products-tools/national-risk-index

National Wildfire Coordinating Group: https://www.nwcg.gov/

NOAA/NWS: https://www.weather.gov/

Our World in Data- Global Change Data Lab: https://ourworldindata.org/organization

Privacy Rights Clearinghouse: https://privacyrights.org/

Rehabilitation of Hazard Potential Dam: https://www.fema.gov/emergency-managers/risk-management/dam-safety/rehabilitation-high-hazard-potential-dams

Residential Proximity to Environmental Hazards and Adverse Health Outcomes: https://www.ncbi.nlm.nih.gov/

Right to Know Network: https://rjifuture.org/

Roadside Geology of Montana; Donald W. Hyndman and Robert C. Thomas. Mountain Press, 2020.

Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288): https://www.fema.gov/disaster/stafford-act

Social Vulnerability Index: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

Social Vulnerability and Community Resilience Working Group: https://www.census.gov/content/dam/Census/library/working-papers/2022/demo/sehsd-wp2022-25.pdf

State of Montana Department of Public Health and Human Services: https://dphhs.mt.gov/

Teton County Hazard Mitigation Plan 2021: https://tetoncomt.org/wp-content/uploads/2022/01/2021-Teton-County-Hazard-Mitigation-Plan.pdf

Tribal Mitigation Plans, Title 44 of the Code of Regulations, Section 201.7: https://www.ecfr.gov/current/title-44/chapter-I/subchapter-D/part-201/section-201.7

Tsvetanov, Tsvetan & Srishti Slaria, The effect of the Colonial Pipeline shutdown on gasoline prices, 2021. https://ideas.repec.org/a/eee/ecolet/v209y2021ics0165176521003992.html

University of South Carolina’s Hazard and Vulnerability Research Institute Baseline Resilience Indicators for Communities: https://sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/index.php/sovi%C2%AE-0

Urban Institute: https://www.urban.org/

US Air Force: https://www.airforce.com/

US Army Corps of Engineers: https://www.usace.army.mil/

U.S. Census Bureau ACS 5-year Estimates: https://www.census.gov/data/developers/data-sets/acs-5year.html

US Coast Guard 2017-2021 Recreational Boating Statistics: https://uscgboating.org/library/accident-statistics/Recreational-Boating-Statistics-2021.pdf

US Crisis Monitor: https://acleddata.com/special-projects/us-crisis-monitor/

US Department of Agriculture: https://www.usda.gov/

US Department of Health and Human Services: https://www.hhs.gov/

US Department of Homeland Security: https://www.dhs.gov/

US Department of Transportation Federal Highway Administration Technical Advisory: https://highways.dot.gov/

US EPA: https://www.epa.gov/

US Forest Service: https://www.fs.usda.gov/

US Geological Survey: https://www.usgs.gov/

2012 International Building Code: https://codes.iccsafe.org/content/IBC2012

2013 FEMA Local Mitigation Planning Handbook: https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf

2018 Montana State Hazard Mitigation Plan: https://drought.unl.edu/archive/plans/GeneralHazard/state/MT_2018.pdf

2019 Montana DPHHS Communicable Disease in Montana Annual Report: https://dphhs.mt.gov/assets/publichealth/CDEpi/StatisticsandReports/CDEpiAnnualSummaryReports/AnnualReport2019final51222.pdf


Lincoln
Glacier
2
Toole
Liberty
Hill
3
Blaine
1
Phillips
Daniels
Sheridan
Valley
6
Roosevelt
Flathead
Pondera
Sanders
Lake
4
Teton
Chouteau
McCone
Richland
8
Cascade
Garfield
Dawson
Mineral
Missoula
Lewis and Clark
Judith Basin
Fergus
Petroleum
Prairie
Wibaux
Powell
Granite
Meagher
Broadwater
Wheatland
Golden Valley
Musselshell
Treasure
Rosebud
Fallon
Ravalli
Deer Lodge
Jefferson
Silver Bow
Gallatin
Sweet Grass
Yellowstone
Custer
Stillwater
Big Horn
7
Carter
Carbon
5
Powder River
Park
Beaverhead
Madison