BEAVERHEAD COUNTY, MONTANA
CITYOF DILLON, MONTANA
TOWN OF LIMA, MONTANA
PRE-DISASTER MITIGATION PLAN

SEPTEMBER 2017 REVISION
DRAFT TOPICAL REPORT RSI-XXXX

PREPARED FOR
Beaverhead County, MT
City of Dillon, MT
Town of Lima, MT

MARCH 2017

RESPEC

RESPEC.COM

BEAVERHEAD COUNTY, MONTANA
CITY OF DILLON, MONTANA
TOWN OF LIMA, MONTANA
PRE-DISASTER MITIGATION PLAN

SEPTEMBER 2016 REVISION
DRAFT TOPICAL REPORT RSI-XXXX

PREPARED BY
Zachary T. Collins, CFM, GISP

RESPEC
3110 Valley Commons Drive, Suite 4
Bozeman, MT 59718

PREPARED FOR
Beaverhead County, MT
City of Dillon, MT
Town of Lima, MT

MARCH 2017

EXECUTIVE SUMMARY

Disasters can strike at any time in any place. In many cases, actions can be taken before disasters strike to reduce or eliminate the negative impacts. These actions, termed mitigation, often protect life, property, the economy, and other values. The Beaverhead County Pre-Disaster Mitigation Plan addresses 13 major hazards with respect to risk and vulnerabilities countywide, including the City of Dillon and the Town of Lima. Through a collaborative planning process, the Beaverhead County hazards were identified, researched, profiled, updated, and prioritized.

The major hazards – aircraft accident, disease and environmental contamination, drought, earthquake, flood, hazardous material release, severe weather, terrorism and civil unrest, transportation accident, urban fire, utility and energy failure, volcanic ash fall, and wildfire – are each profiled in terms of their hazard description, history, probability and magnitude, mapping, vulnerabilities, data limitations, and other factors. The vulnerabilities to critical facilities; critical infrastructure; structures; the population; economic, ecologic, historic, and social values; and future development are updated for each hazard.

Based on the probability and extent of potential impacts identified in the risk assessment, the prioritizations of hazards within Beaverhead County are as follows:
(Note that individual jurisdictions have their own prioritizations based on the hazards and vulnerabilities specific to their locations but are generally similar to that of the county.)

Table ES-1. Beaverhead County Hazard Prioritizations

Level	Hazard
High Hazard	Earthquake Flood Wildfire Severe Weather Utility and Energy Failure
Moderate Hazard	Disease and Environmental Contamination Hazardous Material Release Drought Urban Fire
Low Hazard	Terrorism and Civil Unrest Volcanic Ashfall Aircraft Accident Transportation Accident

The following goals are outlined in the plan's mitigation strategy, based on the results of the risk assessment:

- *Goal 1: Reduce risks from all hazards through comprehensive mitigation activities*
- *Goal 2: Reduce impacts from flooding*
- *Goal 3: Minimize risk of wildfire at the urban interface*
- *Goal 4: Reduce risk of hazardous material incidents*

- *Goal 5: Reduce risk of disease, environmental hazards, and terrorist acts*
- *Goal 6: Reduce impact of earthquakes*
- *Goal 7: Reduce impact of countywide weather hazards such as drought and winter weather*
- *Goal 8: Minimize impact of aircraft incidents*
- *Goal 9: Continue to emphasize preparedness, response, and recovery activities in all types of emergency management planning.*

Associated with each of the goals are objectives and mitigation actions ranging from adopting building codes to burying electric infrastructure to community education. The mitigation projects are prioritized based on cost, staff time, feasibility, population benefit, property benefit, values benefit, project maintenance, and the probability and impact of the hazards being mitigated. An implementation plan outlines the suggested course of action, given the limited resources available to Beaverhead County and the jurisdictions. The Beaverhead County Local Emergency Planning Committee is responsible for the implementation and maintenance of the plan. Other recommended activities, such as integrating this plan into a variety of county, city, and town plans, regulations, and documents, will further the goals of hazard mitigation in Beaverhead County.

The Beaverhead County Pre-Disaster Mitigation Plan exceeds the requirements of a local hazard mitigation plan as outlined in the Interim Final Rule published in the Federal Register on February 26, 2002, at Title 44 of the Code of Federal Regulations, Part 201 as part of the Disaster Mitigation Act of 2000. This plan has been approved by the Federal Emergency Management Agency as a hazard mitigation plan, and therefore, the county, city, and town may be eligible for federal mitigation funds. This plan serves as a guide for understanding the major hazards facing Beaverhead County and the jurisdictions and provides a strategy for preventing or reducing some of the impacts.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

1.0 INTRODUCTION

1.1 PURPOSE

Beaverhead County, the City of Dillon, and the Town of Lima recognize the hazards, both natural and human-caused, that threaten their communities. Rather than wait until disaster strikes, the jurisdictions can take proactive measures to prevent losses and lessen the impact from these hazards. Actions taken to reduce or eliminate the long-term risk from hazards are defined as mitigation. Disaster mitigation is an investment that can save lives and money.

The purpose of this Pre-Disaster Mitigation Plan ("the plan") is to:

- Promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural and human-caused hazards
- Serve as a consolidated, comprehensive source of hazard information
- Educate the communities, including government leaders and the public, on their vulnerabilities
- Fulfill federal, state, and local hazard mitigation planning responsibilities
- Prioritize and promote cost-effective mitigation solutions
- Support requests for grant funding
- Encourage long-term community sustainability.

Effective mitigation planning promotes a broader understanding of the hazards threatening the communities and provides a clearer vision and competitive edge for future mitigation grant funding. By integrating mitigation concepts into local thinking, the communities will find many more opportunities for disaster resistance beyond grant funding. For example, the consideration of disaster mitigation when designing subdivisions may include multiple access points or removal of drinking water wells from the floodplain that will provide greater disaster resistance, reduce future expenses and contribute to community sustainability.

The plan's intent is to assist the communities in making financial decisions for mitigation projects and clarify actions that could be taken through additional funding. Through an effective and inclusive planning process, communities will become more aware of their hazards and will take a proactive approach to disaster prevention and mitigation.

1.2 AUTHORITIES

The Disaster Mitigation Act (DMA) of 2000 amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding a new section, Section 322 – Mitigation Planning. The requirements of such are outlined in the Interim Final Rule published in the Federal Register on February 26, 2002 at 44 CFR Part 201, with some additional amendments. This legislation requires all local governments to have an approved hazard mitigation plan in place by November 1, 2004 to be eligible to receive Hazard Mitigation Grant Program (HMGP) and other types of disaster and mitigation funding.

Beaverhead County, the City of Dillon, and the Town of Lima have adopted this Pre-Disaster Mitigation Plan by resolution (see Appendix L for copies of the resolutions). These governing bodies have the authority to promote mitigation activities in their jurisdictions.

1.3 ACKNOWLEDGEMENTS

Many groups and individuals have contributed to development and updates of the Beaverhead County Pre- Disaster Mitigation Plan. The county Disaster and Emergency Services (DES) Coordinator, the Montana DES District Representative, the Montana State Hazard Mitigation Officer, and the Local Emergency Planning Committee provided significant guidance and support to all aspects of plan development and updates. The National Weather Service provided historic newspaper accounts of severe weather events and other weather data. Numerous elected officials, city, town, and county personnel, and the local communities participated in the planning process and contributed significantly to the plan's development and update.

1.4 COUNTY AND JURISDICTIONAL PROFILE

Beaverhead County is located in southwest Montana, as shown in Map 1.4A, with an area of approximately 5,542 square miles, the largest in the state. Beaverhead County, in comparison, is larger than the States of Rhode Island and Connecticut combined. Beaverhead County is bounded by Ravalli, Deer Lodge, and Silver Bow Counties on the north, Madison County on the east, and the State of Idaho on the south and west. The City of Dillon is the county seat and the Town of Lima is the only other incorporated community in Beaverhead County.

Map 1.4B shows the general features in the county. Three major rivers flow through the county. Each river runs through a very large mountainous valley. The Red Rock River originates in the southeast corner of the county and flows west to the Lima Reservoir, approximately 60 miles south of Dillon. The Red Rock River then flows northwest to Clark Canyon Reservoir, approximately 20 miles south of Dillon. At this point, the Beaverhead River begins. The Beaverhead River runs northeast to the Madison County line, approximately 15 miles northeast of Dillon. The third major river, the Big Hole, begins in the western half of the county. The Big Hole River runs in a northerly direction through the county until it hits the Deer Lodge County line. At this point, the river becomes the northern most border separating Beaverhead County from Deer Lodge and Silver Bow Counties.

Elevations in Beaverhead County range from 4,770 feet above mean sea level along the Big Hole River near the northeast border of the county to over 10,300 feet at Monument Peak along the Idaho border in the Beaverhead Mountains to 11,147 feet at Torrey Mountain and 11,157 feet at Tweety Mountain in the East Pioneer Mountains, northwest of Dillon. The landscape is very diverse in its makeup. Beaverhead County consists of upland glaciated plains that range from nearly level to steeply sloping and numerous steep rugged mountain ranges. These ranges are made up of large grass and sagebrush parks, high alpine meadows, and heavily timbered slopes. Lodgepole Pine, Douglas Fir, Ponderosa Pine, Limbar Pine, and Whitebark Pine are the predominate species of timber. Soil consistencies range from rich topsoil to clay and sand. The mountain ranges are made up of weathered shale, sandstone, and granite.

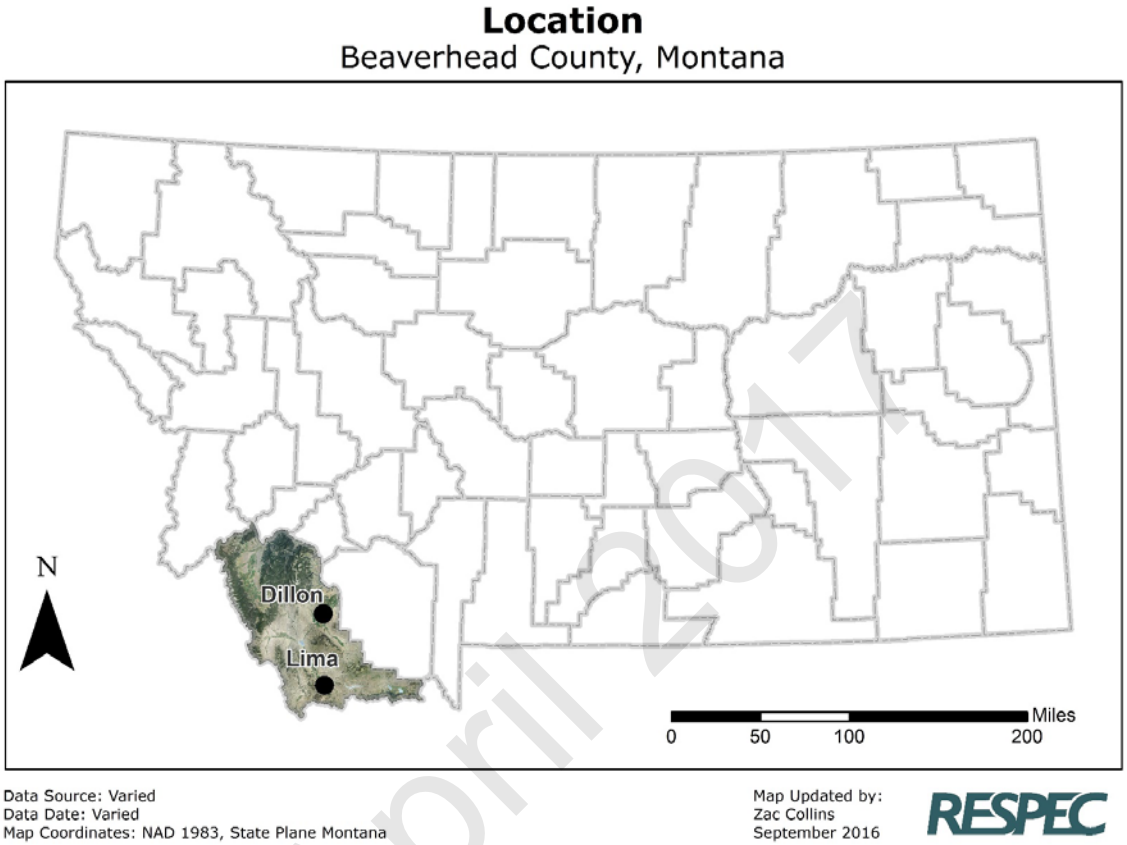

Figure 1-1. Map 1.4A.

Beaverhead County is located within the region generally classified as dry continental or Steppe with four distinct seasons. The weather in Beaverhead County is as diverse as the topography of the county with often large daily temperature variations, particularly from the fall to the spring. Days with severe winter cold and extreme summer heat are typical. Weather conditions can change rapidly and drastically because of the extreme elevation changes throughout the county. Valley temperatures average fairly consistently across the county.

Average high temperatures in January range from 34.4°F in Dillon to 22.4°F in Lakeview. The average lows are from 12.5°F in Dillon to –0.2°F in Lakeview. Temperatures often drop well below 0°F and can last for several days. In winter, temperatures often vary significantly from the averages. Temperatures below -50°F have been recorded, while typical extreme winter minimum temperatures are between -25°F and -35°F [Western Region Climate Data Center, 2016]. Extreme wind chill situations occur every winter when windy conditions coincide with very low temperatures. Extreme cold during the winter can cause ice jams and freezing of streams and rivers from the bottom up. This can cause severe flooding conditions. Rapid warm-ups during the winter and early spring can lead to significant snow melt and flooding of small streams and rivers and/or ice jam flood problems.

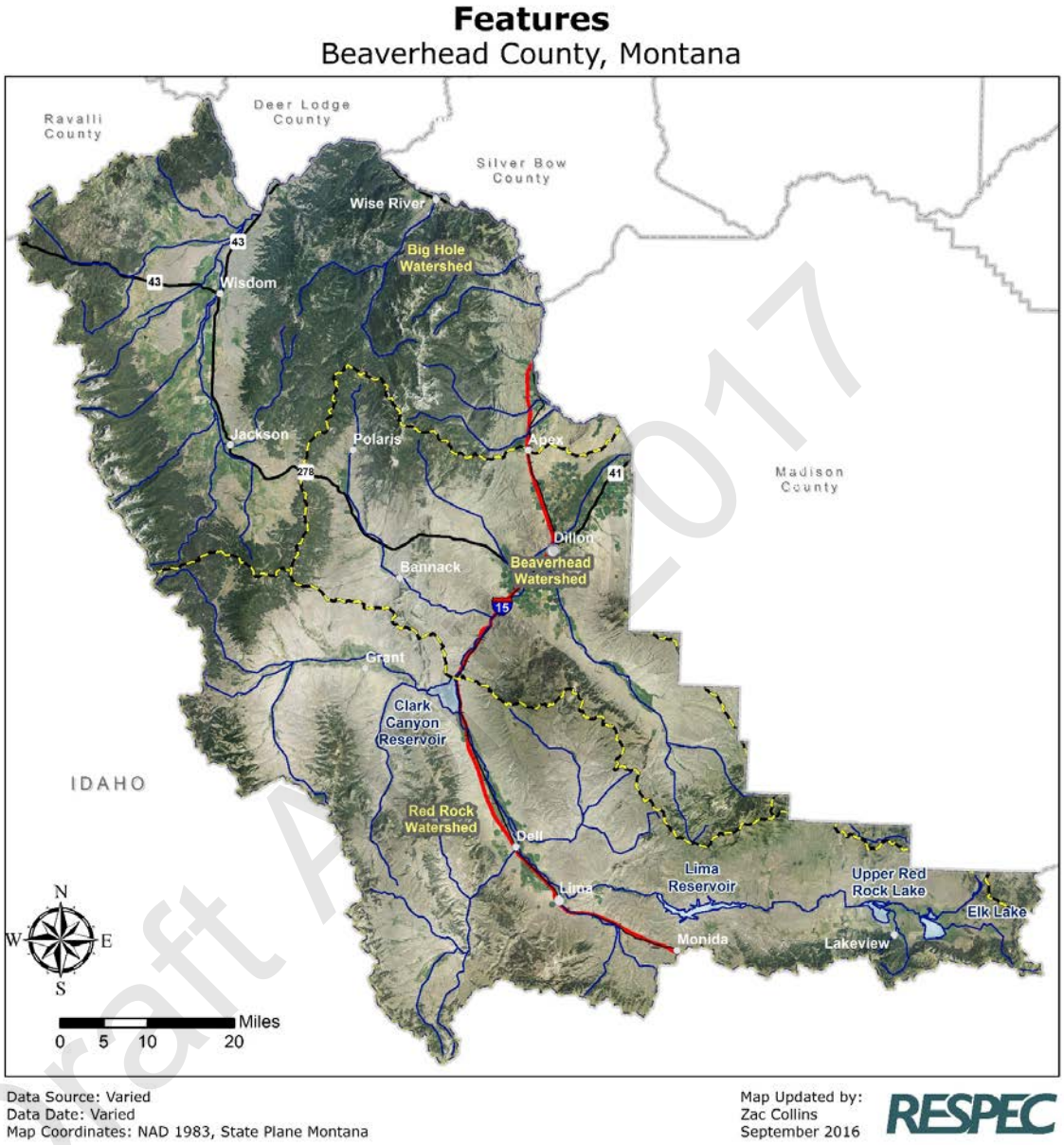

Figure 1-2. Map 1.4B.

Average high temperatures in July range from 83.3°F in Dillon to 76.7°F in Lakeview. The low averages are from 47.6°F in Dillon to 38.2°F in Wisdom. Averages are fairly uniform across the county at valley location, but again, can change and be quite different at higher elevations. Brief spells with temperatures above 100°F can occur but are often short lived. Temperatures above 101°F have been reported on occasion. extended periods with temperatures above 90°F occur every few years. Freezing temperatures can occur, but are rare in June, July, and August, particularly at sheltered valley locations [Western Region Climate Data Center, 2016].

Annual average precipitation ranges from 13.11 inches in Dillon to 19.76 inches in Lakeview. In Dillon, 61 percent of the precipitation falls from May through September. In other reporting areas of the county, the precipitation is fairly evenly distributed throughout the year. Precipitation can vary

significantly from year to year, and location to location within a given year. November through February are, on average, quite dry with average monthly precipitation of 0.55" or less [Western Region Climate Data Center, 2016]. Average annual precipitation does not vary significantly across the county. The heaviest, most intense precipitation often occurs with localized downpours associated with thunderstorms June through August. Significant flash flooding can result from these downpours with over 3 inches of precipitation reported in a few events. Widespread heavy precipitation events of 1 to 2 inches can occur every few years and is most common from April through June and September through early November.

Average winter snowfall ranges from 38.4 inches at Dillon to 100+ inches at higher mountainous elevations [Western Region Climate Data Center, 2016]. The heaviest snowstorms often occur from mid-October through December and late March through May. These storms can produce more than 12 inches of snow and often these storms are accompanied by high winds resulting in blizzard conditions. In spring, these storms can coincide with the calving season resulting in livestock loss. Mid-winter snowstorms generally produce less than 6 inches of snow in the lower elevations, but much heavier amounts in the high mountainous regions. Despite the generally lighter amounts and drier snow, high winds can result in blizzard conditions. Even without falling snow, in the colder conditions of mid-winter, high winds can pick up loose snow, resulting in local ground blizzards.

Severe thunderstorms are common from June into early September. Typically, the greatest hazards associated with these thunderstorms are very high winds, hail, and isolated flooding. Damage to structures and crops occur most every summer from these storms. Tornadoes have been reported, but are relatively rare.

Table 1.4C details the climate statistics recorded by the National Weather Service (NWS) at the Dillon weather station. Climate data from Wisdom (northern Beaverhead County), Lima (southern Beaverhead County), and Lakeview (southeastern Beaverhead County) show the variations in climate.

1.5 PLAN SCOPE AND ORGANIZATION

The scope of the Beaverhead County Pre-Disaster Mitigation Plan includes the following:

- Identify and prioritize disaster events that are most probable and destructive
- Identify critical facilities
- Identify areas within the community that are most vulnerable
- Develop goals for reducing the effects of a disaster event
- Develop specific projects to be implemented for each goal
- Develop procedures for monitoring progress and updating the plan
- Officially adopt the plan.

Table 1-1. Table 1.4C Beaverhead County Climate Statistics

	Dillon	Wisdom	Lima	Lakeview
	1895–2010	1948–2010	1898–2010	1948–2010
Monthly Temperature Average	43.8°F	35.5°F	39.3°F	35°F
Monthly Average Max Temperatures	57.9°F	51.3°F	53.5°F	48.8°F
Monthly Average Min Temperatures	29.7°F	19.7°F	21.5°F	21.3°F
All Time Monthly Average Extreme Max Temperatures	102°F	98°F	100°F	94°F
All Time Monthly Average Extreme Min Temperatures	–40°F	–55°F	–44°F	–49°F
Monthly Average Precipitation	13.3 in	11.92 in	10.77 in	19.5 in
Monthly Average Snowfall	14.6 in	55.7 in	54.6 in	97.1 in
Monthly Average Snowdepth	7 in	14 in	9 in	33 in
Average Number of Days Less than 32 Degrees F (50 Degrees for HI)	195 days	275 days	229 days	250 days
Average Number of Days Above 90 Degrees F (70 Degrees for AK)	9 days	2 days	4 days	0 days
Average Number of Days with Measurable Precipitation	79 days	108 days	72 days	91 days
Highest Annual Precipitation	24.43 inches	15.74 inches	17.17 inches	27.00 inches
	1915.00	1967.00	1993.00	1970.00
Lowest Annual Precipitation	5.76 inches	5.60 inches	6.00 inches	13.28 inches
	1966	1974	1974	1979
1 Day Maximum Precipitation	2.40 inches	1.70 inches	4.00 inches	2.75 inches
	3-Sep-01	8-Sep-70	25-Apr-01	12-Mar-71
Highest Annual Snowfall	104.2 inches	116.0 inches	131.0 inches	244.8 inches
	1903	1951	1982	1955
Highest Temperature Recorded	102°F	98°F	100°F	97°F
	12-Jul-02	25-Jul-33	31-Jul-01	2-Sep-42
Lowest Temperature Recorded	–40°F	–55°F	–44°F	–49°F
	9-Feb-33	23-Dec-83	18-Jan-43	22-Jan-62

Source: Western Regional Climate Center – Desert Research Institute – Reno, Nevada, 2016.

The Beaverhead County Pre-Disaster Mitigation Plan is organized into sections that describe the planning process (Section 2), assets and community inventory (Section 3), risk assessment/hazard profiles (Section 4), mitigation strategies (Section 5), and plan maintenance (Section 6). Appendices containing supporting information are included at the end of the plan.

This plan, particularly the risk assessment section, outlines each hazard in detail and how it may affect Beaverhead County, the City of Dillon, and the Town of Lima. The mitigation strategy outlines long-term solutions to possibly prevent or reduce future damages. Additional hazards may exist that were not apparent to local government or participants through the development of this plan, and certainly disasters can occur in unexpected ways. Although any and all hazards cannot be fully mitigated, hopefull, this plan will help the communities understand the hazards better and become more disaster resistant.

2.0 PLANNING PROFESS AND METHODOLOGIES??

Mitigation planning is a community effort. It also takes time and expertise. For Beaverhead County, the City of Dillon, and the Town of Lima, an effective hazard mitigation plan requires input from a variety of stakeholders, including elected officials, first responders, emergency management, healthcare providers, public works, road officials, state and federal agencies, businesses, non-profit organizations, academia, and the public. Following a disaster, many of these stakeholders will be overwhelmed with recovery responsibilities. Therefore, planning for mitigation and involving as many stakeholders as possible before a disaster strikes will make mitigation activities easier following a disaster and may even prevent the disaster in the first place!

2.1 INITIAL PLANNING PROCESS

Beaverhead County, working with Montana Disaster and Emergency Services, prepared the 2004 Pre-Disaster Mitigation Plan to help guide and focus hazard mitigation activities. Public participation played a key role in the development of goals and mitigation projects. Interviews were conducted by the Beaverhead County Disaster and Emergency Services (DES) Coordinator including with the mayors and elected officials. A public meeting was held to include the input of Beaverhead County residents. The first meetings and formulation of the plan began with the implementation of Project Impact in 1999 and continued with the 2000 Pre-Disaster Mitigation Plan.

The planning process was initiated by preparing a contact list of individuals whose input was needed to help develop the plan. On the county level, these persons included elected officials (county commissioners), Local Emergency Planning Committee members, and the County Road Superintendent. Mayors from the incorporated communities of Dillon and Lima were listed as well as the fire chiefs and public works directors. Federal and state agencies and utility companies on the contact list included the National Weather Service, US Army Corps of Engineers, NorthWestern Energy, Beaverhead-Deer Lodge National Forest, and Montana Department of Natural Resources and Conservation. Persons and entities on the contact list provided a variety of information during the planning process. They were provided with project maps and documents for review, meeting notifications, and mitigation strategy documentation.

Interviews were conducted with individuals and specialists from organizations interested in hazard mitigation planning. The interviews identified common concerns related to natural and human-caused hazards and identified key long- and short-term activities to reduce risk. Individuals interviewed for the plan included representatives from local governments, water providers, fire departments, insurance agents, Beaverhead Development Corporation, school officials, utility providers, and others.

Over the course of the project, numerous meetings were held with and briefings given to local officials and other stakeholders. At the plan's inception, the Beaverhead County DES Coordinator and the plan writer, toured the project area and met with commissioners, mayors, county health officials, and others. The overall project objectives were presented at these meetings and initial concerns and potential mitigation projects were discussed.

Public meetings were held in Dillon and Lima. The dates of these meetings extend back to March 1999. The purpose of the meetings was to gather information on historic disasters, update the list of critical facilities, and gather ideas from citizens about mitigation planning and priorities for mitigation goals. In advance of the public meetings, a press release was distributed to the local newspaper, the Dillon Tribune. The local radio station, KDBM AM/KBEV FM Dillon, received a copy of the press release as a public service announcement. Notices of the public meetings were sent in advance to all jurisdictions participating in the planning process, including Dillon and Lima and all communities within the county. Reporters were invited to attend and participate in public meetings, and follow-up articles on the plan appeared in the local newspaper.

The Beaverhead County Commissioners' meetings, Dillon City Council meetings, and Lima Town Council meetings provided the public with an opportunity to express their opinions and offer insight toward the final version of the plan. Drafts of the plan were distributed throughout the project area in order to provide for public review before the public meeting. Plan reviewers included county commissioners, mayors of the various jurisdictions, city council members, Local Emergency Planning Committee members, representatives of the local utility companies, and other local officials. Plan copies were made available for public review. A comment period was provided. Public comments and suggestions were noted and corrections to the plan were completed as needed. At the final commission and council meetings, the formal adoption of the plan took place and the public was given an opportunity to comment on the final version of the plan. All of the meetings were open to the public and advertised through the communities' typical processes for publicizing public meetings.

A review of the plan for completeness was conducted. Plan copies were submitted to the Montana DES Hazard Mitigation Officer and the Federal Emergency Management Agency for review. Upon receipt of comments, the plan was finalized and taken to the County Commissioners and jurisdictions for adoption.

2.2 PLAN UPDATE PROCESS 2016

Approaching the required 5-year plan update, Beaverhead County (through Madison County) applied for and received a Pre-Disaster Mitigation (PDM) grant to update its plan in 2015. With the funding, a consultant was hired to facilitate the plan update for Beaverhead County and Madison County. Respec based in Bozeman, Montana with experience in hazard mitigation and emergency management, coordinated the planning process in partnership with the county, city, and town. The contract was managed by Madison County for the two county area with the Beaverhead County Disaster and Emergency Services Coordinator acting as the key point-of-contact for the county.

The 2016 Plan update builds on the original 2004 plan and the updated 2009 plan with revised data for each of the defined risks and a updated and reprioritized list of goals and actions for each of these risks. These risks were discussed by Local Emergency Planning Committee (LEPC) as well as the local DES coordinator Tom Wagenknecht. Hazus 3.1 as well as other GIS data was used to provide updated maps as well as data,

The plan update process consisted of the following basic steps:

1. An initial review of the existing plan was conducted by the contractor.

2. A proposed outline for the updated plan was developed.
3. An initial public meeting was held to solicit comment on the existing plan during a LEPC meeting and to discuss what changes and accomplishments have taken place in the county and the jurisdictions over the past 5 years, as well as to brainstorm ideas (new hazards, mitigation strategies) for the updated version.
4. Sections related to the Assets and Community Inventory and Risk Assessment were updated.
5. Stakeholders were given the opportunity to review the updated draft sections and were asked to provide comments, including any new ideas for the mitigation strategy.
6. The Mitigation Strategy and remaining sections were updated.
7. Stakeholders were asked to review the draft plan and provide comments.
8. Public meetings (advertised through invitations, press releases, and a newspaper ad) were held in each of the jurisdictions to update the community on the newly revised plan to solicit comments on the update.
9. Following the public comment period, any comments received were incorporated and the final plan was sent to the state and FEMA fro review.
10. Jurisdictions adopted the updated plan, either before or immediately after state and FEMA conditional approval.

2.2.1 COMMUNITY CHANGES

A driving force in updating this type of plan is the changes that have occurred in the community over the past five years. Beaverhead County has not seen many changes, but perhaps the biggest change in Beaverhead County has been some residential and commercial growth. In 2016 the county Planning Board reviewed only two minor subdivisions that formed four residential lots. This has continued the slowdown in subdivision activity that has been on the down turn in the last five years. Also in 2016 the local floodplain administration was started and four applications for floodplain permits were submitted as well as four floodplain determination reviews.

A few relatively minor disasters have occurred in the county over the past five years, but nothing that has led to big changes in communities or policies.

2.2.2 PLAN CHANGES

Another driving force in updating the plan was the requirements of these plans provided by the federal government. In order to continue to comply with federal requirements, additions and changes to the plan needed to be made. These types of changes were proposed and made by the contractor and reviewed by the communities. Other changes were proposed by community members and made where applicable. Data, methods, and information used in the initial plan were reviewed by the contractor and changes were made if updated information existed. Other items, such as mitigation actions and plan maintenance procedures, were reviewed by local individuals and changes were made as needed. A greater emphasis was placed on hazard mitigation as well as a more in-depth look at drought as a hazard.

The 5-year update of the plan featured updates to all sections to improve readability, usability, and methodologies. Specifically, the following major changes were part of the plan's update:

- Update of the executive summary
- The planning process was updated to include the 5-year revision
- Few hazards were identified, others were modified, and one was removed
- Updated Geographic Information System (GIS) mapping was added
- Sections specific to critical facilities and infrastructure, the population, structures and economic, ecologic, historic, and social values were added
- Evaluations of current land use, new development, and future development were added and update.
- Ranking of hazards was updated based on evaluated risk and probability
- Mitigation goals and strategies continued to be focused on mitigation and less on preparedness and response
- New mitigation strategies and concepts were added, and those completed or no longer relevant were removed
- The projects were more specifically prioritized based on estimated costs and benefits
- New appendices were added as needed.

2.2.3 JURISDICTION PARTICIPATION

This plan includes the following jurisdictions:

- Beaverhead County
- City of Dillon
- Town of Lima.

Note: The jurisdictions listed above are all of the incorporated jurisdictions in Beaverhead County. Other communities such as Dell, Glen, Grant, Jackson, Lakeview, Monida, Polaris, Wisdom, and Wise River are not incorporated nor do they have governing bodies. They are under the jurisdiction of Beaverhead County.

Each jurisdiction participated in a variety of ways depending on the resources available in the community. Representatives from several county offices were active in all aspects of the plan's update. Dillon and Lima participated in the plan's update by sending representatives to public meetings, discussing elements of the plan at the public meetings and with the contractor, providing information and comments to the contractor when requested, hosting public meetings, and reviewing the draft plan. All of the jurisdictions adopted the plan through resolution upon completion.

2.2.4 PUBLIC PARTICIPATION

The public was provided with several opportunities to participate in the plan's update. Public meetings were held in November 2015, October, 2016and xxxxx.

The Beaverhead County Pre-Disaster Mitigation Plan is a living, expandable document that will have new information added and changes made as needed. The plan's purpose is to improve disaster resistance through projects and programs, and therefore, opportunities for changes and public involvement will exist as disasters occur and mitigation continues. Details on the plan's maintenance and continued public involvement are further outlined in Section 6.

2.3 RISK ASSESSMENT METHODOLOGIES

A key step in preventing disaster losses in Beaverhead County and the incorporated jurisdictions is developing a comprehensive understanding of the hazards that pose risks to the communities. The following terms can be found throughout this plan.

Hazard:	a source of danger
Risk:	possibility of loss or injury
Vulnerability:	open to attack or damage

Source: Federal Emergency Management Agency, 2001.

A risk assessment was conducted to address requirements of the Disaster and Mitigation Act of 2000 [DMA, 2000] for evaluating the risk to the community of the highest priority hazards. DMA 2000 requires measuring potential losses to critical facilities and property resulting from natural hazards by assessing the vulnerability of buildings and critical infrastructure to natural hazards. In addition to the requirements of DMA 2000, the risk assessment approach taken in this plan evaluates risks to the population and other values and also examines the risk presented by human-caused hazards. The goal of the risk assessment process is to determine which hazards present the greatest risk and what areas are cumulatively the most vulnerable to hazards.

The hazard risk assessment requires information about what hazards have historically impacted the community and what hazards may present risks in the future. Identifying historical and possible future hazards was primarily accomplished in two phases. The first phase entailed interviewing local government officials and staff, local emergency planning and response staff, and the general public. The second phase entailed researching government records, news publications, and online databases for records of previous hazard events. The results of the initial hazard evaluation were used to formulate a risk assessment of hazards according to those that have historically caused the most problems and those judged as future concerns.

The risk assessment approach used for the Beaverhead County Pre-Disaster Mitigation Plan entailed using Geographic Information System (GIS) software and statistical data to develop vulnerability maps for people, structures, and critical facilities. This type of approach to risk assessment is dependent on the detail and accuracy of the data used during the analysis. Additionally, some types of hazards are extremely difficult to model. The schedule and resources available for conducting this risk assessment dictated that existing data be used to perform the assessment. The existing information available is extensive but also has many limitations. Results of the risk assessment allow hazards to be compared and relative comparisons to be made of areas within the jurisdiction.

This all-hazard risk assessment and mitigation strategy serves as an initial source of hazard information for those in Beaverhead County. Other plans may be referenced and remain vital hazard documents,

but each hazard has its own profile in this plan. As more data becomes available and disasters occur, the individual hazard profiles and mitigation strategies can be expanded or new hazards added. This risk assessment identifies and describes the hazards that most threaten the communities and determines the values at risk from those hazards. The risk assessment is the cornerstone of the mitigation strategy and provides the basis for many of the mitigation goals, objectives, and potential projects.

The *assets and community inventory* section includes elements such as critical facilities, critical infrastructure, population, structures, economic values, ecologic values, historic values, social values, current land uses, new development, and future development potential. The list of critical facilities and infrastructure were carried over from the 2004 plan version. Additional elements were included during the plan update based on contractor research.

Each hazard or group of related hazards has its own *hazard profile*. A stand-alone hazard profile allows for the comprehensive analysis of each hazard from many different aspects. Each hazard profile contains a *description* of the hazard containing information from specific hazard experts and a record of the hazard *history* compiled from a wide variety of databases and sources. Available documentation of historic hazards is directly related to their occurrence near populated areas. An extensive search was conducted for hazard data on Beaverhead County, but because of the rural nature of the county, in some instances, little information exists. The lack of data does not mean there is a lack of hazards or risk from hazards in Beaverhead County. The hazard information used in the plan is what was available and data specific to the Beaverhead County. The databases used to compile the information are more detailed and accurate than that found in the Spatial Hazard Events and Losses Database for the United States (SHELDUS) database.

Using the local historical occurrence, or more specific documentation if available, a *probability* was determined. In most cases, the number of years recorded was divided by the number of occurrences, resulting in a simple past-determined recurrence interval. If the hazard lacked a definitive historical record, the probability was assessed qualitatively based on regional history or other contributing factors. The *magnitude* or extent of the hazard describes a realistic approximation of the worst case scenario. This qualitative approximation is based on past occurrences in the county or in nearby counties. If the past occurrence was not an accurate representation, general knowledge of the hazard was used to approximate the types of impacts that could be expected from a low-frequency, high magnitude event of that hazard.

Mapping of the hazards, where spatial differences exist, allows for hazard analyses by geographic location. Some hazards, such as riverine flooding, can have varying levels of risk based on location (i.e. near the river versus far away from the river). Other hazards, such as winter storms or drought, cover larger geographic areas and the delineation of hazard areas is not typically available or useful on the county scale.

C*ritical facilities* were mapped using data provided by Beaverhead County. The mapping of the facilities allowed for the comparison of building locations to the hazard areas where such hazards are spatially recognized. Base maps depicting the critical facility locations were compared to available hazard layers to show the proximity of the facilities to the hazard areas. Given the nature of critical facilities, the

functional losses and costs for alternate arrangements typically extend beyond the structural and contents losses. These types of losses can be inferred based on the use and function of the facility.

Critical infrastructure for services such as electricity, heating fuels, telephone, water, sewer, and transportation systems was assessed in a narrative format using history and a general understanding of such systems to determine what infrastructure losses may occur. Basic mapping exists of the networks in the county. These layers were additionally compared to the hazard areas. Most of the other types of infrastructure do not have digital mapping or were withheld by the managing company for security reasons.

Structures were mapped and analyzed in a way similar to that of the critical facilities. Data showing the locations of most structures countywide, with the exception of Dillon and Lima, was provided by Beaverhead County. Montana Department of Revenue Computer Assisted Mass Appraisal System (CAMA) data was used for approximate structure locations in Dillon and Lima. This data contains the taxable building value of each parcel in the county. Those parcels with a taxable building value greater than zero were assumed to have a structure. This GIS mapping allowed for the comparison of building locations to the mapped hazard areas. Using this technique, an approximate number of structures in the various hazard areas can be determined. The number of estimated structures in a hazard area was multiplied by the median building value to derive an approximate total building exposure value. For some hazards, the total dollar exposure was multiplied by a damage factor since many hazard events will not result in a complete loss of all structures. These estimates are general in nature, and therefore, should only be used for planning purposes. The approximations, however, are based on current hazard and exposure data. HAZUS-MH, a loss estimation software program developed by the Federal Emergency Management Agency (FEMA), approximated losses from earthquakes and floods to structures. Where GIS mapping was unavailable or not useful, estimations and plausible scenarios were used to quantify potential structure losses.

Population impacts were qualitatively assessed based on the number of structures estimated to be in the hazard area. Given 3,844 estimated structures in the county (based on the CAMA parcels with a building value greater than zero) and a 2007 US Census county estimated population of 8,804, an estimate of 2.3 people per structure was derived. Depending on the time of year, population concentrations are likely much greater due to non-resident populations. Other factors used in evaluating the population impacts include the ability of people to escape from the incident without casualty and the degree of warning that could be expected for the event. In general, the loss of life and possible injuries are difficult to determine and depend on the time of day, day of the week, time of year, extent of the damage, and other hazard specific conditions.

Qualitative methodologies, such as comparisons to previous disasters, occurrences in nearby communities, and plausible scenarios, helped determine the potential losses to *economic, ecologic, historic, and social values*. In many cases, a dollar figure cannot be placed on values, particularly those that cannot be replaced. Therefore, these types of losses were quantified through narrative descriptions and provide some background on what may occur during a disaster.

The assessment on the impact to *future development* is based on the mechanisms currently in place to limit or regulate development in hazardous areas. Some hazards can be mitigated during development,

others cannot. The impacts were assessed through a narrative on how future development could be impacted by the hazard based on current regulations.

Many unknown variables limit the ability to quantitatively assess all aspects of a hazard with high accuracy. Therefore, *data limitations* provide a framework for identifying the missing or variable information. These limitations were determined by hazard through the risk assessment process. In some cases, the limitations may be resolved through research or data collection. If a limitation can be reasonably resolved through a mitigation project, the resolution is included as a potential action in the mitigation strategy. Other factors were determined based on an evaluation of past events and a general understanding of the hazard characteristics. This basic listing of secondary hazards provides a link between the hazard profiles and identifies additional hazards that may compound the impacts of the primary event (i.e. poor air quality because of smoke during a wildland fire).

At the end of the risk assessment, the *summary* brings together data from each of the hazards to show comparisons and ultimately rank the hazards by jurisdiction. The overall hazard rating is determined using qualitative rankings of the probability of future occurrences and likely impacts when compared to other hazards.

Because of the inherent errors possible in any disaster risk assessment, the results of the risk assessment should only be used for planning purposes and in developing projects to mitigate potential losses.

2.4 HAZARD IDENTIFICATION

Hazards are continuously being identified and modified to reflect the needs of the communities. In 2004, fifteen hazards were identified and analyzed. The hazards most likely to affect Beaverhead County were derived from a number of sources. Hazard information was compiled by examining data from local, state, and federal agencies, including Montana Disaster and Emergency Services, the Federal Emergency Management Agency, the US Coast Guard, and the National Weather Service. Data was also acquired through review of historical newspaper articles and interviewing local experts. Most importantly, the residents of Beaverhead County voiced their opinions on what hazards had affected their lives and their communities during the public meetings.

In 2016, the hazards included were reconsidered and modified. Thunderstorms and hail, high winds and tornadoes, and winter storms hazards were combined into one severe weather hazard. The public health hazard was expanded and renamed the disease and environmental contamination hazard. The mass sheltering hazard was removed since it is not a hazard but rather a consequence of a hazard. A volcanic ash fall hazard was added.

Table 2.4A shows the hazards, jurisdictions, and how and why they were identified. The level of detail for each hazard correlates to the relative risk of each hazard and is limited by the amount of data available. As new hazards are identified, they can be added to the hazard list, profiled, and mitigated.

Table 2-1. Table 2.4A Beaverhead County Hazards for All Jurisdictions (Page 1 of 2)

Hazard Profile	How Identified	Why Identified
Aircraft Accident	National Transportation Safety Board	History of small aircraft accidents Potential for larger aircraft accidents causing mass casualties
Disease and Environmental Contamination (including human, animal, and plant diseases)	Centers for Disease Control and Prevention Montana Department of Live Stock Pandemic studies US Department of Agriculture World Health Organization	Global disease threat History of pandemics Dependence on agricultural economy Potential for significant environmental contamination
Drought	National Drought Mitigation Center National Climatic Data Center National Weather Service US Department of Agriculture	History of droughts Importance of agriculture to the local economy Numerous USDA disaster declarations Local Watershed committees interest
Earthquake	US Geological Survey Montana Bureau of Mines and Geology HAZUS-MH National Earthquake Hazards Reduction Program	History of strong earthquakes, including damages Faults located throughout the county
Flood (including riverine, flash, ice jam, and urban floods and dam failure)	National Climatic Data Center HAZUS-MH National Weather Service US Army Corps of Engineers Federal Emergency Management Agency (FEMA) US Geological Survey	History of riverine, ice jam, and flash floods Several dams throughout the county, including high hazard dams
Hazardous Material Release	US Department of Transportation Emergency Response Guidebook National Response Center Environmental Protection Agency	Regular railroad and truck traffic transport goods through the county
Severe Weather (including tornadoes, hail, downbursts, lightning, strong winds, blizzards, heavy snow, ice storms, and extreme cold	National Climatic Data Center Storm Prediction Center National Weather Service	History of tornadoes, severe thunderstorms, and strong winds, including damages History of severe winter storms

Table 2-1. Table 2.4A Beaverhead County Hazards for All Jurisdictions (Page 2 of 2)

Hazard Profile	How Identified	Why Identified
Terrorism and Civil Unrest	Federal Bureau of Investigation Memorial for the Prevention of Terrorism Southern Poverty Law Center	National indications and foreign threats of future terrorist attacks Potential for school violence and other domestic attacks National growth of Active shooter incidents
Transportation Accident (including railroad and motor vehicle accidents)	Montana Highway Patrol Federal Railroad Administration	History of small transportation accidents Potential for larger transportation accidents causing mass casualties
Urban Fire	US Fire Administration	History of structure fires throughout the county Potential for a large downtown fire with significant losses
Utility and Energy Failure	Community input	Potential for long term utility outages that threaten health and safety
Volcanic Ashfall	US Geological Survey Cascades Volcano Observatory	History of volcanic ashfall Proximity to active geologic areas
Wildfire	Beaverhead County Community Wildfire Protection Plan Montana Department of Natural Resources and Conservation US Forest Service Farm Service Agency	Local history of large wildfires Government lands and Conservation Reserve Program lands within the county Numerous areas of wildland urban interface

3.0 ASSETS AND COMMUNITY INVENTORY

In addition to identifying and understanding the hazards of the area, an important aspect of mitigation planning is contemplating the effects such hazards may have on the communities. To thoroughly consider the effects, the assets and values at risk must be identified. Examples of community assets include the population, critical facilities, businesses, residences, critical infrastructure, and natural resources, historic places, and the economy. The following sections identify the specific assets and community inventory.

3.1 CRITICAL FACILITIES AND INFRASTRUCTURE

Critical facilities and infrastructure protect the safety of the population, the continuity of government, or the values of the community. In many cases, critical facilities fulfill important public safety, emergency response, and/or disaster recovery functions. In other cases, the critical facility may protect a vulnerable population, such as a school or elder care facility. Examples of critical facilities include: 911 emergency call centers, emergency operations centers, police and fire stations, public works facilities, sewer and water facilities, hospitals, jails, schools, essential businesses, shelters, and public services buildings.

Utilities such as electricity, heating fuel, telephone, water, and sewer rely on established infrastructure to provide services. The providers of these services use a variety of systems to ensure consistent service in the county. Each of these services is important to daily life in Beaverhead County, and in some cases, is critical to the protection of life and property. The transportation network is another example of important infrastructure and relies on bridges and road/rail segments.

Critical facilities and infrastructure were initially identified throughout the planning process for the 2004 and 2009 plans and then reviewed and updated in 2016.

3.1.1 ELECTRICITY

Electricity runs lights, computers, medical equipment, water pumps, heating system fans, refrigerators, freezers, televisions, and many other types of equipment. Electric providers in Beaverhead County include Vigilante Electric Cooperative, headquartered in Dillon, and NorthWestern Energy, headquartered in Sioux Falls, SD. Much of the electric service is run through overhead lines. These lines are supported by poles and have key components such as transformers and substations.

3.1.2 HEATING FUEL

During the cold winter months, the heating of homes and businesses is a necessity. The primary heating fuel used in the Dillon area is natural gas, where available. Rural areas, such as the Town of Lima, rely more on propane, electricity, and wood. Overall, a variety of fuels are used as shown in Table 3.1J. Most systems ultimately require electricity to run their thermostats and blowers.

3.1.3 CRITICAL FACILITIES

Table 3-1. Critical Facilities (Page 1 of 2)

Community	Name	Address	Community	Name	Address
Dillon	Barrett Hospital, Clinic, and Ambulance	90 Highway 91 South	Lima	Lima City Hall/Fire Station/Emergency Response Unit	5 Section Corner St
Dillon	Beaverhead County Airport	2400 Airport Rd	Lima	Lima High School/Grade School	1 N Harrison St
Dillon	Beaverhead County Courthouse/Law Enforcement Annex	10 N Pacific St	Lima	Lima Water Treatment Facility, Spring, and Intake	251 Springhill Rd
Dillon	Beaverhead County Health Department	41 Barrett St	Lima	Montana Department of Transportation	200 Reeder Rd
Dillon	Beaverhead County High School	104 N Pacific St	Lima	US Post Office	19 W Peat St
Dillon	Beaverhead County Landfill	3801 Ten Mile Rd	Glen	Reichle Grade School	6715 Schoolhouse Rd
Dillon	Beaverhead County Museum	15 S Montana St	Glen	US Post Office	20028 Highway 91 N
Dillon	Beaverhead County Road Department	613 S Rife St	Grant	Grant Grade School	12420 Highway 324
Dillon	Beaverhead County Search and Rescue	1116 Highway 41	Grant	Grant Volunteer Fire Department/Emergency Response Unit	170 Valley St
Dillon	Bicentennial Apartments Retirement Homes	76 W Center St	Jackson	Jackson Grade School	415 Jardine Ave
Dillon	Brookside Village Apartments Retirement Homes	100 W Glendale St	Jackson	Jackson Sewage Treatment Facility	410 Jardine Ave
Dillon	Dillon City Hall	125 N Idaho St	Jackson	Jackson Volunteer Fire Department/Emergency Response Unit	207 Spring St
Dillon	Dillon Middle School	14 Cotton Dr			
Dillon	Dillon Sewage Treatment Facility	100 Lagoon Ln	Jackson	US Post Office	200 Jardine Ave
Dillon	Dillon Volunteer Fire Department	405 N Idaho St	Polaris	Grasshopper Valley Volunteer Fire Department	9753 Pioneer Mountains Scenic
Dillon	Dillon Water Treatment Plant	2400 Ten Mile Rd	Polaris	Polaris Emergency Response Unit	By-way
Dillon	KDBM/KBEV Radio	610 N Montana St	Polaris	Polaris Grade School	4210 Pioneer Mountains Scenic By-way
Dillon	Library	121 S Idaho St			

Table 3-1. Critical Facilities (Page 2 of 2)

Community	Name	Address	Community	Name	Address
Dillon	Mary Innes School	225 E Reeder St	Polaris	US Post Office	96 Billings Creek Rd
Dillon	Montana Department of Natural Resources and Conservation	730 N Montana St	Wisdom	Montana Department of Transportation	58791 Highway 278
Dillon	Montana Department of Transportation	3577 Highway 91 N	Wisdom	Southern Montana Telephone Company	
Dillon	Montana Fish, Wildlife and Parks	730 N Montana St	Wisdom	US Post Office	306 County Rd
Dillon	Montana National Guard Armory	1070 Highway 41	Wisdom	US Forest Service Ranger District Office	
Dillon	NorthWestern Energy Building	90 S Atlantic St	Wisdom	Wisdom Community Center	411 County Rd
Dillon	Parkview Acres Nursing Home	200 N Oregon St	Wisdom	Wisdom Grade School	408 Elm St
Dillon	Parkview North Elementary School	32 Cotton Dr	Wisdom	Wisdom Sewage Treatment Facility	665 Steel Creek Rd
Dillon	Renaissance Assisted Living Residence	1025 E Center St	Wisdom	Wisdom Volunteer Fire Department/Emergency Response Unit	224 N Main St
Dillon	University of Montana – Western	710 S Atlantic St	Wise River	US Forest Service Ranger District Office	
Dillon	US Bureau of Land Management	1005 Selway Dr	Wise River	US Post Office	65211 Highway 43
Dillon	US Forest Service	420 Barrett St	Wise River	Wise River Community Center	65240 Highway 43
Dillon	US Post Office	117 S Idaho St	Wise River	Wise River Grade School	175 Swamp Creek Rd
Dillon	Vigilante Electric Company	225 East Bannack St	Wise River	Wise River Volunteer Fire Department/Emergency Response Unit	64845 Highway 43

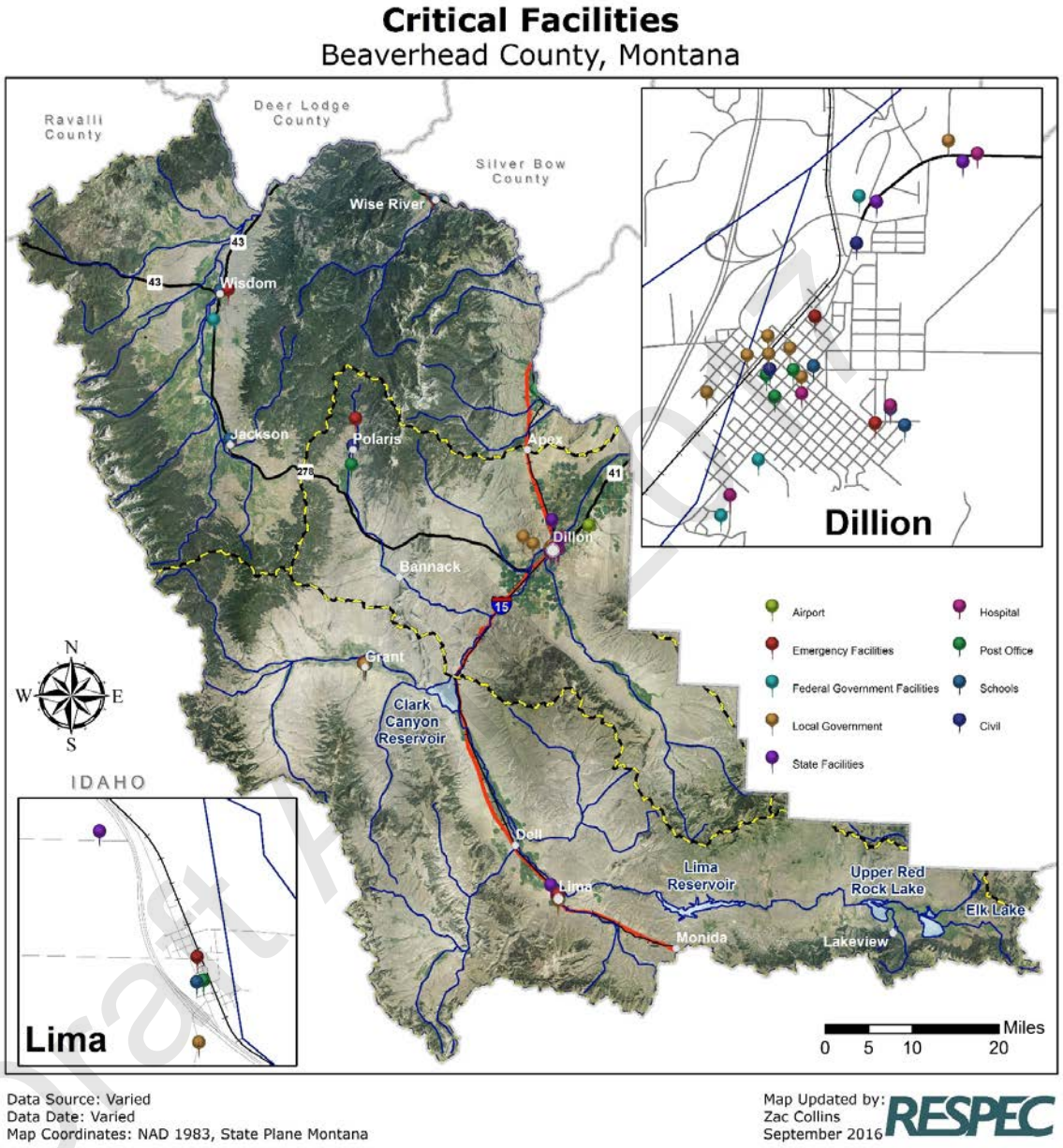

Figure 3-1. Map 3.1.

Natural gas in the area is provided by NorthWestern Energy through underground pipeline infrastructure. Buildings heated with propane and fuel oil typically have a nearby tank that is refilled regularly by a local vendor. The vendor uses a truck to transport the propane/oil to the users. Therefore, the vendors rely on accessibility to the communities and rural residents via the road network. Should any areas become isolated due to poor road conditions, the vendor may not be able to access the tanks to refill them.

Table 3-2. Table 3.1J US Census Housing Data on House Heating Fuel

	Beaverhead County (Total)	City of Dillon	Town of Lima
Occupied housing units	4,124	1,757	112
Utility gas	1,660	1,046	0
Bottled, tank, or LP gas	440	9	24
Electric	1,269	588	12
Fuel oil, kerosene, etc.	39	0	9
Coal or coke	9	9	0
Wood	646	95	67
Solar energy	6	0	0
Other fuel	44	0	0

Source: US Census Bureau, 2010–2014 American Community Survey 5-Year Estimates

3.1.4 TELEPHONE

Local telephone services in the county are provided by Southern Montana Telephone Co., based in Wisdom, and 3 Rivers Communications, based in Fairfield. Similar to electric infrastructure, telephone can be run through overhead or underground lines. Much of the telephone infrastructure in Beaverhead County lies within the road right-of-ways.

3.1.5 WATER AND SEWER

Municipal water and sewer systems exist within Dillon and Lima and in the unincorporated communities of Jackson and Wisdom. The water systems typically consist of groundwater wells or pumps from a body of water. The sewer systems generally have treatment plants and/or lagoons. Both water and sewer use underground pipes to service customers. County residents outside of the water and sewer districts rely on individual well and septic systems.

3.1.6 TRANSPORTATION

The transportation infrastructure within Beaverhead County includes the road, rail, and air networks. The primary road transportation routes in Beaverhead County are Interstate 15 and Highways 41, 43, and 278. The county also has a number of county highways and roads connecting the small, unincorporated communities of Lakeview, Monida, Dell, Grant, Polaris, Glen, Jackson, Wisdom, Wise River, and Dewey. Beaverhead County has approximately 1,450 miles of county roads, 90 miles of interstate, and 94 miles of state highway. The City of Dillon has approximately 29 miles of street and the Town of Lima has approximately 6 miles.

Union Pacific railroad operates a main line through the county, generally along Interstate 15. The railroad transports goods and raw materials along this line several times per day.

Beaverhead County has several small airports serving private, charter, and/or government aircraft in Dillon (DLN), Dell (4U9), Wisdom (7S4), and Wise River (02T). The Dillon airport is a full service, fixed base operator (FBO) airport with 100LL and Jet A fuels available. The airport has two paved and lighted

landing strips, one which is 75 feet in width by 6,500 feet in length and the other 65 feet in width by 3,600 feet in length. The airport in Dell is state-owned and has a paved and lighted 7,000-foot landing strip. The closest commercial service airports are in Butte and Bozeman. Commercial aircraft fly over the county continuously every day. Scott Air Force Base also frequently performs practice missions and tactical flights over the Big Hole, Grasshopper, and Centennial Valleys.

3.2 POPULATION AND STRUCTURES

The citizens, visitors, and their property are at all risk from various disasters. In essentially all incidents, the top priority is the protection of life and property.

Table 3-3. Table 3.2A Population Statistics

Location	Estimated Population 7/1/2015	2010 Census	2000 Census	Change Since 2010 Census
Beaverhead County (TOTAL)	9,300	9,246	9,202	+54
City of Dillon	4,210	4,134	3,752	+76
Town of Lima	222	221	242	+1

Source: US Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.

Like critical facilities, structures such as residences and businesses are also vulnerable to hazards. The following tables detail some of the housing statistics.

Table 3-4. Table 3.2B Housing and Business Census Data

	Beaverhead County (Total)	+/- Since 2009	City of Dillon	+/- Since 2009	Town of Lima	+/- Since 2009
Number of Housing Units	5,273	702	1,917	86	183	25
Median Value of Specified Owner-Occupied Housing Units	$172,800	$83,600	$144,500	$62,800	$96,100	$31,400
Number of Mobile Homes	809	–17	281	62	32	0
Lacking Complete Plumbing Facilities	5	–45	0	–33	0	–4
Lacking Complete Kitchen Facilities	3	–48	0	–19	0	–4

Source: US Census Bureau, 2010–2014 American Community Survey 5-Year Estimates

The total value of residential structures in Beaverhead County can be estimated using a number of different methods as shown in Table 3.2D. Census values were estimated by multiplying the number of housing units (5,273 units) by the median unit value ($172,800). Data from the Montana Department of Revenue ORION data base accessed with the State Library Cadastral data set can also be used to show the estimated building value. This database lists for each parcel of land the associated taxable land and building market values. The Cadastral data for Beaverhead County has 4,383 parcels listed with a building value greater than zero. Table 3.2D contains the sum of the building values listed in Montana State Library Cadastral data set. In comparison, the Federal Emergency Management Agency's HAZUS-

MH loss estimation software gives the building stock in Beaverhead County a replacement value of $766 million for 4,338 buildings. The HAZUS-MH Value is thought to be the average for the estimated value of the residential structures.

Table 3-5. Table 3.2D Estimated Value of Residential Structures

Jurisdiction	Census Estimated Value	State Library Cadastral Estimated Building Value	HAZUS-MH Building Replacement Value
Beaverhead County, total	$911,174,400	$653,390,559	$766,329,000
City of Dillon	$277,006,500	$469,896,465	not applicable
Town of Lima	$17,586,300	$24,085,015	not applicable

Sources: US Census Bureau, 2010–2014 American Community Survey 5-Year Estimates, 2015; Montana State Library, 2016.

HAZUS-MH 2016.

3.3 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

According to the 2000 US Census, Beaverhead County has 26.0 percent of its working population in occupations related to education, health, and social services. Agriculture is the next highest vocational area and accounts for 19.3 percent of the working class. The third largest group of occupations is related to recreation, entertainment, accommodations, and services. These make up 10.3 percent of the working population.

As the top cattle-producing county in Montana, Beaverhead County's economy is largely driven by agriculture. Mining is another significant industry with one of the world's largest talc mines located in Beaverhead County; gold and precious gemstones are also mined. Dillon is an economic center for the region and is home to the University of Montana – Western Campus. [U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates, 2015]

Disasters of any magnitude can threaten the fragile economies and well-being of residents. Some basic economic statistics follow:

- Median household income (2014): $42,577
- Persons below poverty (2014): 15.3 percent.

[US Census Bureau, 2015]

The ten top private employers (excluding railroad and government) in the county include:

- Barrett Hospital & Healthcare
- Barrett's Minerals Inc.
- KCI Therapeutic Services
- Parkview Acres Care & Rehabilitation Center
- Renaissance Senior Care
- Safeway
- Southwestern Montana Family YMCA

- Town Pump
- Van's IGA
- McDonalds.

[Montana Department of Labor and Industry, 2014]

Based on data from the US Census of Agriculture in 2015, Beaverhead County has the following farm statistics:

Figure 3-2. ???????

	2012	2002	% Change
Number of Farms	430	421	+2
Land in Farms	1,380,888 acres	1,279,031 acres	+7
Average Size of Farm	3,211 acres	3,038 acres	+5
Market Value of Products Sold			
Crop Sales $31,189,000 (21 percent)	$142,876,000	$63,266,000	+36
Livestock Sales $111,687,000 (78 percent)			
Average Per Farm	$199,829	$150,274	+33
Number of cattle and calves:	153,655	135,926	+11
Number of sheep and lambs:	16,191	15,823	+2

Source: 2012 Census of Agriculture, 2012

The ecologic, historic, and social values of Beaverhead County each tie in to the quality of life for residents and visitors. Without these values, lives and property may not be threatened, but the way of life and connections to history and the environment could be disrupted. These values can have deep emotional meaning and investment.

Ecologic values represent the relationship between organisms and their environment. For humans, these values include clean air, clean water, a sustainable way of life, and a healthy, natural environment including a diversity of species. Natural hazards, such as floods and wildfires, are usually part of a healthy ecosystem but often human-caused hazards damage ecologic values. Ecologic values in Beaverhead County include the Beaverhead-Deer Lodge National Forest, Anaconda Pintlar Wilderness, and Red Rock Lakes National Wildlife Refuge. Beaverhead County does not have any generally known listed endangered species. However, Ute Ladies' Tresses are listed as a threatened species in the county. [US Fish and Wildlife Service, 2008]

Historic values capture a piece of history and maintain a point in time. Historic values can include sites, buildings, documents, and other pieces that preserve times past and have value to people. Beaverhead County has 18 resources listed in the National Register of Historic Places. (National Park Service, 2013)

Some of the more significant historic sites include the Big Hole National Battlefield, Lemhi Pass National Landmark, Bannack National Historic Landmark, Sacagawea Memorial Area, the Lewis and Clark Memorial, and numerous ghost towns.

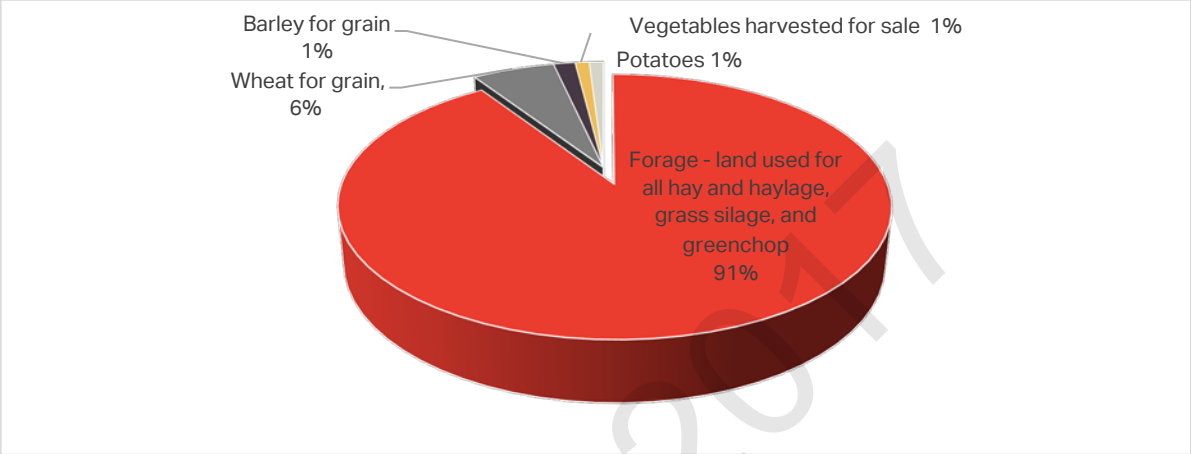

Figure 3-3. Primary Crops (Based on Number of Farms) [US Department of Agriculture, 2007].

Social values often cannot be quantified but are an important aspect of quality of life and interpersonal relationships. Examples of social values in Beaverhead County may include gatherings that promote community building, personal achievement, freedom from tyranny, the ability to communicate with others, pride in making the world a better place, and friendships. The realm of social values is only limited by the human imagination and usually relates to how a person feels. Disasters, both natural and human-caused, can disrupt important social activities and sometimes have lasting effects on society.

3.4 CURRENT LAND USE

Beaverhead County has varied land use but is primarily rural with most of the land use devoted to agriculture, undeveloped areas, and government ownership. Small communities and individual homes and farms are interspersed. Map 3.4A shows the federal, state, and local government ownership.

3.5 NEW DEVELOPMENT

Most development is occurring in the rural areas of the county. These areas may be prone to hazards such as flash flooding, wildfire, drought, and earthquakes. Although subdivision review requires mitigation to address probable impacts, a lot of development and construction occurs outside of this type of review process.

Table 3.5A shows the estimated development in the Dillon since 2004. Dillon is the only jurisdiction in the county with a building permit system. Additional new construction may be occurring in areas lacking building permit regulations.

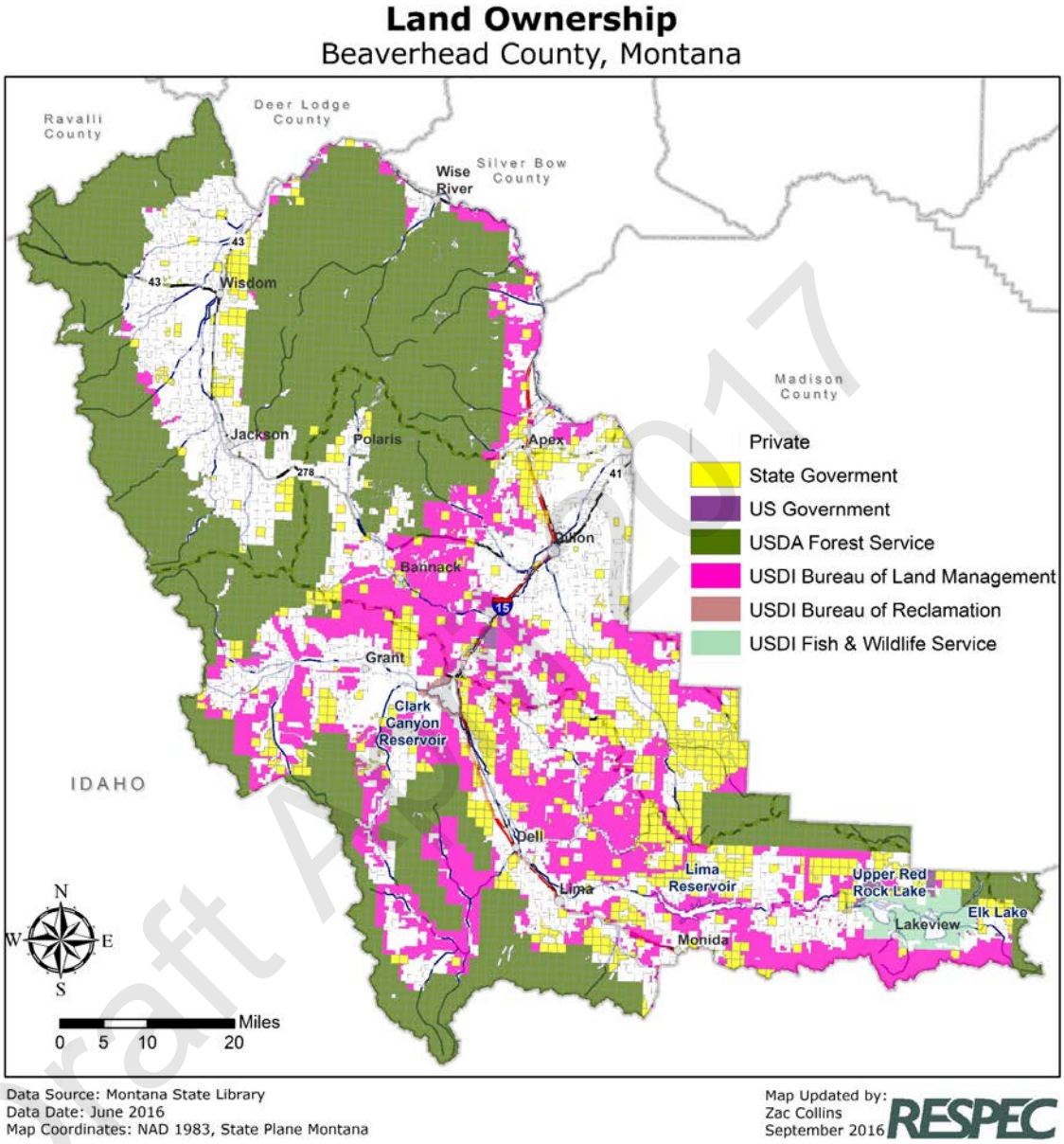

Figure 3-4. Map 3.4A.

Public concerns for new development in 2016 included:

- Non-subdivision developments in the wildland urban interface (not subject to regulations)
- New buildings that are not up to building code standards (jurisdictions lack building codes) and therefore are more prone to structural failures because of earthquakes, wind, and snow
- Response times and addressing for new development in the rural areas
- Response times and addressing for new development in the Floodplain areas.

Table 3-6. Table 3.5A Number of Subdivisions Approved in Beaverhead County 2003–2012

Year	Minor Subdivisions (1–5 Lots)	Major Subdivisions (6+ Lots)	Total Subdivisions Lots
2003	6	3	42
2004	10	0	20
2005	7	1	28
2006	7	1	44
2007	9	6	164
2008	10	0	18
2009	7	1	28
2010	4	0	3
			(Recreational Rental Sites) +9
2011	7	0	15
2012	1	1	13
2013	6	0	6
2014	3	0	6
2015	1	1	1 lot 11 Rv sites
2016	2	0	4
2003–2016 Totals	**80**	**14**	**412**

Source: Beaverhead County 2012 Activity Report, 2016.

Table 3-7. Table 3.5A Number of Septic Systems Permitted in Beaverhead County 2003–2012

Year	New	Replacement	Total Permits
2003	59	23	82
2004	52	21	73
2005	75	18	93
2006	59	18	77
2007	89	12	101
2008	58	21	79
2009	41	11	52
2010	36	9	45
2011	38	13	51
2012	54	10	64
2013	47	15	62
2014	38	10	48
2015	48	14	62
2016	61	15	76
2003–2016 Totals	**755**	**210**	**965**

3.6 FUTURE DEVELOPMENT

Because of the diversity of opportunity in Beaverhead County, continued growth is projected by county planners. New subdivisions are typically being developed on very good farm ground. Each year more farmland is lost to subdivision development because of the economic condition of the agriculture industry. However, other economic areas seem to be growing, especially those related to recreation.

Because of recreational opportunities in rural areas of Beaverhead County, there are many rural subdivisions being developed. The primary areas for these rural developments are the Grasshopper Valley, a very popular area 25 miles west of Dillon and the northeast end of the Big Hole River basin. Numerous houses are being built not only for the recreational opportunity but also for the aesthetic qualities of the area.

Existing land uses and the review processes and regulations for new development play important roles in disaster mitigation. Smart development is an inexpensive and effective way to reduce the impact of future disasters on the community. The following mechanisms are used by the jurisdictions to guide future development.

3.6.1 GROWTH POLICIES

Beaverhead County has a growth policy, as required by state law, to guide future development. The policy does not provide regulatory authority but rather outlines the goals and objectives for future growth. Regulatory authorities such as subdivision regulations and zoning are then guided by the growth policy. Growth policies are essentially the new version of comprehensive plans in Montana.

The Beaverhead County Growth Policy has the purpose of guiding elected officials in economic development, housing, local and social services, and land use decisions. Goals, objectives, and strategies are included in county topics such as Economic Development, Housing, Local and Social Services, and Land Use. The Growth Policy addresses the following areas that are relevant to disaster mitigation:

- Development of a capital improvements plan
- Development of a county fire plan
- Assessment of wildfire risks
- Improvements to the subdivision regulations
- Utilization of Firewise educational tools
- Prohibition or mitigation of new development by the developer in flood-prone areas, areas of excessive slope, high wildfire risk areas, and areas of high ground water
- Development of GIS data depicting high hazard areas.

Source: Beaverhead County Growth Policy, 2013.

The Big Hole Watershed Land Use Plan is an attachment of the growth policy prepared by the four counties along the Big Hole River. Guiding principles include targeting future development away from high-risk areas such as forests and floodplains.

3.6.2 SUBDIVISION REGULATIONS

The Beaverhead County Subdivision Regulations (2010) apply to all divisions of land in which one or more parcels contain 20 acres or more and less than 160 acres with some exemptions. Purposes of the regulations include, among others:

- The avoidance of danger or injury by reason of natural hazard or the lack of water, drainage, access, transportation, or other public improvements.

Lands considered unsuitable for development include areas of natural and human-caused hazards such as flooding, high potential for wildfires, snow avalanches, rock falls, landslides, steep slopes in excess of 25 percent, subsidence, high water table, polluted or non-potable water supply, high voltage lines, high pressure gas lines, or air or vehicular traffic hazards or congestion.

The design and improvement standards include provisions such as:

- Any new lot created along the Beaverhead, Big Hole, and Red Rock Rivers shall have a minimum of 300 feet of frontage width
- All other surface-water features (springs, creeks, ponds, lakes, streams, etc.) excepting manmade irrigation waterways shall have a 50-foot building setback and a 100-foot minimum drain field setback.

Compliance with flood ordinances inclues:

- Evaluation of flood hazards for subdivisions within 2,000 horizontal feet and 20 vertical feet of a live stream draining 25 square miles or more that does not have floodplain mapping
- Proper drainage design
- Minimizing of fire risk through various national guidelines
- Water supplies for fire protection
- Two access roads.

3.6.3 ZONING

The City of Dillon and the Town of Lima have zoning regulations. These regulations generally guide land use for the jurisdictions and include designations for areas such as agricultural, residential, commercial, and floodplains.

4.0 RISK ASSESSMENT/HAZARD PROFILES

4.1 AIRCRAFT ACCIDENTS

4.1.1 DESCRIPTION

An aircraft accident, for the purposes of this plan, is any large-scale aircraft crash or incident involving mass casualties. Dillon (DLN), Dell (4U9), Wisdom (7S4), and Wise River (02T) have small airports serving primarily private aircraft with larger commercial and government aircraft passing overhead. The Dillon airport is a full service, fixed base operator (FBO) airport with 100LL and Jet A fuels available. The airport has two paved and lighted landing strips, 75' by 6,500' and 65' by 3,600'. The airport in Dell is state-owned and has a paved and lighted 7,000' landing strip. This airport is maintained to provide a place for all private and small commercial aircraft to land if experiencing trouble. The closest commercial service airports are in Butte and Bozeman. Commercial aircraft fly over the county continuously every day. Scott Air Force base also frequently performs practice missions and tactical flights over the Big Hole, Grasshopper, and Centennial Valleys. Several ranches also have private landing strips.

Aviation accidents can occur for a multitude of reasons from mechanical failure to poor weather conditions to intentional causes. The size of accidents also varies widely from single engine accidents to large commercial crashes. The location of the accident, such as a remote area versus a populated location, also plays an important role in the amount of destruction.

Figure 4-1. Figure 4.1.1.A Lost Trail Pass Accident. Both occupants survived.

4.1.2 HISTORY

The history of aircraft accidents in Beaverhead County consists primarily of small magnitude incidents, some with casualties, but most with very little effect on the entire community. Table 4.1.2A has data on aircraft accidents in the county over the past 20 years.

Table 4-1. Table 4.1.2A Aircraft Accidents in Beaverhead County From 1984 to 2016

Accident #	Event Date	Location	Latitude	Longitude	Casualties
DEN84LA195	6/25/1984	DILLON	45.217	-112.637	Non-Fatal
DEN85LA020	10/26/1984	LIMA	44.6348	-112.592	Non-Fatal
DEN86LA086	3/1/1986	WISDOM	45.6166	-113.45	Non-Fatal
DEN86LA234	8/22/1986	DILLON	45.217	-112.637	Non-Fatal
SEA90LA191	9/11/1990	DILLON	45.217	-112.637	Non-Fatal
SEA92LA028	12/14/1991	JACKSON	45.368	-113.409	Non-Fatal
SEA95GA062	2/24/1995	DILLON	45.217	-112.637	Non-Fatal
SEA96LA019	11/15/1995	WISDOM	45.6166	-113.45	Non-Fatal
SEA96FA209	9/5/1996	WISE RIVER	45.7913	-112.949	Fatal (1)
SEA97FA075	3/23/1997	DILLON	45.217	-112.637	Fatal (4)
SEA99LA008	10/26/1998	DILLON	45.217	-112.637	Non-Fatal
SEA02TA164	8/24/2002	WISDOM	45.6166	-113.45	Non-Fatal
SEA03LA091	5/31/2003	DILLON	45.217	-112.637	Non-Fatal
LAX07FA150	5/3/2007	DILLON	45.217	-112.637	Fatal (2)
LAX08CA287	8/31/2008	DILLON	45.217	-112.637	Non-Fatal
WPR10TA335	7/5/2010	DILLON	45.217	-112.637	Non-Fatal
WPR13LA069	12/14/2012	DELL	44.7233	-112.698	Non-Fatal
WPR13CA427	9/27/2013	DELL	44.7233	-112.698	Non-Fatal
WPR14CA246	6/13/2014	Jackson	45.368	-113.409	Non-Fatal

Source: National Transportation Safety Board, 2016.

4.1.3 PROBABILITY AND MAGNITUDE

Aircraft accidents are documented carefully. Over the past 32 years, 7 fatalities, 3 injuries and a total of 19 aircraft accidents have occurred in Beaverhead County, all of which could be considered relatively minor. Although an incident involving a commercial passenger flight and mass casualties cannot be ruled out, the probability is lower, based on historical occurrence.

A mass casualty incident that overwhelms the emergency response resources within the county and neighboring counties, such as a commercial plane crash, represents a high magnitude event. In such an incident, additional resources would be needed and could result in a significant loss of life. If a crash occurred in a developed area, substantial property losses may also be seen.

Overall Aircraft Accident Probability: Low-Moderate

4.1.4 MAPPING

All areas of the county are at relatively uniform risk for an aircraft accident. Those areas close to the airports are theoretically at greater risk due to the proximity to local air traffic. Mapping does not enhance this hazard profile.

Figure 4-2. Figure 4.1.3A West Big Hole Accident. Four occupants survived.

4.1.5 MAPPING ???? DUPLICATE OF INFORMATION ABOVE

4.1.5.1 CRITICAL FACILITIES

Except in the very rare case of a plane crashing into a critical facility, the facilities should remain unaffected by an aircraft accident. An accident blocking a primary transportation route could delay emergency services.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Vehicle losses
- Critical functional losses
- Critical data losses.

Expected Aircraft Accident Impact to Critical Facilities: Low

4.1.5.2 CRITICAL INFRASTRUCUTRE

Theoretically, an aircraft can take out power lines, telephone lines, roadways, bridges, or other important pieces of infrastructure resulting in service disruptions.

Possible losses to infrastructure include:

- Physical infrastructure losses
- Loss of services.

Expected Aircraft Accident Impact to Critical Infrastructure: Low

4.1.5.3 STRUCTURES

Should structures be directly impacted by an aircraft, damages could vary in the tens or hundreds of thousands of dollars depending on the structure or structures impacted. The likelihood of such a high magnitude accident is extremely low.

Possible losses to structures include:

- Structural losses
- Contents losses
- Vehicle losses
- Displacement losses.

Expected Aircraft Accident Impact to Structures: Low

4.1.5.4 POPULATION

Of all the resources and values, aircraft accidents pose the most common risk to the population due to the potential for mass casualties. The magnitude of such population impacts varies based on the size and occupancy of the aircraft.

Expected Aircraft Accident Impact to the Population: Moderate

4.1.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Localized agriculture and business losses caused by damaged crops or structure losses
- Physical and disruption business losses.

Possible ecologic losses include:

- Releases of hazardous materials from the damaged aircraft into the environment.

Possible historic losses include:

- Structural, contents, and physical losses to historic properties.

Possible social losses include:

- Emotional impacts related to mass fatalities and injuries.

Aircraft Accident Impact to the Values: Low-Moderate

4.1.5.6 FUTURE DEVELOPMENT

The specific locations of where development occurs, except for possibly in the immediate vicinity of the airport, should not significantly affect the vulnerabilities from this hazard. Beaverhead County did adopt Airport Affected Area Regulations in 2007.

Expected Aircraft Accident Impact to Future Development: Low

4.1.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the aircraft accident hazard include:

- Difficulty in predicting where future aircraft accidents will occur
- Lack of publicly available digital data showing commercial air traffic lanes overhead.

Other hazards often related to aircraft accidents include:

- Hazardous material release

- Severe thunderstorms
- Smoke
- Strong winds
- Terrorism
- Weather (blizzards, heavy snow, heavy rain, low visibility)
- Volcanic ash fall.

4.2 DISEASE AND ENVIRONMENTAL CONTAMINATION

Including Human, Animal, and Plant Diseases

4.2.1 DESCRIPTION

Diseases affect humans, animals, and plants continuously. Each species has its own natural immune system to ward off most diseases. The causes and significance of diseases vary. Of significance in the disaster prevention realm are communicable diseases with the potential for high infection rates in humans or those which might necessitate the destruction of livestock or crops. Such diseases can devastate human populations and the economy.

Disease transmission may occur naturally or intentionally, as in the case of bioterrorism, and infect populations rapidly with little notice. New diseases regularly emerge or mutate. Known diseases, such as influenza, can be particularly severe in any given season. Terrorism experts also theorize the possibility of attacks using biological agents.

Public health officials also participate in regulatory programs related to food safety, water quality, hazardous waste disposal, occupational safety, and others. Environmental contaminants causing air pollution or water pollution can become significant threats to the population.

4.2.1.1 HUMAN DISEASE

Human epidemics may lead to quarantines, large-scale medical needs, and mass fatalities. Typically, the elderly, young children, and those with suppressed immune systems are at greatest risk from communicable diseases. The following biologic agents are considered the highest bioterrorism threats (Category A) due to their ease of dissemination or person-to-person transmission, high mortality rate with potential for major public health impacts, potential for public panic and social disruption, and the necessity for special public health preparedness:

- Anthrax
- Botulism
- Plague
- Tularemia
- Viral Hemorrhagic Fevers.

Source: Centers for Disease Control and Prevention, 2016

These diseases can infect populations rapidly, particularly through groups of people in close proximity such as schools, assisted living facilities, and workplaces.

4.2.1.2 ANIMAL DISEASE

Animal diseases, particularly those that infect livestock, can distress the agricultural community. Depending on the animals infected and the geographic extent of the disease, diseases could lead to food shortages and pose negative economic impacts on agricultural dependent communities. Diseases or conditions requiring STATE and FEDERAL reporting and quarantine include:

- Acute swine erysipelas
- African horse sickness
- African swine fever
- Avian influenza (High pathogenic)*
- Bovine babesiosis
- Bovine spongiform encephalopathy*
- Brucellosis* (Brucella abortus, B. melitenses, B. suis, B. canis)
- Cattle fever tick (Boophilus annulatus, B. microplus)
- Chronic wasting disease
- Classical swine fever (Hog cholera)
- Contagious bovine pleuropneumonia (Mycoplasma mycoides mycoides)
- Contagious equine metritis
- Dourine (Trypanosoma equiperdum)
- Equiinte encephalomyelitis* (EEE, WEE, VEE)
- Equine infectious anemia
- Equine piroplasmosis
- Exotic Newcastle disease*
- Foot and mouth disease
- Fowl typhoid (Salmonella gallinarum)
- Glanders (Burkholderia mallei)*
- Heartwater (Cowdria ruminantium)
- Japanese encephalitis*
- Lumpy skin disease
- Malignant catarrhal fever
- Mange** (Psoroptes ovis, Sarcoptes scabiei* or Chorioptes sp.)
- Nairobi sheep disease
- New and Old World Screwworm
- Nipah virus encephalitis*
- Peste des petits ruminants
- Porcine Epidemic Diarrhea PEDv*
- Pseudorabies (Aujeszky's disease)
- Rabbit hemorrhagic disease
- Rift Valley fever*
- Rinderpest
- Scrapie
- Sheep pox and goat pox
- Surra (Tryponosoma evansi)
- Swine influenza (H1N1)
- Swine vesicular disease
- Trypanosomosis (Tse-tse borne)
- Tuberculosis* (Mycobacterium bovis)
- Vesicular exanthema
- Vesicular stomatitis
- Viral hemorrhagic septicemia

* Zoonotic disease

** Only Psoroptes mange is quarantinable.

Source: Montana Deaprtment of Livestock, 2015

Diseases or conditions requiring STATE reporting and quarantine include:

- Anthrax*
- Bluetongue
- Contagious agalactia (Mycoplasma spp)
- Contagious caprine
- Pleuropneumonia
- Contagious foot rot
- Crimean Congo hemorrhagic fever
- Equine viral arteritis
- Equine rhinopneumonitis, neurologic form (EHV-1)
- Ovine pediculosis
- Plague* (Yersinia pestis)
- Pullorum disease (S. pullorum)
- Q-Fever* (Coxiella burnettii)
- Rabies*
- Theileriosis
- Trichomonosis
- Tularemia*
- West Nile virus*

* Zoonotic disease

Source: Montana Department of Livestock, 2015

4.2.1.3 PLANT DISEASE

Many plant and crop diseases exist. Of most concern are those diseases that spread rapidly and cause widespread economic losses. The specific diseases that could cause plant epidemics depend on the species. Of particular concern in Beaverhead County would be those diseases that affect hay/forage, barley, oats, wheat, or potatoes. Although not categorized as a disease, new pests and weeds introduced could have similar impacts.

4.2.1.4 ENVIRONMENTAL CONTAMINATION

A healthy environment is important for sustainable communities. The contamination of water and air can occur for a variety of reasons including the accidental release of a hazardous material, intentional contamination, small releases that build-up over time, releases of materials not yet known to be hazardous, or imbalances in the environment that negatively affect water or air quality.

The following is the total number of water facilities that have or had permits issued by the Environmental Protection. A full list can be found in Appendix M.

Table 4-2. ???

Location	Number of Permits Issued
Bannack	1
Dillion	26 (2*)
Lima	3
Wisdom	4
Wise River	4
Boulder	(1*)
Total	38

Source: Environmental Protection Agency, 2016.
* air facilities have or had permits issued by the EPA

The National Weather Service issues air quality forecasts and several agencies have partnered to develop a national air quality website at *http://airnow.gov*. Montana DEQ also issues smoke forecasts daily during the wildfire season.

4.2.2 HISTORY

Fortunately, Beaverhead County has not experienced any significant disease outbreaks within its population in recent years. Approximately three human influenza pandemics have occurred over the past 100 years, one severely affecting the United States. Following World War I, the Spanish influenza pandemic of 1918 killed 20-40 million people worldwide, including 675,000 Americans. [Billings, 1997] In the State of Montana, the Spanish influenza caused 9.9 deaths per 1,000 people from 1918 to 1919. [Brainerd, 2002]

Figure 4-3. Picture 4.2.2A Rainbow Gathering of 2000.

The major events that have affected public health in the last few years were the forest fires of 2000 and 2003 and the Rainbow Gathering of 2000. Though, no major health effects were seen, the potential existed. Poor air quality during the forest fires could have presented overwhelming respiratory problems. During the Rainbow Gathering, approximately 24,000 non-residents lived in commune style on National Forest lands outside Dillon. The county could have experienced large numbers of communicable disease, especially from within the camp. During the gathering, the Beaverhead County Health Department and the Barrett Hospital Emergency Room saw a dramatic increase in the number of patients seen and treated. Not only did these events create public health hazards, they also created environmental health hazards.

The following statistics were reportable events documented by the Beaverhead County Health Department. Note that not all reportable events get reported.

4.2.2.1 DOCUMENTED DISEASES IN BEAVERHEAD COUNTY

In addition to global disease and bioterrorism concerns, naturally occurring diseases can threaten communities. The following table lists the cases in the last 10 years.

Table 4-3. Table 4.2.2 Beaverhead County Documented Diseases in the Last 10 Years

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Grand Total
Campylobacteriosis	2					1	3	3	9	14	32
Chlamydia	25	18	20	27	10	45	44	37	27	43	296
Coccidioidomycosis								2	2		4
Colorado tick fever	1										1
Cryptosporidiosis										1	1
Giardiasis		1			1				3	1	6
Gonorrhea	1									3	4
Haemophilus influenzae, invasive									1		1
Hantavirus pulmonary syndrome	1										1
Hepatitis C Virus Infection, chronic or resolved	2	6	2	9	3	13	7	7	7	4	60
Hepatitis C, acute							1				1
Influenza, hospitalization*								6	2	5	13
Lead poisoning1								2		1	3
Listeriosis						1				1	2
Lyme disease		1									1
Pertussis			1			1	2		1		5
Salmonellosis	2	1	3		3	1	2	3	2	2	19
Shiga toxin-producing Escherichia coli (STEC)									2	4	6
Shigellosis								1			1
Spotted Fever Rickettsiosis				1						1	2
Streptococcus pneumoniae, invasive										2	2
Syphilis				1							1
Transmissible Spongiform Encephalopathies (TSE)								1			1
Varicella (Chickenpox)	11	4	8		2	2	6		1		34

* The lack of data for disease represents the fact that an occurrence did not exist in the last 10 years. Source: Montana Department of Public Health & Human Services, 2016.

Table 4-4. Table 4.2.2B Beaverhead County Communicable Disease Declared Disasters and Emergencies

Declaration	Year	Additional Information	Casualties	Damages/Assistance
MT-01-00 (state)	2000	Rainbow Family Gathering	Unknown	$77,606 state share $23,911 local share

Source: Montana Disaster and Emergency Services, 2008.

4.2.3 PROBABILITY AND MAGNITUDE

Quantifying the probability of a human epidemic or contamination event affecting Beaverhead County presents challenges due to a limited history of incidents and outbreaks. Medical advances over the past fifty years prevent many disease outbreaks, yet the potential still remains. Much of the county is in a rural setting, and therefore, is somewhat isolated from the rapid spread of global diseases, however, the City of Dillon serves as a regional center for commercial activities and travel. Therefore, disease could be brought into the local population by travelers. The populated areas such as Dillon have the greatest potential for the rapid spread of disease should a disease enter the community. The university setting would also be a prime setting for the rapid spread of disease.

Animal and plant disease outbreaks are even harder to predict. Most global livestock diseases have been confined to specific countries due to strict import regulations. Any plant disease outbreaks have been relatively easily contained.

The magnitude of a disease outbreak varies from every day disease occurrences to widespread infection. During the 1918 Influenza Pandemic, infection rates approached 28 percent in the United States. [Billings, 1997] Other pandemics produced infections rates as high as 35 percent of the total population. [World Health Organization, 2009] Such a pandemic affecting Beaverhead County represents a severe magnitude event. Almost any highly contagious, incapacitating disease that enters the regional population could overwhelm local health resources. Similarly, any rapidly spreading bioterrorism event for which little vaccination or containment capability exists is a high magnitude event.

Overall Disease and Environmental Contamination Probability: Moderate

4.2.4 MAPPING

The disease and environmental contamination hazard is uniform across the county, and therefore, mapping does not enhance this hazard profile.

4.2.5 VULNERABILITIES

4.2.5.1 CRITICAL FACILITIES

In some instances, the accessibility and functionality of critical facilities can be compromised by diseases and environmental contamination until the facility is decontaminated or the threat has passed. With the loss of function of facilities supporting emergency response, delays in emergency services could result. Additionally, with a significant human disease outbreak, resources such as ambulance services and the hospitals could quickly become overwhelmed.

Should a building become contaminated by some agent, cleanup costs and the loss of use of the buildings could result. Such costs could be significant. For example, the cleanup of anthrax in several congressional offices on Capitol Hill in September and October of 2001 cost the Environmental Protection Agency about $27 million. [US General Accounting Office, 2003] For this reason, all critical facilities are assumed to be at some risk from disease and environmental contamination.

Diseases can spread quickly in facilities housing vulnerable populations such as schools, dormitories, and elderly housing. Often these facilities, as well as the hospitals and medical clinics, are the first places where diseases are identified and treated.

Possible losses to critical facilities include:

- Critical functional losses
- Clean-up costs.

Expected Disease and Environmental Contamination Impact to Critical Facilities: Low-Moderate

4.2.5.2 CRITICAL INFRASTRUCTURE

In most cases, infrastructure would not be affected by disease and environmental contamination. Scenarios that would affect infrastructure include the contamination of the water supplies and diseases that require special provisions in the treatment of wastewater. Should an epidemic necessitate a quarantine or incapacitate a significant portion of the population, support of and physical repairs to infrastructure may be delayed, and services may be disrupted for a time due to limitations in getting affected employees to work.

Possible losses to infrastructure include:

- Functional losses due to a low workforce.

Expected Disease and Environmental Contamination Impact to Critical Infrastructure: Low-Moderate

4.2.5.3 STRUCTURES

The structural integrities of buildings are not generally threatened by disease and environmental contamination. Similar to critical facilities, should a structure become contaminated, clean-up costs could be expensive.

Possible losses to structures include:

- Clean-up costs.

Expected Disease and Environmental Contamination Impact to Structures: Low

4.2.5.4 POPULATION

Perhaps the most significant impact from disease and environmental contamination is to the population. Disease can spread rapidly through schools, universities, health facilities, and communities. The entire county population of 9,300 plus non-residents is at risk for contracting a disease or being affected by environmental contaminants. The number of infections and fatalities in the communities would depend on the transmission and mortality rates.

Using a general estimate of 35 percent for the infection rate and a mortality rate (once infected) of 20 percent, as can be the case in an influenza pandemic, approximately 3,255 residents of Beaverhead County would be infected with about 651 fatal infections. This estimate is somewhat extreme, but uses plausible infection and mortality rates.

As with any disease, age and other health conditions can be contributing factors. The ability to control the spread of disease depends on the virulence of the disease, the time lapse before the onset of symptoms, the movement of the population, and the warning time involved. Vaccinations, anti-vials, quarantines, and other protective measures may also prevent the spread and impact of the disease. Besides human diseases, animal and plant diseases could negatively affect agriculture and limit food supplies.

Should public water supplies or personal wells become contaminated, the population could be at risk, particularly if water was used while contaminated. Otherwise, alternative water supplies such as bottled water, boil orders, or water from neighboring communities would need to supplement basic water needs in long term situations. Should such assistance be limited, the population may be displaced for the duration.

Air contamination is much more difficult to control. Ultimately, unhealthy air quality can have a direct impact on the population's wellbeing. Anywhere from low levels over a long period to high levels over a short period may result in negative effects on the population. People may be advised to shelter-in-place or evacuate. In some cases, the air pollution may go unnoticed for a period of time. Effects could range from diseases long after exposure to instant death, depending on the type and level of contamination.

Expected Disease and Environmental Contamination Impact to the Population: High

4.2.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Service industry losses during human quarantines, limited travel, and contamination concerns
- Business disruption losses due to a lack of workers and customers
- Direct agricultural losses during animal or plant disease outbreaks
  - Beaverhead County had 430 farms and 1,380,888 acres in farmland with annual sales totaling over $142 million in 2012.
  - Beaverhead County had 153,655 head of cattle and calves, 16,191 head of sheep and lambs, and 494 head of poultry in 2012.

Source: US Department of Agriculture, 2012.

Possible ecologic losses include:

- Eradication of certain species.

Possible social losses include:

- Emotional impacts related to mass fatalities

- Disruption of social activities during quarantines
- Fear of contracting diseases or encountering contaminants.

Expected Disease and Environmental Contamination Impact to the Values: Moderate-High

4.2.5.6 FUTURE DEVELOPMENT

Structures built as a result of new development would have little impact on the disease vulnerabilities, unless in the rare case, the new structures were part of a lab dealing with biological agents. New residents and population add to the number of people threatened in Beaverhead County, but the location of such population increases would probably not matter.

The primary exception is the development of industries or facilities that pollute the environment, or have the potential to pollute. This type of development could increase the risk of contamination. Current local regulations do little to deter this type of development; however, the state and federal permitting processes allow for some review of negative impacts.

Expected Disease and Environmental Contamination Impact to Future Development: Low-Moderate

4.2.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the disease and environmental contamination hazard include:

- Uncertainties related to how and when a disease will spread through a population or environmental contaminants will be released
- The emergence of new, unstudied diseases.

Other hazards often related to disease and environmental contamination include:

- Other disasters that result in the loss or contamination of potable water or sewer services
- Food contamination caused by long-term power outages
- Mold, mildew, and other toxins from flooding
- Smoke from wildfires
- Air and water contamination during hazardous material releases.

4.3 DROUGHT

4.3.1 DESCRIPTION

A drought is an extended period of unusually dry weather. Drought is a special type of disaster because its occurrence does not require evacuation of an area nor does it constitute an immediate threat to life or property. People are not suddenly rendered homeless or without food and clothing. The primary impact of a drought is economic hardship, but it does, in the end, resemble other types of disasters in that victims can be deprived of their livelihoods, and communities can suffer economic decline.

The following is an excerpt from the National Drought Mitigation Center:
Drought is an insidious hazard of nature. It is often referred to as a "creeping phenomenon" and its impacts vary from region to region. Drought can therefore be difficult for people to understand. It is equally difficult to define, because what may be considered a drought in, say, Bali (six days without rain)

would certainly not be considered a drought in Libya (annual rainfall less than 180 mm). In the most general sense, drought originates from a deficiency of precipitation over an extended period of time--usually a season or more--resulting in a water shortage for some activity, group, or environmental sector. Its impacts result from the interplay between the natural event (less precipitation than expected) and the demand people place on water supply, and human activities can exacerbate the impacts of drought. Because drought cannot be viewed solely as a physical phenomenon, it is usually defined both conceptually and operationally.
[National Drought Mitigation Center, 2016]

Droughts can range from minor to severe, short-term to long-term with a variety of determining factors such as precipitation, soil moisture, and river levels. A minor, short-term drought can slip by unnoticed while a long-term severe drought can impact the agricultural economy, natural resources, and even public water supplies. Monitoring of drought conditions occurs nationally, and various indices, such as the Palmer Index, indicate the level of drought.

The effects of drought become apparent with a longer duration because more and more moisture related activities are affected. Non-irrigated croplands are most susceptible to moisture shortages. Rangeland and irrigated agricultural lands do not feel the effects as quickly as the non-irrigated, cultivated acreage, but their yields can also be greatly reduced due to drought. Reductions in yields caused by moisture shortages are often aggravated by wind-induced soil erosion.

In periods of severe drought, forest and range fires can destroy the economic potential of the livestock industry and wildlife habitat in and adjacent to the fire areas. Under extreme drought conditions, lakes, reservoirs, and rivers can be subject to severe water shortages, which greatly restrict the use of their water supplies. An additional hazard resulting from drought conditions can be insect infestation.

4.3.1.1 WARNINGS, WATCHES, AND ADVISORIES

Sometimes related to drought, the National Weather Service issues the following products:

- Blowing Dust Advisory: Blowing dust advisories are issued for widespread or localized blowing dust reducing visibilities to less than a mile but greater than ¼ mile with sustained winds of 25 mph or greater.
- Dust Storm Warning: Dust storm warnings are issued when widespread or localized blowing dust reduces visibilities to less than ¼ mile with sustained winds of 25 mph or greater.
- Heat Advisory: A heat advisory is issued when conditions are favorable for heat index values reaching 105 or greater for three days or more.
- Heat Warning: A heat warning is issued when high temperatures are expected to be over 105°F and low temperatures are expected to be over 80°F for 3 days or more.

Source: National Weather Service, 2006

4.3.2 HISTORY

Paleoclimate studies show extreme periods of drought hundreds of years ago in the northern Great Plains including 200–370 A.D., 700–850 A.D., and 1000–1200 A.D. Compared to these periods over the past 2,000 years, the droughts since 1,200 A.D. have been relatively wet and minor. [Laird et al, 1996]

Droughts cannot be defined with certainty as extremely dry periods often alternate with wetter than normal periods.

1930's – The 1930's Dust Bowl remains the most highly publicized of past droughts in Montana. Interviews with life-long county residents indicate that during this era, there were economic hardships throughout the county.

1960's - Montana saw another drought episode in 1961. By the end of June, 17 counties had requested federal disaster designations due to a lack of moisture, higher than normal temperatures, and grasshopper infestation. Small grain crops died before maturing, and range grass and dryland hay crops were deteriorating rapidly. Livestock water supplies were at critical levels. In July of 1961, the State's Crop and Livestock Reporting Service called it the worst drought since the 1930's. In 1966, the entire state experienced another episode of drought.

1970's – Over 250,000 acres of Montana farmland was damaged by winds in the western and southern part of state over a 7-month period in 1977. Excessive tillage and inadequate crop cover during years of little moisture caused exaggerated soil damage. In June of 1977, Montana officials worked with officials from Washington, Idaho, and Oregon on the Northwest Utility Coordination Committee to lessen the potential for hydroelectricity shortages. On June 23, Governor Judge ordered a 10 percent electric use reduction in state and county governments.

1980's - Drought-related economic losses in Montana in 1980 were estimated to be $380 million. Drought continued to plague the state in 1985, and all 56 counties received disaster declarations. The continued lack of moisture in 1985 resulted in a wheat crop that was the smallest in 45 years. Grain farmers received more in government deficiency payments and insurance money than they did for their crops. For a typical 2,500 acre Montana farm/ranch, the operator lost more than $100,000 in equity over the course of that year. The state's agriculture industry lost nearly $3 billion in equity. The extended effects of this drought included the loss of thousands of off-farm jobs and the closing of many implement dealerships and Production Credit Associations. On September 6, 1988, Beaverhead County declared a drought emergency.

1990's – Drought emergencies were declared in a number of Montana counties with 83 percent of the state reported under drought conditions by mid-August 1994. Impacts included stress to stream fisheries (low water levels, high temperatures), reduced crop yields, and wildfires.

According to an article published in the Dillon Tribune, statistics from the U.S. Department of the Interior showed the two major reservoirs in Beaverhead County were at much below average levels. The capacity for the Lima Reservoir was listed at 84,050 acre-feet with an average level being 67,040 acre-feet. On May 30, 1990, the level of the reservoir was at 46,040 acre-feet. Clark Canyon Reservoir's capacity was rated at 255,600 acre-feet with 171,000 acre-feet being an average level. On May 30, 1990, the reservoir only had 111,800 acre-feet.

2000's – Severe drought and persistent heat caused significant losses to agriculture and related industries. Beaverhead County declared local disasters in July 2001, 2002, and 2003. The US Department of Agriculture issued Natural Disaster Determinations for drought for the entire state of

Montana for the years 2000, 2001, 2002, and 2003. This designation entitled counties to low interest loans for producers, small business administration loans, and an Internal Revenue Service provision deferring capital gains. February 2005 was a particularly dry month; it was the driest February on record across the State of Montana.

According to the February 4, 2004 Dillon Tribune, Beaverhead County was experiencing record low stream flows and inflows to reservoirs. Inflows to Clark Canyon Reservoir at the end of January, 2004 were 8,472 acre-feet compared to 9,283 acre-feet at the same time in 2003. Stored water amounts were at 42,613 acre-feet at the end of January, 2004 compared to 50,608 acre-feet in January,2003.

According to precipitation records as recorded at the weather station on the University of Montana – Western Campus, (1940–2012) there was a downward trend of annual precipitation in the southeast quarter of the county. The Beaverhead River Basin and Red Rock River Basin experienced drastically lower precipitation than most of the other three quarters of the county.

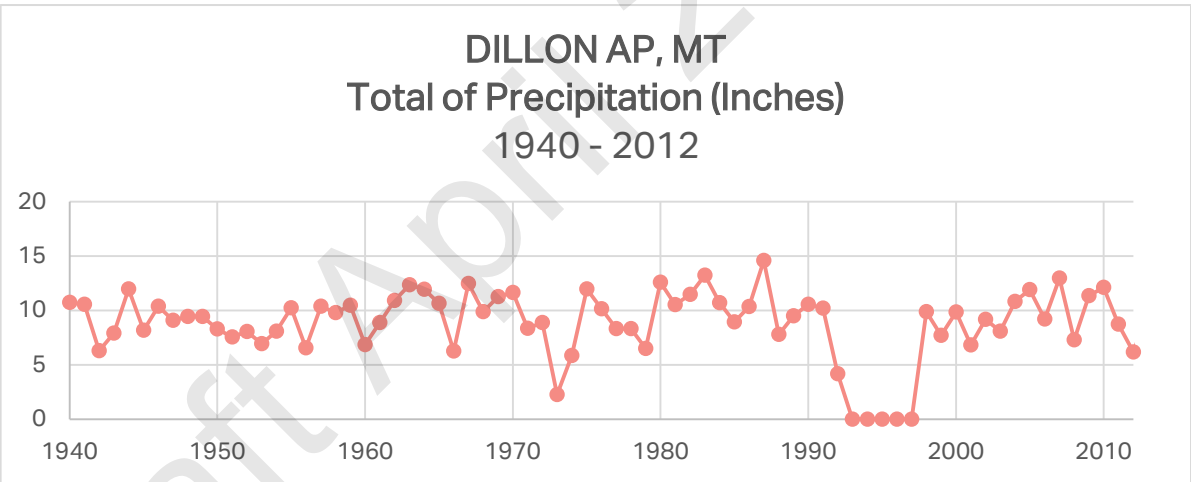

Figure 4-4. ???. Western Regional Climate Center, 2016.

Beaverhead County has been in drought 81 percent of the time from January 2000 to November 2016.

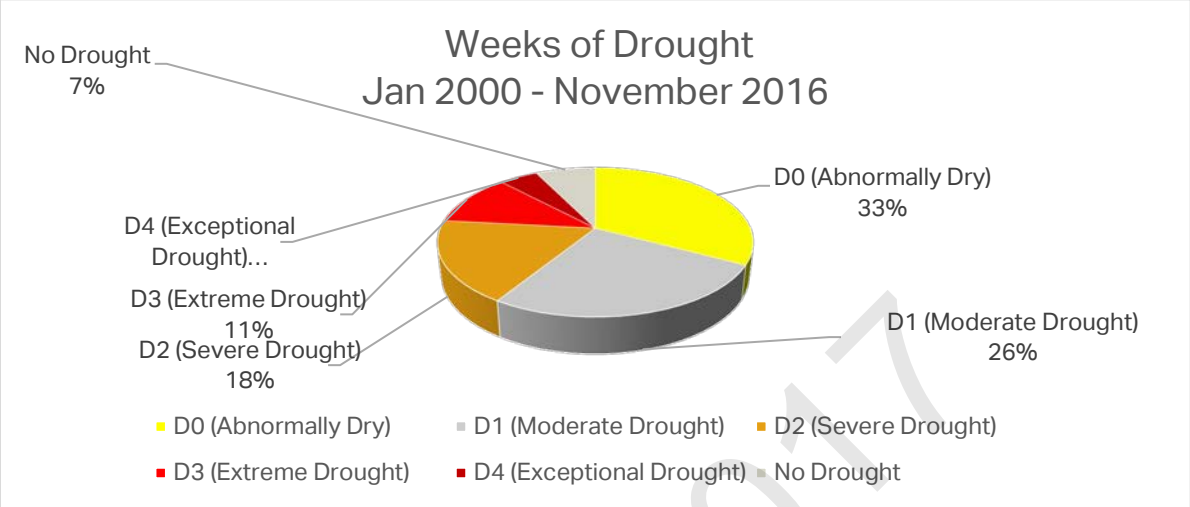

Figure 4-5. ???. Drought Monitor by including the National Drought Mitigation Center (NDMC), the US Department of Agriculture (USDA) and the National Oceanic and Atmospheric Association (NOAA), 2016.

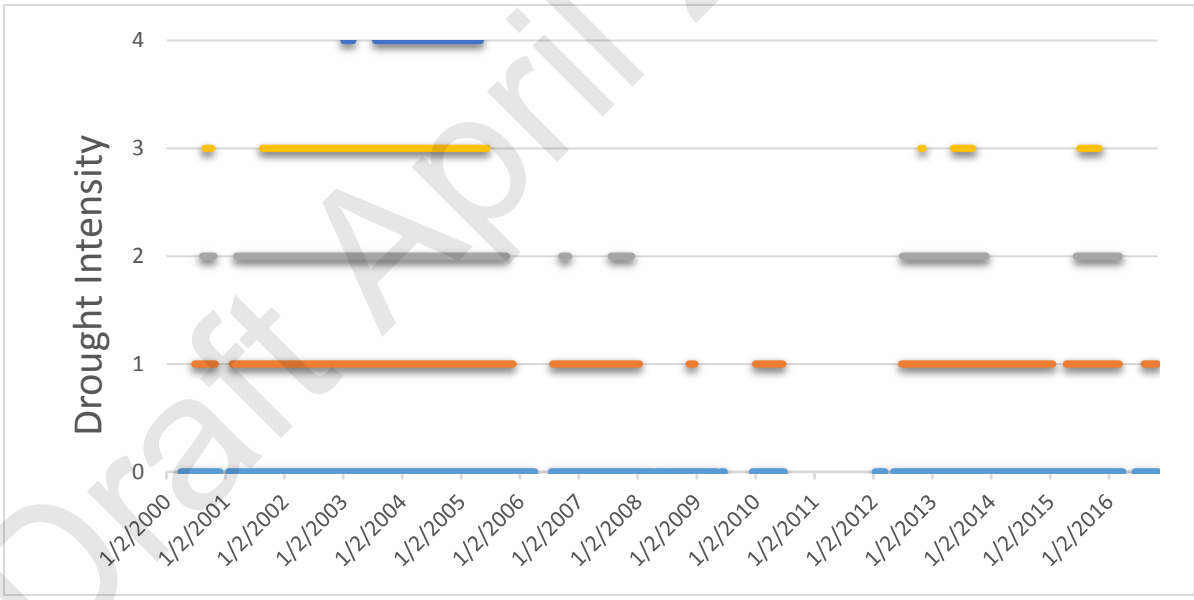

Figure 4-6. ???. Drought Monitor by including the National Drought Mitigation Center (NDMC), the US Deparmtent of Agriculture (USDA) and the National Oceanic and Atmospheric Association (NOAA), 2016.

This level of drought has affected the community in many different ways form lack of irrigation water to the ability to fill the two water reservoirs used by over 4,300 residents.

The Federal Emergency Management Agency's ability to use the Presiden'ts Disaster Fund for drought relief to state and local interests is very limited in scope. However,the US Department of Agriculture frequently declares agricultural disasters because of drought.

Table 4-5. Table 4.3.2A Beaverhead County Drought Declared Disasters and Emergencies

County	State	Designation Code	Designation Number	DROUGHT	Wind, High Winds	Fire, Wildfire	Heat, Excessive heat High temp. (incl. low humidity)	Insects	Approval date	Begin Date	End Date	Description of disaster	CROP DISASTER YEAR
Beaverhead	MT	2	S3838	1	1	1	1	1	6/24/2015	4/28/2015	N/A	Drought-FAST TRACK	2015

4.3.3 PROBABILITY AND MAGNITUDE

The National Oceanic and Atmospheric Administration Paleoclimatology Program studies drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, "…paleoclimatic data suggest that droughts as severe as the 1950's drought have occurred in central North America several times a century over the past 300–400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago." Based on this research, the 1950's drought situation could be expected approximately once every 50 years or a 20 percent chance every ten years. An extreme drought, worse than the 1930's "Dust Bowl," has an approximate probability of occurring once every 500 years or a 2 percent chance of occurring each decade. [National Oceanic and Atmospheric Administration, 2003]

A 500-year drought with a magnitude similar to that of the 1930's that destroys the agricultural economy and leads to wildfires is an example of a high magnitude event. The Palmer Index, an index used by the Climate Prediction Center to measure long-term drought, has frequently had southwest Montana in the "extreme drought" category over the past several years.

Overall Drought Probability: Moderate

4.3.4 MAPPING

Drought is usually a regional hazard that is not enhanced by county-level mapping. All county areas are assumed to have the same risk level. Mapping of the current drought status and a current regional drought summary is published by the US Drought Monitor each Thursday at *http://droughtmonitor.unl.edu/*.

4.3.5 VULNERABILITIES

4.3.5.1 CRITICAL FACILITIES

Drought typically does not have a direct impact on structures.

Possible losses/impacts to critical facilities include:

- Loss of critical function caused by low water supplies.

Expected Drought Impact to Critical Facilities: Low

4.3.5.2 CRITICAL INFRASTRUCTURE

Severe droughts can negatively affect drinking water supplies. Should a public water system be affected, the losses could total into the millions of dollars if outside water is shipped in. Private wells could also dry up. Lima has a very ample public water supply.

Possible losses to infrastructure include:

- Loss of potable water.

Expected Drought Impact to Critical Infrastructure: Low-Moderate
Except Lima: Low

4.3.5.3 STRUCTURES

Drought typically does not have a direct impact on structures.

Possible losses/impacts to structures include:

- Loss of function caused by low water supplies.

Expected Drought Impact to Structures: Low

4.3.5.4 POPULATION

Drought evolves slowly over time and the population typically has ample time to prepare for its effects. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

Expected Drought Impact to the Population: Low-Moderate
Except Lima: Low

4.3.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

In an article written in the Montana Standard on the long-term drought effects on the Beaverhead River, Dick Oswald of the Montana Fish, Wildlife and Parks Department indicated there was a definite decline in the number of trophy brown and rainbow trout in the river during drought periods. The loss of fish has an economic impact on the county mainly with the loss of income generated through outfitters and guides on the blue-ribbon streams within the county.

Fishing regulations changed numerous times throughout the 1990's and 2000's in order to accommodate low water flow. Not only have these changes affected the Beaverhead River, but they have also affected the Big Hole River and the Red Rock River. Regulations that have been modified include the number of fish that can be taken, fishing hours, and mandated and voluntary stream closures. Drought has not only affected the agricultural industry, but it has impacted the economics of the entire county.

Possible economic losses include:

- Significant agricultural losses due to damaged crops and reduced livestock feed.
  - Beaverhead County had 421 farms and 1,279,031 acres in farmland with annual sales totaling over $63 million in 2002.
  - Beaverhead County had 135,926 head of cattle and calves, 15,823 head of sheep and lambs, and 295 head of poultry in 2002.

Source: US Department of Agriculture, 2002.

In the summer of 2016 (August 19) Montana's Department of Fish, Wildlife and Parks (FWP) established a temporary emergency closure on a large section of the Yellowstone River. This temporary closure affected the Yellowstone River and its tributaries between Yellowstone National Park boundaries near Gardiner, Montana, approximately 183 miles downriver to Laurel, Montana. The closure applied to all water based recreation uses on the affected area. It is believed that the temporary closure cost Park County between $360,000 and $524,000. The major rivers used by guides and outfitters in Beaverhead County include, the Beaverhead River and the Big Hole River. If an event of the same nature took place on the rivers of Beaverhead County, there would be similar tolls taken on the livelihood of locals as well as long lasting effects for future use of the rivers.

Table 4-6. Table 4.4.1A Outfitter Angling Pressure Estimates March 2013–February 2014 for Beaverhead County Area Drainages

Stream Name	Drainage	Total Pressure	Error	Guided Trips
Beaverhead River	Beaverhead River	9,603	1,397	110
Spring Creek	Beaverhead River	67	67	1
Big Hole River Drainage	Big Hole River	216	125	3
Big Hole River Sec 01	Big Hole River	10,432	1,520	127
Big Hole River Sec 02	Big Hole River	4,992	1,065	62
Big Hole River Sec 03	Big Hole River	615	430	6
Total		**25,925**	**4,604**	**309**

Possible ecologic losses include:

- Potential Loss of fish populations.

Tests results on whitefish collected from the main stem of the Yellowstone show the reason for the fish kill was Proliferative Kidney Disease With the loss of fish on the Yellowstone River numberingin the high thousands, drought can have a devastating effect on populations of whitefish and trout. One Yellowstone Cutthroat found was also tested positive for the disease. The disease is caused by a microscopic parasite known to exist in Canada, the United States and Europe. The disease has been documented before in two isolated locations in Montana during the past 20 years. The latest outbreaks that have been found have happened in the Pacific Northwest and Idaho. Other causes for this out break are higher than average water temperatures, lower than average stream flows and recreational stressors.

"As experts continue to identify the potential ramifications of changing climatic conditions, disturbances such as those contributing to the closure (e.g. low flows and elevated water

temperatures) may increase in frequency and severity. Such a prospective warrants additional attention to the economic impacts of closures or other management actions taken to preserve the resource. Thus, as the summer fishing and floating seasons come to a close at the end of September, and the river is incrementally opened back up by FWP, ITRR aims to follow up this preliminary report with a more in-depth study of the economic impacts of the closure. The goal of a follow up investigation would be to not only more precisely quantify the impact to fishing and rafting based businesses during the closure period based on the actions of travelers, but also shed light on the future potential impacts of parasitic outbreaks and any lasting residual effects of this event. Residual effects are potentially positive and negative. Potentially positive effects stem from the containment of the outbreak to a limited set of rivers, while negative effects may continue if visitor willingness or desire to recreate in the affected areas declines."
Economic Contributions of the Yellowstone River to Park County, Montana, 2016

With populations of whitefish and trout in all of the Beaverhead County area drainages, an outbreak of any kind that will harm native and non-native fish populations will be detrimental to both economic and ecologic markers with in the county including:

- Loss of waterfowl populations
- Loss of wildlife food and water supplies.

Expected Drought Impact to the Values: Moderate-High
Except Lima: Moderate

4.3.5.6 FUTURE DEVELOPMENT

Future development's greatest impact on the drought hazard would possibly be to ground water resources. New water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Fortunately, public water systems are monitored by the Montana Department of Environmental Quality, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on the drought vulnerabilities.

Expected Drought Impact to Future Development: Low-Moderate

4.3.6 DATA LIMITATIONS AND OTHER FACTORS

In the last five years, Montana provided in excess of $21.4 million in direct funding to local watershed groups, irrigation districts, conservation districts, water-user associations, and private individuals for water management planning and project implementation. There is still a need to have high quality data for watersheds such as LiDAR and quality gauge data. In 2016 the DNRC began providing monthly water supply reports during the growing season to each of the four planning basins identified in the Montana State Water Plan to provide a one-stop-shop for drought and water supply information at a more localized level. Montanan DRAFT Drought Plan, 2006

The data limitations related to the drought hazard include:

- Difficulties in pinpointing the start and end of drought periods
- Limitations in quantifying economic losses from drought

- Lack of a publicly available database listing historical USDA drought declarations and the associated losses
- Complications in determining the depth of social and ecological impacts.

Other hazards often related to drought include:

- Wildfires
- Strong winds
- Extreme heat
- Soil erosion
- Flash flooding (dry soils are not as permeable to water and heavy rains run off faster).

4.4 EARTHQUAKE

4.4.1 DESCRIPTION

One of the most frightening and destructive phenomena of nature is a severe earthquake and its terrible aftereffects. An earthquake is the sudden movement of the Earth, caused by the abrupt release of strain that has accumulated over a long time. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth's surface. Huge plates slowly move over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, thus, producing an earthquake. [US Geological Survey, 1997]

Earthquakes occur along faults, which are fractures or fracture zones in the earth across which there may be relative motion. When strain energy that has been building, sometimes for centuries, is released, it causes two sides of a fault to slip or slide past each other resulting in an earthquake. The released energy radiates out from the focus (point of the slip) in a series of seismic waves. Ground shaking and ground breaking are the primary hazards of an earthquake. The seismic waves in the earth cause distortion of surface materials such as water, soil, and structures. These distortions are considered secondary hazards. Earthquakes may be felt and affect areas hundreds of miles from the epicenter (the point directly above the focus on the surface of the ground).

Earthquakes have been known to cause severe damage to buildings, roads, bridges, and even rupture dams. Severe earthquakes destroy power and telephone lines and gas, sewer, and water mains, which in turn, may result in fires and hinder firefighting or rescue efforts. Earthquakes can strike communities without warning and damage buildings and infrastructure on a large scale. Most of the earthquake activity in Montana occurs along the Intermountain Seismic Belt in western Montana as shown in Figure 4.4.1A.

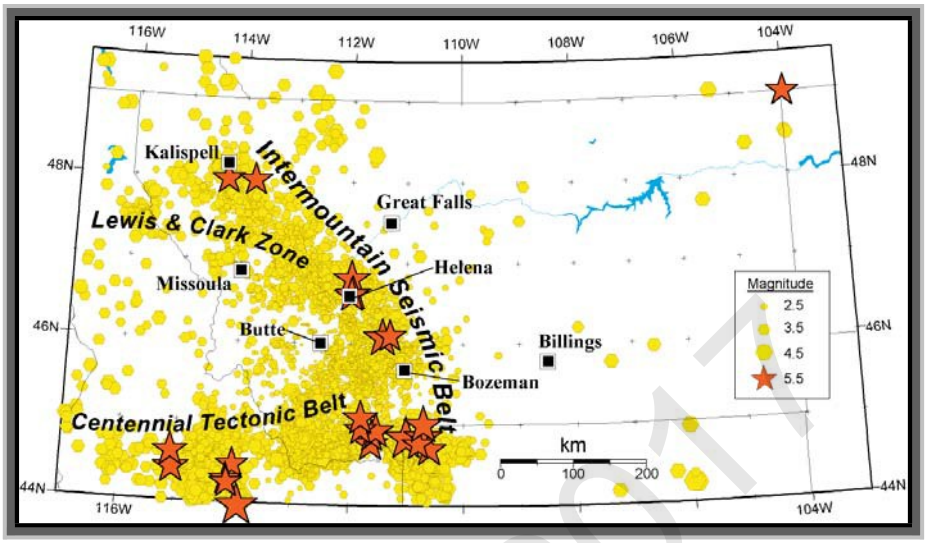

Figure 4-7. Figure 4.4.1A International Seismic Belt in Montana. Source: Montana Bureau of Mines and Geology, 2009.

The southern portion of Beaverhead County is located on the edge of the Intermountain Seismic Belt and in the middle of the Centennial Tectonic Belt. Beaverhead County has seven known faults: Centennial Fault, Red Rock Fault, East Muddy Creek Fault, West Muddy Creek Fault, Deadman Fault, Kissick Fault, and the Blacktail Fault. All of these faults are located in the southern half of the county and are part of the Centennial Tectonic Belt. Each year there are hundreds of small tremors recorded in this area.

When earthquakes do occur, they can threaten structural stability, infrastructure, and other property with very little warning, depending on the severity of the earthquake. Geologists primarily measure earthquake severity in two ways: by magnitude and by intensity. Magnitude is based on the area of the fault plane and the amount of slip. The intensity is based on how strong the shock is felt and the degree of damage at a given location. The most commonly used scales are the Richter magnitude scale, moment magnitude scale, and modified Mercalli intensity scale. [National Earthquake Hazards Reduction Program, 2009] The modified Mercalli scale measures quake intensity (observed effect) and is indicated on a scale ranging from the Roman Numeral I to XII, I representing minor damage and XII representing severe damage. With the Richter Scale, there are no high or low ratings. Magnitude increases by multiples of ten; a magnitude 5 earthquake is 10 times stronger than a magnitude 4 earthquake and 100 times stronger than a magnitude 3 earthquake.

4.4.2 HISTORY

The historic earthquakes of Montana are among the largest recorded in the continental United States. Beaverhead County has been within close proximity to many of those earthquakes. Pre-1900 earthquakes lack definitive records, however, a significant earthquake was noted in Beaverhead County near Dillon on November 4, 1897. The following earthquakes, since 1900, have affected Beaverhead County in some way.

Virginia City Earthquake, November 23, 1947 – *Richter magnitude 6.3, modified Mercalli intensity VIII, 25 miles west-northwest of West Yellowstone*. Damages were primarily confined to Madison County,

but the earthquake was felt in Beaverhead County. The earthquake was also felt in parts of Idaho, Washington, and Wyoming.

Hebgen Lake Earthquake, August 17, 1959 – *Richter magnitude 7.5, modified Mercalli intensity X, 15 miles north of West Yellowstone*. The Hebgen Lake Earthquake is the strongest earthquake to have occurred in the Northern Rockies since 1876. This earthquake caused 28 fatalities and about $11 million in damage to highways and timber, primarily in Madison and Gallatin Counties. Minor damage occurred throughout southern Montana. Aftershocks continued for several months. A USGS trenching study of the Hebgen Fault in 2000 estimated that the 1959 earthquake occurs roughly once every 3,000–5,000 years.

Borah Peak Earthquake, October 28, 1983 - *Richter magnitude 7.3, modified Mercalli intensity IX, 15 miles west of Mackay, ID.* The Borah Peak earthquake, the largest ever recorded in Idaho, caused two deaths and $12.5 million in damage. The earthquake caused significant surface faulting, rock falls, and landslides. Most of the damage occurred in the Challis and Mackay areas. Intensities in Beaverhead County likely reached VI on the modified Mercalli intensity scale. Minor damage was reported in Dillon while the school gym in Lima received extensive damage.

Red Rock Valley Earthquake, August 20, 1999 - *Richter magnitude 5.3, 4.3 miles north of Dell*. No damages reported.

[US Geological Survey, 2009; University of Utah, 2009; Idaho Geological Survey, 2009; Stickney, no date]

Figure 4-8. Figure 4.4.2A Damaged Chimney of Old Main Hall Following the 2005 Earthquake. The chimney was removed to prevent total collapse. Source: Stickney, no date.

Table 4-7. Table 4.4.2B Beaverhead County Earthquake Declared Disasters and Emergencies

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.4.3 PROBABILITY AND MAGNITUDE

Southwest Montana has a high probability of future earthquakes, although, damaging earthquakes are somewhat harder to predict. Earthquake experts use probabilities when determining the seismicity of an area. Peak horizontal acceleration is the maximum horizontal acceleration experienced by a particle during the course of the earthquake motion. When acceleration acts on a physical body, the body experiences the acceleration as a force. Gravity is a commonly known force of nature, and therefore, the units of acceleration are measured in terms of g, the acceleration due to gravity. At 10%g, pre-1940 dwellings are likely to perform poorly and pre-1975 dwellings are likely to have some vulnerability to earthquake shaking. [US Geological Survey, 2008]

The peak horizontal acceleration with a 10 percent probability of exceedance in 50 years in Beaverhead County ranges from 5%g to 30%g. To make sense of these values, at 9.2%g, the earthquake is felt by all with many frightened. Some heavy furniture is moved with a few instances of fallen plaster. Damage is considered slight. At 18%g, damage is negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, and considerable in poorly-built or badly designed structures. Some chimneys may be broken, and the shaking is noticed by people driving cars. At 34%g, damage is slight in specially designed structures, considerable in ordinary substantial buildings with partial collapse, and great in poorly built structures. Chimneys and walls may fall and heavy furniture is overturned. [Qamar, 2008]

In all of western Montana, an event of magnitude greater than 5.0 can be expected every 1.5 years, a magnitude of 6.0 or greater is expected every 10 years, and a magnitude 7.0 or greater is expected every 77 years. The highest recurrence rate of large earthquakes in Montana occurs in the Hebgen Lake-Yellowstone Region, followed by Helena and Three Forks. [Montana Disaster and Emergency Services, 2009a]

Overall Earthquake Probability: Low-Moderate

4.4.4 MAPPING

As discussed in the probability section, structural engineers often use peak horizontal acceleration as a guide for seismically designing structures. Map 4.4.4A shows the earthquake peak horizontal acceleration that has a 10 percent probability of exceedance in 50 years. The map also shows the known fault areas.

4.4.5 VULNERABILITIES

General losses from earthquakes can be estimated using HAZUS-MH, a loss estimation model developed by the Federal Emergency Management Agency. This model uses national datasets and hazard information to estimate the earthquake losses from a particular event at the census tract or county level. Although the default data and methods provided with the model contain many generalizations that could lead to inaccuracies, the model provides a ballpark estimate of what earthquake losses may occur and the magnitude of such. A structural engineer can make specific determinations on individual structures.

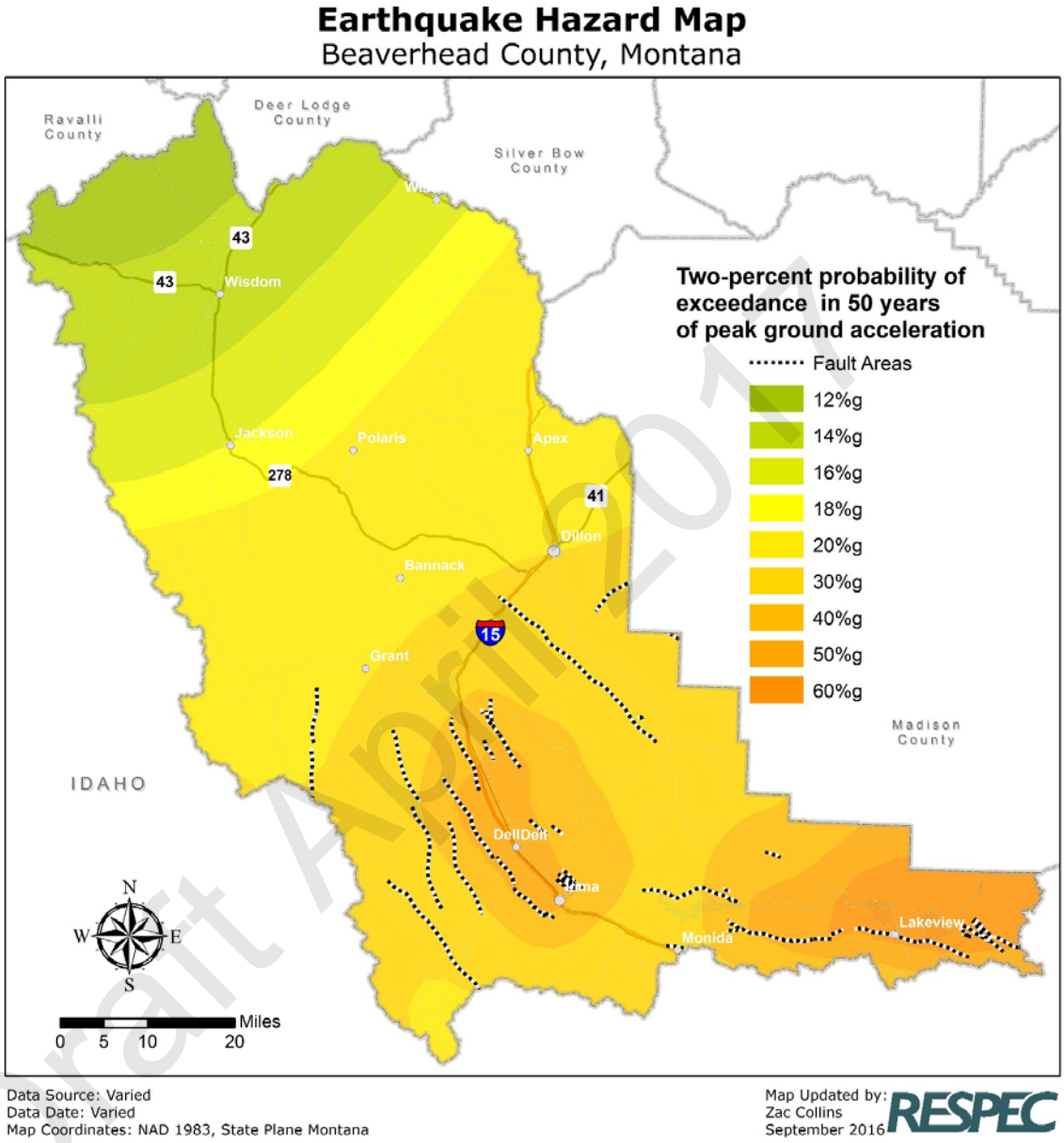

Figure 4-9. Map 4.4.4A.

One scenario was run through the model. The model used a 500-year probabilistic hazard with a 7.0 moment magnitude. Details on the results follow.

4.4.5.1 CRITICAL FACILITIES

Certainly, all critical facilities identified in this plan are not included in the national databases used by HAZUS-MH. The facilities included in the model were assigned a probability of at least slight damage given the 500-year, 7.0 moment magnitude

Table 4-8. ???

Classification	Total	# Facilities		
		Damage > 50%	Damage > 50%	> 50% on day
Hospitals	1	0	0	1
Schools	13	0	0	13
PoliceStations	2	0	0	2
FireStations	6	0	0	6

The HAZUS-MH scenario also estimates that Beaverhead County has a total of 31 hospital beds. On the day of the earthquake, only 22 beds (74%) are estimated to be available to existing patients and the injured. By one week, the number of beds increases to 29 beds (94%). By day 30 all beds will be back in use.

Possible losses/impacts to critical facilities include:

- Structural damages
  - Content losses
  - Loss of critical function.

Expected Earthquake Impact to Critical Facilities: Moderate

4.4.5.2 CRITICAL INFRASTRUCTURE

The HAZUS database contains 290 miles of highway, 174 bridges, and 526 miles of pipeline in Beaverhead County. Infrastructure, as quantified in the default HAZUS-MH database, suffers significant damages during the 500-year, 7.0 moment magnitude earthquake. Table 4.4.5A shows the estimated economic losses and damages by type.

Table 4-9. Table 4.4.5A HAZUS-MH Estimated Infrastructure Losses

Infrastructure System	Economic Losses	Damages
Highway	$98.5 million	
Airport	$86.6 million	
Potable Water	$8.5 million	18 leaks 5 breaks 36 households without water on Day 1 12 households without water on Day 7
Waste Water	$71 million	13 leaks 3 breaks
Natural Gas	$3.4 million	4 leaks 1 breaks

Possible losses to infrastructure include:

- Loss of potable water
- Sewer line breaks
- Gas line breaks
- Electric outages
- Damages to roads, bridges, and runways.

Expected Earthquake Impact to Critical Infrastructure: Moderate-High

4.4.5.3 STRUCTURES

Using the same HAZUS-MH methodology as the critical facilities, the building stock in Beaverhead County was tested through the 500-year, 7.0 moment magnitude probabilistic model. The results estimated that 11 structures would have complete damage, 104 structures would have extensive damage, 477 structures would have moderate damage, 1,242 would have slight damage, and 3,702 would have no damage. The building losses are broken into two groups: direct building losses and business interruption losses. The direct building losses are the projected costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the projected losses related to the inability to operate a business due to the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those who are displaced from their homes due to the earthquake. HAZUS-MH estimates the building-related economic losses countywide would be $37.2 million. As with any loss estimate, large errors may be present and estimations should only be used for planning purposes.

Possible losses/impacts to structures include:

- Structural damage
- Content losses
- Loss of function/habitability.

Expected Earthquake Impact to Structures: Moderate-High

4.4.5.4 POPULATION

Assuming the 500-year, 7.0 magnitude probabilistic earthquake occurred at 5 p.m. the following casualties are estimated by HAZUS-MH:

- 1 fatality
- 19 injuries will require medical attention but hospitalization is not needed
- 3 injuries will require hospitalization but are not considered life-threatening
- 0 injuries will require hospitalization and can become life-threatening.

Most of the casualties occurred in commercial structures.

Expected Earthquake Impact to the Population: Moderate

4.4.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Physical and functional damages to businesses.

Possible historic losses include:

- Structural losses, especially in older, unreinforced masonry and/or poorly constructed buildings
- Content losses.

Possible social losses include:

- Fear of aftershocks
- Emotional impacts from casualties
- Cancellation of activities.

Expected Earthquake Impact to the Values: Moderate-High

4.4.5.6 FUTURE DEVELOPMENT

Beaverhead County, Dillon, and Lima do not have residential building codes, except for electric and plumbing codes required by the State. However, most new construction is generally of decent quality. Structures built to current codes have a lower chance of suffering damages in a strong earthquake. Without code adoption and enforcement, future development is at risk from earthquake damages.

Expected Earthquake Impact to Future Development: Moderate-High

Other hazards often related to earthquake include:

- Dam failures
- Hazardous material releases.

4.5 FLOOD

Including Riverine, Ice Jam, Flash, and Urban Floods and Dam Failure

4.5.1 DESCRIPTION

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt and rainfall accumulates and overflows onto the banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers and lakes that are subject to recurring floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban areas. Extreme cold temperatures can cause streams and rivers to freeze, causing ice jams and creating flood conditions.

Hundreds of significant floods occur in the United States each year and kill an average of about 100 people annually. Flooding is one of the most deadly hazards nationwide and in Montana. Most injuries and deaths occur when people are swept away by flood currents, and most property damage results from inundation by sediment-laden water. Fast-moving water can wash buildings off their

foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of livestock.

4.5.1.1 RIVERINE AND ICE JAM FLOOD

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise on to normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks into adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snow packs, heavy spring rains, or a combination of the two.

Figure 4-10. Figure 4.5.1A Big Hole River on May 27, 2009.

An ice jam is a stationary accumulation of ice that restricts flow. Ice jams can cause considerable increases in upstream water levels, while at the same time, downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. When an ice jam releases, the effects downstream can be similar to that of a flash flood or dam failure. Ice jam flooding generally occurs in the late winter or spring. Ice jams in Beaverhead County are common.

In Beaverhead County, flooding can occur during any given year. Some factors that play a role in determining the severity of this type of disaster are: winter temperatures, duration of sub-zero temperatures, winter snow pack, drastic temperature fluctuations, early spring precipitation, and dam levels.

4.5.1.2 IDENTIFICATION AND MAPPING

The riverine hazard areas may be mapped as part of the National Flood Insurance Program (NFIP). Under this program, an area is broken into zones to depict the level of flood hazard. Most commonly, the areas within the 100-year floodplain are considered the greatest risk. The 100-year floodplain has a 1 percent chance of exceedance in any given year. Over a 100-year period, a flood of this magnitude or greater has a 63.5 percent chance of occurring. Structures in the 100-year floodplain are five times more likely to be damaged by flood than a major fire. [Federal Emergency Management Agency, 2009a]

Locations outside the 100-year floodplain may also experience flood conditions during greater magnitude floods, localized events, or along unmapped creeks, streams, and ditches.

The Flood Insurance Rate Maps (FIRMs) depicting flood-prone areas of Beaverhead County were last updated on September 30, 1982, for the City of Dillon on July 5, 1982, and for the Town of Lima on March 4, 1986.

The Beaverhead County Flood Insurance Study, including the incorporated jurisdictions, analyzes the flood hazards for Alder Creek, Beaverhead River, Blacktail Deer Creek, Carrigan Lane Drainage, Dillon Canal, Guidici Ditch, Junction Creek, Murray Gilbert Slough, Selway Slough, and Stodden Slough. May and June are the peak months for riverine flooding along the Beaverhead River because of mountain snowmelt. The construction of the Clark Canyon Dam in 1964 mitigated much of the flooding along the Beaverhead River near Dillon. Lima Reservoir and the Red Rock Lakes also provide storage for floodwaters downstream. Undersized culverts and road and railroad crossings on Blacktail Deer Creek and Junction Creek are the primary reasons for flooding in those areas. [Federal Emergency Management Agency, 1982]

Beaverhead County has a number of rivers and streams that have historically flooded and caused damage to buildings, roads, farm land, and residential areas. The Red Rock River is one of these drainages. It drains the southeastern portion of the county. Many tributaries flow into the Red Rock River as it runs through the Centennial Valley, depositing its water first into the Lima Reservoir. It then continues north through the valley and runs into the Clark Canyon Reservoir. The Red Rock River has flooded numerous times throughout history and has threatened property, lives, and livestock. Most of the flooding that has occurred has been during the winter months when ice flows create dams and force the river out of its banks. When temperatures drop to extreme lows, 10°F to –40°F, the river will begin to freeze from the bottom up, causing water levels to rise as it freezes. Flooding occurs when these extreme temperatures last for a long period of time. The river will eventually rise high enough to run out of its bank. At the same time, ice will form along the edges of the river and begin to freeze across the banks. When the temperature warms, the ice that formed along the banks breaks free and becomes floaters. These large pieces of floating ice hang up on islands, rock bars, debris, and other objects in the river creating ice jams that force the river out of its banks.

Another river that has caused numerous problems over the years is the Beaverhead River. This river runs from Clark Canyon Reservoir to the north end of Beaverhead County. Because the Clark Canyon Dam regulates spring runoff into the Beaverhead River, the primary cause of flooding is cold weather creating bottom icing and ice jams. Historically, the Beaverhead River has flooded at various times depending on the runoff from rains and snowpack. In 1965, the Clark Canyon Reservoir was built as a multi-use water storage facility, including recreation and flood control. In 1984, the flood control pool was exceeded because of a very large spring storm in the headwaters of this facility. Water for the first time went over the spillway. This left the river in an uncontrolled state because it was necessary to release as much water from the reservoir as possible to mitigate overtopping of the dam. These large discharges and other streams with large runoff feeding into the Beaverhead River below the dam caused some flooding problems in various areas of the Beaverhead River floodplain. This event could happen again in almost any year depending on the rainfall and snowpack in the watershed area. There

are also documented cases of the Beaverhead River flooding during the winter months from extreme cold and extreme influxes in temperatures, similar to the Red Rock River.

The blue ribbon fishery, the Big Hole River, has been one of the county's persistent problems when the spring runoff comes and has also been a problem at various times with winter ice jams and flooding. The Big Hole River drains the western and northern most reaches of the county. It also acts as the border between Beaverhead County and three other counties: Deer Lodge, Silver Bow, and Madison Counties. The Big Hole River has flooded several times in the past because of large amounts of runoff in the spring, two dam failures in two tributaries, and winter icing problems. Small portions of this blue ribbon stream, the more highly developed areas, have had floodplain studies completed. Despite these studies, development continues along the river from its headwaters to its confluence with the Beaverhead River, which forms the Jefferson River. A study completed in 2005, the Big Hole River Flood Inundation Potential Mapping and Channel Migration Zone Delineation, identifies floodplain and channel migration areas.

The Grasshopper Valley historically has flows from spring runoff and precipitation that has caused minor flooding in some specific areas. This area includes residential developments that were approved before subdivision regulations and floodplain regulations. This watershed drains into the Beaverhead River below Clark Canyon Reservoir and this contributes to the unregulated flows of the Beaverhead River.

The Blacktail Deer Creek has caused flooding problems in various areas along its corridor when spring runoff and above normal precipitation is present and during extreme winter cold spells.

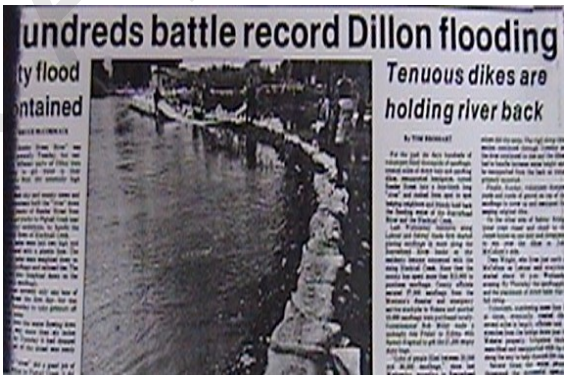

Figure 4-11. ???.

One major area of concern is in the City of Dillon. Two culvert bridge structures along Blacktail Deer Creek at Reeder Street and Railroad Street chronically ice up in the winter and cause flooding into residential areas in the middle of the city. Water levels rise and the west side of the city, usually encompassing a twelve square block area, is flooded. These two structures were installed in the 1950's, before floodplain regulations and good engineering practices. These two structures have been causing flooding problems since their installation. Map 4.5.1B shows the impact areas in blue. A mitigation project to fix the culvert bridges and streambed was underway in 2009.

Figure 4-12. Checking the Plans. Beaverhead County Engineer Jim Carpita, Disaster and Emergency Services Coordinator Larry Laknar, and County Commissioner Mike McGinley look over plans for the Blacktail Deer Creek Pre-Disaster Mitigation Project. The culvert style Reeder Street Bridge, shown in the background, will be replaced. Photo by J. P. Plutt. Source: Dillion Tribune 9/9/06.

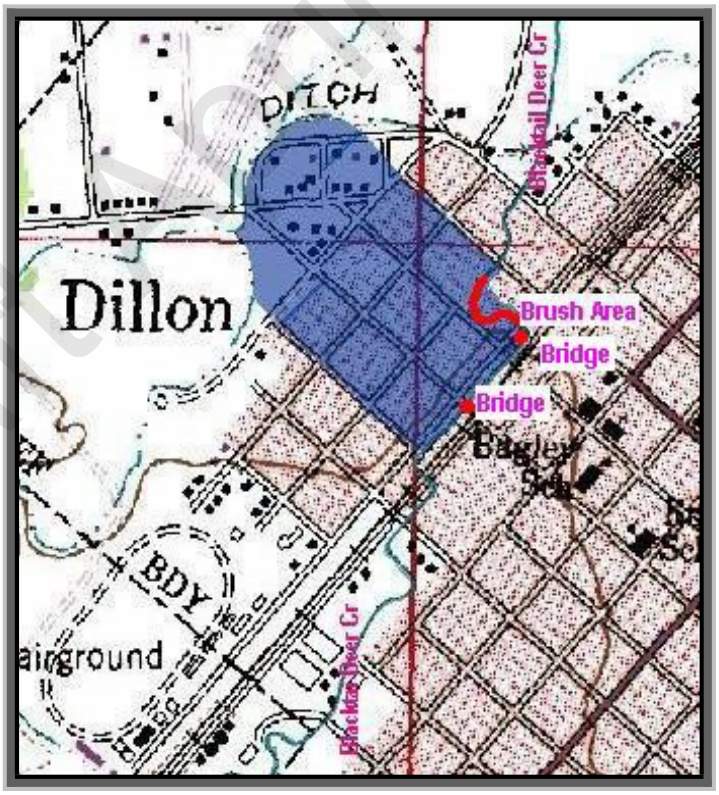

Figure 4-13. Map 4.5.1B Blacktail Deer Creek Problem Areas in Dillon.

About 7.5 miles south of Dillon, the creek has an elevated streambed section just downstream of a bridge with very little water clearance. During extreme cold temperatures, the creek freezes from the bottom up, forcing the water to overflow the banks where the creek bed is quite shallow. The bridge then acts as a dam, forcing the water out of the banks upstream of the bridge. Once out its banks, the

water runs uncontrolled across fields, eventually reaching residential developments and washing out roads. Map4.5.1C shows this area. The blue shading represents the impact area.

Figure 4-14. ???.

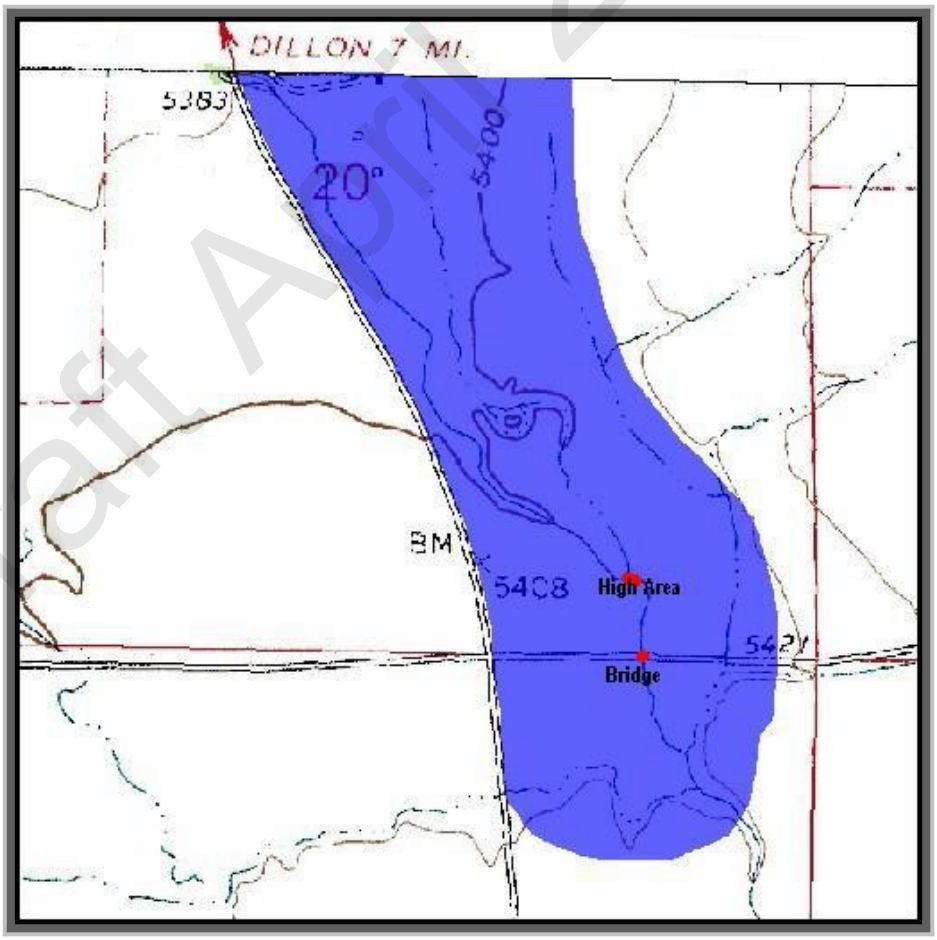

Figure 4-15. Map 4.5.1C Blacktail Deer Creek Problem Area South of Dillon.

4.5.1.3 FLOODPLAIN MANAGEMENT

The floodplain in Beaverhead County, the City of Dillon, and the Town of Lima is managed through floodplain ordinances. All jurisdictions participate in the National Flood Insurance Program (NFIP) and have a designated floodplain administrator that issues and reviews permits for development in the floodplain. No changes in NFIP participation have occurred in Beaverhead County or the incorporated jurisdictions since the last plan update.

In 2011 the Montana DNRC instigated new floodplain mapping for 116 miles of the Big Hole River. Other participants include the Big Hole Watershed Committee, surrounding counties, Future West, Respec, and Montana DEQ. After draft maps were completed by Respec and public meetings held in 2013, The DNRC issued a Final Order on January 13th, 2015 to adopt the reports and maps. Local and county floodplain management regulations have been updated with the new floodplain maps as well as the data form the report. The link below is the DNRC web page for the study as well as the location to find the DNRC Big Hole Floodplain Study Final Order and the products of the study.
http://dnrc.mt.gov/divisions/water/operations/floodplain-management/big-hole-floodplain-study-products

Even though many of the waterways have floodplain regulations in place and subdivisions have regulations today, most of them did not have such regulations in place at the time of earlier residential developments.

4.5.1.4 FLOOD INSURANCE

Residents of Beaverhead County and the jurisdictions have the opportunity to purchase flood insurance through the National Flood Insurance Program. Currently, 38 policies are in force in Beaverhead County, including 26 within the City of Dillon. Beaverhead County and the incorporated jurisdictions do not have any National Flood Insurance Program repetitive loss properties as of October 31, 2016.
[Federal Emergency Management Agency, 2016]

4.5.1.5 FLASH FLOOD

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

A flash flood generally results from a torrential (short duration) rain or cloudburst on a relatively small drainage area. Chinook winds, warm dry winds, and early spring rain storms that are typical to the area often lead to the rapid melting of snow and cause flooding.

4.5.1.6 URBAN FLOOD

Urban flooding is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization increases runoff two to six times more than natural terrain. [National Oceanic and Atmospheric Administration, 1992] The flooding

of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

4.5.1.7 DAM FAILURE

A dam is a barrier constructed for the purpose of preventing, restricting, or regulating the flow of water. Dams are generally made of earthen materials or concrete. Earthen dams tend to be more forgiving and withstand more than concrete dams when it comes to earth movement due to earthquakes and volcanic action. Most often, these dams are used for flood control, irrigation, recreation, and stock watering.

Dam failure occurs when one of these human created barriers becomes structurally unstable. If the instability of the structure is not recognized early enough, the material making up the dam can blow out causing a massive wall of water to flood lands located downstream. Dam failure usually occurs as a secondary effect of storms or earthquakes.

Although not particularly likely, seismic activity, poor maintenance, overwhelming flow conditions, and terrorist activities can all lead to the catastrophic failure of a dam. The result is the rush of water contained by the dam downstream at a rapid pace. The structural integrity of a dam depends on its design, maintenance, and ambient conditions. Dams exist in a variety of shapes, sizes, and materials. Uses include recreation, flood control, irrigation, water supply, and hydroelectricity. Should a dam fail, the consequences can be devastating or minimal depending on the dam's characteristics and regional attributes.

Most dams are classified based on the potential hazard to life and property should the dam suddenly fail. Note the hazard rating is not an indicator of the condition of the dam or its probability of failure. Definitions, as accepted by the Interagency Committee on Dam Safety, are as follows:

- Low Hazard Potential
  - Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
- Significant Hazard Potential
  - Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environment 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.
- High Hazard Potential
  - Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

Source: Federal Emergency Management Agency, 2004a.

According to the National Inventory of Dams database, Beaverhead County has 46 dams, 7 high hazard, 4 significant hazard, and 35 low hazard. In 2016 the Montana DNRC worked with FEMA and Gannett Flemming Inc. to produce the Dam Owner Emergency Intervention Toolbox (2016)

(http://dnrc.mt.gov/divisions/water/operations/dam-safety/cool-tools-for-dam-safety/MDNRCDamOwnerEmergencyInterventionToolbox_Final.pdf)

This Dam Emergency Intervention Toolbox was developed to provide owners of dams throughout the United States with the necessary information and tools to identify and remedy unsafe conditions which may develop. In addition to presenting identification techniques and intervention actions that may be performed to prevent or delay an incident resulting from an observed unusual dam condition, the toolbox includes background information on embankment dams, inspection guidelines, and recordation practices for monitoring procedures. User-input sections of the toolbox support the text and allow for site-specific recommendations. Figure 1: Map of Dams across the United States Source: National Inventory of Dams Dam Owner Emergency Intervention Toolbox Page 2 for all dams with an Emergency Action Plan (EAP), this Dam Emergency Intervention Toolbox and the EAP should be considered companion documents for responding to emergency events. While this document contains general guidance responding to emergency conditions at dams, EAPs contain information for coordination with local emergency responders during emergency circumstances.
Source: Dam Owner Emergency Intervention Toolbox, 2016

Table 4.5.1D shows the high and significant hazard dams in Beaverhead County. [US Army Corps of Engineers, 2009]

Table 4-10. Table 4.5.1D Dams in Beaverhead County

Dam Name	Water Body	Hazard	Owner
Agnes Lake Dam	Agnes Creek	High	Burk Ranches Inc.
Boot Lake Dam	Birch Creek	High	Beaverhead Water Company
Clark Canyon Dam	Beaverhead River	High	US Bureau of Reclamation
Kelley Dam	Rattlesnake Creek	High	Rattlesnake Reservoir Company
Lima Dam	Red Rock River	High	Beaverhead County Red Rock River Water/Sewer District
Pear Lake Dam	Birch Creek	High	Beaverhead Water Company
Tub Lake Dam	Birch Creek	High	Beaverhead Water Company
Anchor North Dam	Tributary of Birch Creek	Significant	Beaverhead Water Company
Anchor South Dam	Tributary of Birch Creek	Significant	Beaverhead Water Company
Bond Lake Dam	Bond Creek	Significant	Beaverhead Water Company
Estler Lake Dam	Estler Creek	Significant	Estler Reservoir Company

Source: US Army Corps of Engineers, 2009.

Of most concern to the Dillon area are the Clark Canyon and Lima Dams. The Clark Canyon Dam is an earthen dam that was built in 1965. The face of the dam is 125 feet tall and the dam has a carrying capacity of 329,000 acre-feet of water. Because the dam is located at the head of a narrow winding canyon, it is projected that if the dam were to break, a 25 foot wall of water would hit Dillon. This would not only cause devastation to the city proper but also to large amounts of farm and ranch land, numerous subdivisions, and water supplies. If adequate time were not given to an unsuspecting

population, the loss of lives would be quite high. With the surrounding area being agricultural in nature, there would be a large impact on the agricultural industry in the area. Loss of crops and livestock would economically impact the community. Also located in the path of this potential wall of water are two very important industries. Located approximately twelve miles south of Dillon is the Montaqua Water Bottling Company. Directly at the mouth of the canyon is Barrett Minerals, a talc processing plant that processes talc from a local mine and ships throughout the United States.

Figure 4-16. Figure 4.5.1E Clark Canyon Dam.

The Lima Dam is an earthen dam that was first constructed in the late 1800's with significant reconstruction in the 1930's and 1990's. The dam drains approximately 570 square miles, is 58 feet tall, 455 feet long, and has a crest width of 30 feet. The spillway is classified as uncontrolled. The entire face of the dam is roller compacted concrete which will allow water to run over the dam face without deteriorating the dam. The reservoir has a carrying capacity of approximately 84,000 acre-feet of water. Many residential homes and ranches are located downstream from the Lima Reservoir. These structures would be severally flooded if the dam were to break and the potential for a high number of fatalities exists. The flooding would also impact roads, bridges, utilities, and other infrastructure components. Floodwaters could also reach Dell and cause property damage to buildings and other facilities. Because Lima Reservoir is located 30 miles upstream of the Clark Canyon Reservoir, if Lima Dam were to break, the influx of water into Clark Canyon Reservoir could dramatically increase the potential for failure of that dam or cause the dam to exceed its carrying capacity and cause excessive water to run over the spillway. This could create possible flooding in the valley below because of uncontrollable flow into the Beaverhead River.

The Kelley and Estler Lake Dams, located in the Rattlesnake Creek drainage approximately 20 and 26 miles respectively northwest of Dillon, are of particular significance because they serve as the alternate water supplies for Dillon. The small community of Argenta is on Rattlesnake Creek roughly 6 miles below Kelley Reservoir. If the Estler Lake Dam broke, it would deposit an uncontrolled wall of water into Kelley Reservoir. This would place additional stress on the Kelley Reservoir Dam, greatly increasing the chance of its failure and would produce uncontrolled flows in Rattlesnake Creek, increasing the chance of death and property damage downstream.

Given the seismic potential in the area, dams in Beaverhead County are especially vulnerable to earthquakes.

4.5.1.8 WARNINGS, WATCHES, AND ADVISORIES

Dam failure or levee breeches can occur with little to no warning. Storms may create a flood in a few hours or even minutes for locations upstream of dams. Flash floods can occur within 5 hours of the beginning of heavy rainfall and dam failure can occur within hours of the first warning signs of breaching. Failures and breaches can also occur days to weeks after a storm as a result of debris jams or snow melt.

The National Weather Service issues flood warnings, watches, and advisories when flood conditions are forecast. The following products may be issued:

- Flood Watch: Flood watches inform the public of conditions which may cause gradual flooding within the next 36 hours, but the flooding is neither certain nor imminent.
- Flood Warning: Flood warnings are issued when flooding is expected to occur more than 6 hours after the causative event.
- Flood Advisory: Flood advisories are issued when main stem river flows are elevated and flooding of low-lying areas is possible.
- Small Stream Flood Advisory: Small stream flood advisories are issued when small streams are rising and flooding of low-lying areas or ponding of water in urban areas are possible.
- Flash Flood Watch: Flash flood watches inform the public of conditions which may cause short duration, intense flooding from heavy precipitation, snow melt, dam failure, or ice jams within the next 36 hours, but the flooding is neither certain nor imminent.
- Flash Flood Warning: Flash flood warnings are issued when flooding is imminent during short term events requiring immediate action. Flash flooding occurs when the water level rises rapidly to inundation within 6 hours of a causative event (i.e. heavy precipitation, snow melt, dam failure, or ice jams).

Source: National Weather Service, 2006

4.5.2 HISTORY

Table 4-11. Table 4.5.2A Flood Events in Beaverhead County (Page 1 of 2)

Date	Type	Impacts
May 13, 1894	Dam Failure	A dam failure was recorded on the Lima Dam.
1912	Dam Failure	Breach in the Boot Lake Dam in the Birch Creek drainage. The dam was reconstructed.
July 14, 1927	Dam Failure	The Montana Power Company holding dam washed out on Pattengail Creek, upstream of Wise River. The entire community of Wise River, with the exception of the hotel, was washed downstream. Four people were killed. Reconstruction cost over $1.1 million. Damages included the railroad, state and county roads, bridges, buildings, ranch and farm structures, power lines, and communications services.
May 1933	Dam Failure	A leak developed into a large hole on the Lima Dam. The dam had to be reconstructed. Several ranches were flooded and damages to bridges, head gates, diversion dams, and roads occurred.
1937	Ice Jam	High river stages and some localized flooding.
June 1944	Riverine	Red Rock River near Dell reached 4.85 feet, the peak height of record for the site.
1949	Ice Jam	High river stages and some localized flooding.
1951	Ice Jam	High river stages and some localized flooding.
February 1952	Ice Jam	Blacktail Deer Creek near Dillon reached 4.62 feet due to backwater.
April 1952	Riverine	Red Rock River at Kennedy Ranch near Lakeview reached 5.24 feet. Big Sheep Creek near Dell reached 7.72 feet.
April 1954	Riverine	Red Rock River at Kennedy Ranch near Lakeview reached 5.41 feet.
March 1956	Riverine	Grasshopper Creek near Dillon reached 6.47 feet, the peak height of record for the site.
April 1969	Riverine	Muddy Creek near Dell reached 4.52 feet. Grasshopper Creek near Dillon reached 6.17 feet.
June 1972	Riverine	Big Hole River near Melrose reached 8.04 feet
1974	Ice Jam	High river stages and some localized flooding.
June 1974	Riverine	Wise River near Wise River reached 8.43 feet, the peak height of record for the site.
January 1979	Ice Jam	High river stages and some localized flooding.
May 1984	Riverine	Red Rock River at Kennedy Ranch near Lakeview reached 5 feet. Muddy Creek near Dell reached 4.44 feet. Big Sheep Creek near Dell reached 7.87 feet, the peak height of record for the site. Blacktail Deer Creek near Dillon reached 4.86 feet, the peak height of record for the site. Water was over the spillway at the Clark Canyon Dam. County bridges and roads sustained major damages. A state disaster was declared.
June 20, 1984	Dam Failure	An earthen dam on Browne's Lake failed, causing damages to roads, bridges, head gates, diversion dams, and farm land. Losses were estimated at $100,000.
January 10, 1993	Ice Jam	Floating ice created ice jams throughout the county, including the Red Rock and Beaverhead Rivers.
March 1994	Ice Jam	Ice jams occurred on the Red Rock and Beaverhead Rivers.

Table 4-11. Table 4.5.2A Flood Events in Beaverhead County (Page 2 of 2)

Date	Type	Impacts
February 21, 1995	Ice Jam	Extreme cold led to flooding from ice throughout the county.
March 11, 1995	Riverine	Flooding at Lima from Junction Creek caused structure, road, and bridge damage. A state disaster was declared for the Town of Lima. Widespread flooding occurred throughout the county during the spring of 1995.
February 1996	Ice Jam	Ice jams occurred on the Red Rock and Beaverhead Rivers.
June 1997	Riverine	Big Hole River near Melrose reached 8.09 feet, the peak height of record for the site. Widespread flooding occurred throughout the county.
February 1, 1998	Ice Jam	Ice jam flooding occurred along Blacktail Deer Creek at Dillon. A local disaster was declared.
June 28, 2001	Log Jam	A log jam occurred on the Beaverhead River.
May 30–June 3, 2003	Riverine	Snowmelt brought the Big Hole River over its banks. Several rural roads were washed out, lowland pastures were flooded, and a few homes were threatened.
July 9, 2005	Flash	A thunderstorm caused flooding of a subdivision 3 miles north of Dillon. Basement flooding and culvert overflows were reported.
July 22, 2008	Flash	Thunderstorm runoff flooded many Dillon streets to several feet.
January 4, 2011	Ice Jam	Ice jamming was occurring along the Beaverhead River in Twin Bridges affecting private residential areas on Bridge street as well as Jessen Park. During the event, Jessen Park was closed due to flooding and several private residences and the high school were affected.
June 17, 2013	Flash Flood	Flash flooding reported in Bannack State Park created a small debris flow and 5 injuries were reported by Beaverhead County DES Manager. Heavy rain of .77 inches was reported in about 30 minutes in the park.

Sources: Federal Emergency Management Agency, 1982; National Climatic Data Center, 2009; National Center for Environmental Information, 2016.

Table 4-12. Table 4.5.2B Beaverhead County Flood Declared Disasters and Emergencies

Declaration	Year	Additional Information	Casualties	Damages/Assistance
ST-84-1 (state)	1984	Beaverhead County	None	$388,784 state share $23,699 local share
MT-1-95 (state)	1995	Town of Lima	None	$38,994 state share $385 local share

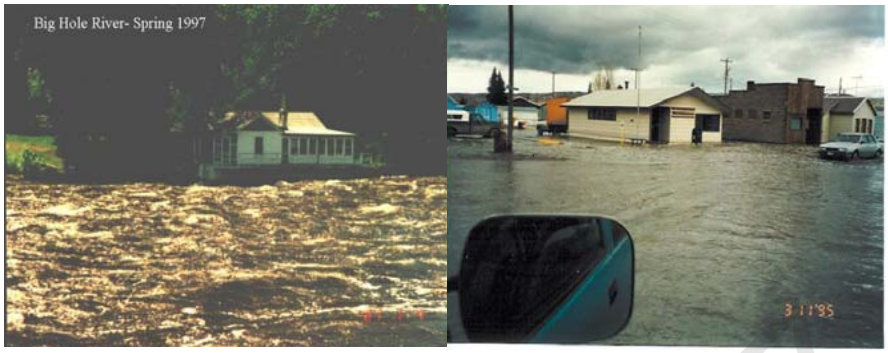

Figure 4-17. Left: Figure 4.5.2C Flooding on the Big Hole River During the Spring of 1997. Right: Figure 4.5.2D Flooding in Lima on March 11, 1995.

4.5.3 PROBABILITY AND MAGNITUDE

Floodplain mapping through the National Flood Insurance Program geographically demonstrates the 100- year riverine flood probability. The 100-year floodplain has a 1 percent probability of being exceeded in any given year, however, only those areas that are mapped have geographic depictions of their flood probabilities. For other areas, estimated probabilities can be based on the historical occurrence.

For flood, the 500-year events typically represent the worst-case scenarios. Detailed mapping of the 500-year hazard areas only exist for Big Hole river in Beaverhead County (MT DNRC 2015) however, such an event would likely cause significant problems. Damages to structures, infrastructure, and the economy could be expected in areas that have never flooded in recorded history. With only 26 flood insurance policies in force in Beaverhead County, 11 in Dillon, and 1 in Lima as of September 30th, 2016, many property owners will not have many options for financial recovery from floods because most homeowners' insurance policies do not cover flood damages.
Federal Emergency Management Agency National Flood Insurance Program (NFIP), 2016

Overall Flood Probability: Moderate-High
Except the Town of Lima: Moderate

4.5.4 MAPPING

Typically, as part of the NFIP assessment, the Federal Emergency Management Agency (FEMA) conducts a Flood Insurance Study (FIS) to identify the community's risk levels. The Flood Insurance Study includes statistical data for river flows, rainfall, topographic surveys, and hydrologic and hydraulic analyses. After examining the FIS data, FEMA creates Flood Insurance Rate Maps (FIRMs) delineating the different areas of flood risk. Land areas that are at high risk for flooding are called Special Flood Hazard Areas (SFHAs), or floodplains. The floodplain maps are not available digitally and are only available in hard copy map format from the Federal Emergency Management Agency or the local floodplain administrator. Digital mapping of the Big Hole River was developed through a study conducted in 2005; this mapping is not used for NFIP purposes but was used for the hazard analyses here.

In 2014 the DNRC conducted approximate level floodplain analysis for 117 miles of the Big Hole River. This analysis was the final phase in conducting a NFIP approximate level floodplain study for most of the entire length of the Big Hole River. Floodplain mapping was performed utilizing ESRI ArcMap 10.0 in conjunction with Atkins' aforementioned proprietary floodplain mapping tool RASGEO. Using RASGEO, the results of the modeled 1- and 0.2-percent-annual-chance events were utilized to create a DEM of the respective water surface profiles. RASGEO then intersects the water surface DEMs with the 5-m DEM in order to delineate the boundaries of the respective floodplains. During the creation of the final floodplain shapefiles, the majority of islands found within the floodplains of the 1- and 0.2-percent-annual-chance events were removed. All island areas that were deemed higher than the adjacent 1- and 0.2-percent-annual-chance water surface profile that were less than one acre in size were removed utilizing ArcMap 10.0. Any backwater areas that extended through multiple cross sections were also modified to represent the elevation associated at the point which the backwater initiates from the main channel. These adjustments provide a slight variance in the mapped widths versus the top widths described by the HEC-RAS model. A model and mapped top width check was performed where discrepancies are documented, included as Appendix C. It should be noted that larger islands and islands relating to residences or roadway embankments were left as originally mapped.
Source Big Hole River Approximate Level Floodplain Study Hydraulic Analysis and Floodplain Mapping, 2014.

Alternatively, outside of the Big Hole area FEMA's HAZUS-MH Flood Module software uses sophisticated GIS technology to show the estimated flood hazard areas. A 500-year analysis was conducted for Beaverhead County along the Beaverhead River and Wise River using default HAZUS-MH data. Note that HAZUS-MH did not contain adequate data to analyze the Big Hole River, Blacktail Deer Creek, Grasshopper Creek, or Red Rock River. Map 4.5.4A shows the hazard areas.

For unmapped areas, floodplains were recognized first by identifying rivers and streams and then reviewing information from historical events and data that was available. After studying existing floodplain maps, buffer zones were created using the following criteria:

- Rivers: 1,320 feet each side
- Streams: 660 feet each side
- Intermittent: 330 feet each side.

Topography plays a very important role in flooding, and the buffer zones were determined without any consideration for topography. The disadvantage to this method is that it is fairly general and doesn't adequately address known flood prone areas nor remove those areas that are not flood prone. The advantage of this method is that it allows some analysis of unmapped floodplain areas.

The dam inundation maps for the hazardous dams in and near Beaverhead County are available in paper format and can be found in the Beaverhead County Disaster and Emergency Services office. A failure of the Lima Dam is restricted to the floodplain along the Red Rock River and would not inundate Lima, but would totally inundate Dell. The inundation area of the Clark Canyon Dam includes all Beaverhead River bottom reaches below the dam extending to the north boundary of the county. Map 4.5.4B shows the areas of Dillon that are projected to flood during a Clark Canyon Dam failure. The pink area represents the 100-year floodplain and the red area represents the dam failure.

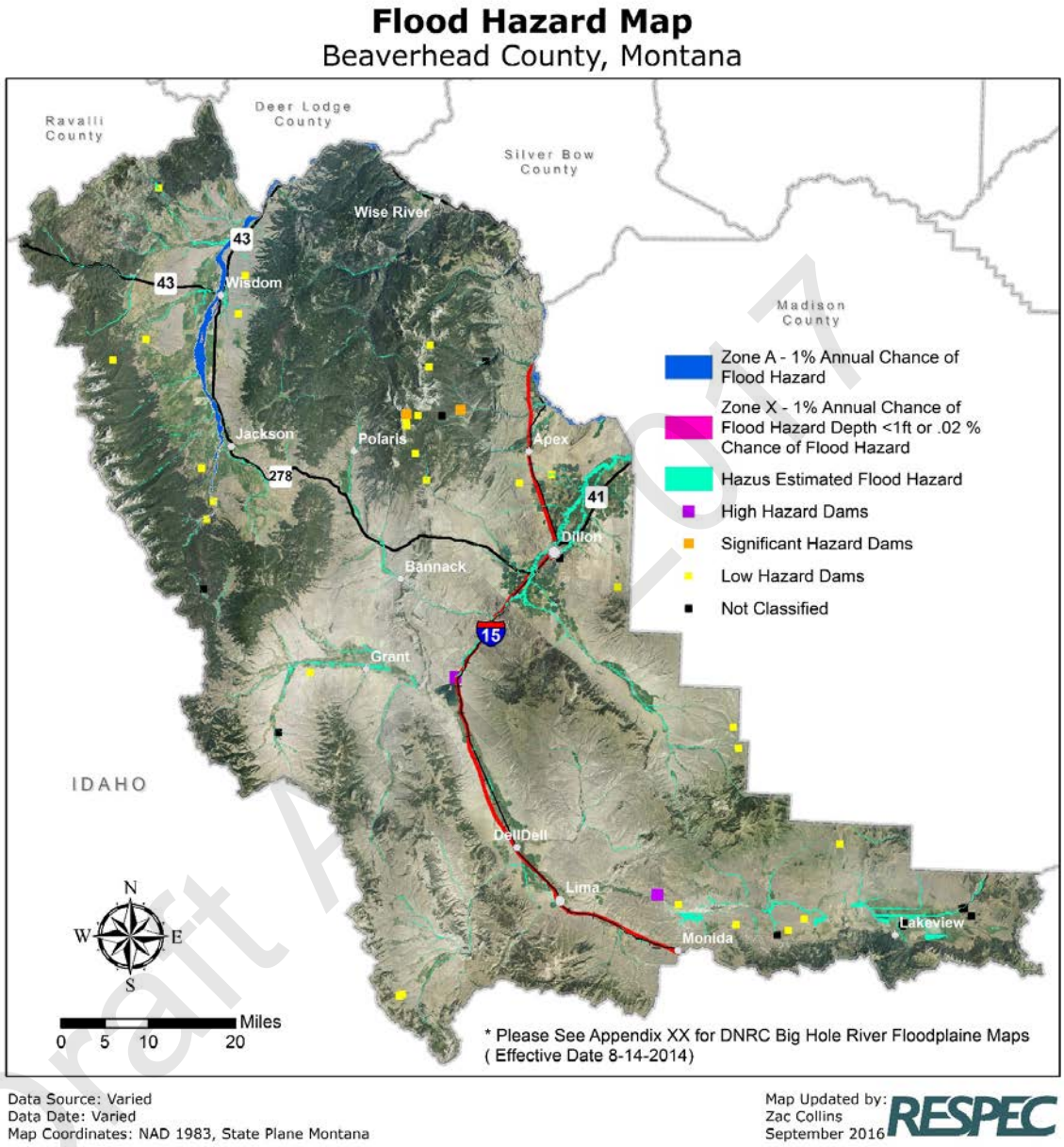

Figure 4-18. Map 4.5.4A.

4.5.5 VULNERABILITIES

Riverine flood losses were estimated by comparing the estimated floodplains to structure and infrastructure data. In addition, essentially any structure or infrastructure in the county or the jurisdictions could experience flash flood damages; these damages all depend on exactly where the heavy rain or snowmelt occurs.

The type of property damage caused by flood events depends on the depth and velocity of the floodwaters. Faster moving floodwaters can wash buildings off their foundations and sweep cars downstream. Extensive damage can be caused by basement flooding. Most flood damage is caused

by water saturating materials susceptible to loss such as wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances.

Figure 4-19. Map 4.5.4B Dillon Dam Failure Hazard Areas.

FEMA's Hazus Analysis Module determines damage percentages for various building types. Table 4.5.5A shows the estimated percentages of building and contents losses from flooding at depths of 1 foot, 3 feet, and 6 feet.

Table 4-13. Table 4.5.5A Flood Building and Contents Loss Estimation Percentages

Structure Type	Flood Depth		
	1 foot	3 feet	6 feet
RES1 - One story	23% building damage	40% building damage	59% building damage
No basement	26% content damage	44% content damage	64% content damage
RES1 - Two story	12% building damage	18% building damage	24% building damage
No basement	11% content damage	23% content damage	39% content damage
RES1 - One story with Basement*	32% building damage	46% building damage	65% building damage
	19% content damage	25% content damage	32% content damage
RES1 - Two story with Basement	21% building damage	29% building damage	44% building damage
	18% content damage	29% content damage	42% content damage
RES2 - Manufactured Housing	44% building damage	73% building damage	81% building damage
	27% content damage	64% content damage	78% content damage

* By default, Hazus now uses the damage functions from the FEMA Benefit Cost Analysis tool, which may greatly increase loss estimates for these specific building types than versions of Hazus before Hazus 3.0. Source: Federal Emergency Management Agency, 2016.

4.5.5.1 CRITICAL FACILITIES

Data included with HAZUS-MH has a few of the critical facilities, but certainly not all of them. Runs of this model for the Beaverhead and Wise Rivers showed no losses to critical facilities during floods up to the 500-year event. While this estimate is encouraging, comparing the more detailed database of critical facilities to the estimated flood hazard areas shows that some facilities are vulnerable to floods. These facilities include:

- Beaverhead County Museum
- Brookside Village Apartments Retirement Homes, Dillon
- Dillon Post Office
- Grasshopper Valley Volunteer Fire Department, Polaris
- Lima City Hall
- Lima Volunteer Fire Department
- US Bureau of Land Management Office, Dillon
- Wise River Post Office.

Losses from flash floods are always possible to essentially any facility. Failure of the Clark Canyon Dam would possibly inundate all of the critical facilities in Dillon. Critical facilities in Lima could become inundated following the failure of the Lima Dam.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Vehicle losses
- Critical functional losses
- Critical data losses.

Expected Flood Impact to Critical Facilities: Moderate

4.5.5.2 CRITICAL INFRASTRUCTURE

Critical infrastructure is often threatened by floods. The most common losses are to roads, bridges, water systems, and sewer systems.

Failure of the Clark Canyon or Lima Dam would impact highways, county roads, bridges, railroad, and utilities. The Kelley and Estler Dams would affect State Highway 278 and Interstate 15.

Possible losses to critical infrastructure include:

- Road, bridge, and culvert losses
- Water and sewer system losses
- Blocked, flooded roads
- Electric service disruptions
- Railroad losses

- Telephone service disruptions.

Expected Flood Impact to Critical Infrastructure: Moderate-High

4.5.5.3 STRUCTURES

Building counts shown in Table 4.5.5B are generated through FEMA's Hazus software. This data is based on 2010 US Census data aggregated at the Census block level. With the release of Hazus 3.0, a modified Census block dataset, called dasymetric data, became the default boundary used for loss estimation. The dasymetric data was created for the US Army Corps of Engineers and shared with FEMA for use in Hazus. The dasymetric data is created by removing portions of the standard, homogeneous Census block that are assume to be unpopulated, which includes water and wetlands, scrub land, forests, and other land use types. This approach does not modify the building counts or values of the Census block, it modifies the block geometry to consolidate the building inventory into the areas that are assumed to be habitable. The dasymetric data was introduced to address over-estimation of losses by the Hazus software with new results approximate 30% lower on average.

In Beaverhead County, roughly 7% of the built environment is not captured by the dasymetric data. *Based on the Montana Cadastral data for Beaverhead County, dated 1/16/2017, where Total Building Value is populated with a number other than 0.

The Hazus flood analysis methodology was also updated with Hazus 3.0 to address a long-existing defect in the software where building foundation heights were not being used as designed. Correcting this defect will have an impact on the results and in most cases, reduce estimated flood losses.

Table 4-14. Table 4.5.5B Estimated Flood Exposure

Study Areas	Estimated Number of Structures in the Flood Hazard Area	Estimated Total Building Costs
100 Yr County (HAZUS-MH)	258 structures	$19 Million
500 Yr County (HAZUS-MH)	298 structures	$26.7 Million
Big Hole River Study (DNRC)	7 Structures	$58,000

Sources: Big Hole River Study 100-year and 500-year; 2015 Hazus 3.1, 2016

Table 4-15. Table 4.5.5C Dam Failure Exposure

Dam(s)	Estimated Structure Impacts
Clark Canyon Dam	All along the Beaverhead River and partially up Grasshopper Creek. Peak water would reach Dillon about 4-6 hours after a break with a possible height of 25 feet. Most structures in Dillon would be impacted.
Kelley and Estler Dams	An RV park and numerous homes would be impacted.
Lima Dam	Rural areas outside Lima and the community of Dell would be impacted. 46 locations would be called and evacuated.

Sources: Beaverhead County Red Rock River Water and/or Sewer District, 2008; Rattlesnake Reservoir Company, 2003; US Bureau of Reclamation, 2002.

Beaverhead County does not have any National Flood Insurance Program repetitive loss properties as of June 2016. A repetitive loss property is defined as "any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978." [FEMA, 2009a]

Regular homeowners' insurance typically does not cover flood losses. Therefore, to financially protect their properties, owners must purchase flood insurance. Table 4.5.5E shows the flood insurance statistics for Beaverhead County.

Table 4-16. Table 4.5.5E Beaverhead County Flood Insurance Statistics

Location	Policies	Insurance In-Force	Total Loss Payments 1978–Feb. 2008
Beaverhead County, unincorporated areas	24	$4,259,200	$0
City of Dillon	24	$2,637,300	$2,464.07
Town of Lima	0	$0	$0

Source: Federal Emergency Management Agency, 2016.

Possible losses to structures include:

- Structural losses
- Contents losses
- Vehicle losses
- Displacement losses.

Expected Flood Impact to Structures: Moderate-High

4.5.5.4 POPULATION

Slow-rising riverine floods usually have a fair amount of warning time and allow people to evacuate from the hazard areas. Based on the history involving rescues of people and animals, the entire population has not historically heeded or received warnings. Flash floods may not have lengthy lead times. Heavy rains can quickly inundate areas not typically prone to flooding, roads can washout and become a hazard to vehicle occupants, and normally dry channels may fill up with rushing waters. Throughout the United States, an average of 82 people die each year from floods, based on the 30-year history from 1986 to 2015. [National Weather Service, 2015]

Expected Flood Impact to the Population: Moderate

Possible economic losses include:

- Agriculture losses caused by reduced profits, damaged crops, killed livestock, or delays in planting
- Transportation delays due to road infrastructure losses or closures

- Business interruptions and physical losses.

Possible ecologic losses include:

- Biodiversity losses could occur if toxins were released into the flood waters, but flooding typically benefits riparian areas.

Possible historic losses include:

- Structural, contents, and physical losses to historic properties from flood waters.

Possible social losses include:

- Cancelled activities due to road infrastructure losses or damaged properties
- Emotional impacts due to long term evacuations, property losses, and casualties

Expected Flood Impact to the Values: Moderate

4.5.5.5 FUTURE DEVELOPMENT

Beaverhead County, the City of Dillon, and the Town of Lima participate in the National Flood Insurance Program and have ordinances regulating development in floodplain areas. New development in unmapped areas could potentially occur in areas prone to flooding and increase vulnerabilities and potential losses. However, most of the current land use regulations require the consideration of flood hazards during the development review process.

Expected Flood Impact to Future Development: Moderate

4.5.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the flood hazard include:

- Quantifying all of the losses that occur during major floods, especially when some are covered by insurance and others are not
- Lack of floodplain mapping in many areas
- Lack of digital floodplain data for areas that are mapped.

Other hazards often related to flood include:

- Hazardous material release
- Winter storms that produce heavy snow
- Severe thunderstorms with heavy rain.

4.6 HAZARDOUS MATERIAL RELEASE

4.6.1 DESCRIPTION

A hazardous material release is the contamination of the environment (i.e. air, water, soil) by any material that because of its quantity, concentration, physical characteristics, or chemical characteristics threatens human, animal, or plant health, the environment, or property. Hazardous material spills are usually accidental events that arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. The consequences of such spills are usually unintended. An accidental or intentional release of materials could produce a health hazard to those in the area,

downwind, and/or downstream with immediate, prolonged, and/or delayed effects. The spread of the material may additionally be defined by weather conditions and topography of the area. A hazardous material release can come from a fixed facility, via its transportation, or intentionally in the case of terrorism.

Fixed facilities housing hazardous substances in Beaverhead County include the usual facilities within communities such as water treatment plants, swimming pools, gas stations, and supply stores containing substances such as fuel, farm chemicals, propane, fuel oil, paint, and small amounts of chlorine.

A hazardous material release may also occur due to a transportation accident. The most likely locations for a transportation-related hazardous material release are along the interstate, highways, and the railroad. The roadways in Beaverhead County include Interstate 15, Montana Highways 41 and 43, Secondary Route 278, and the Union Pacific Railway. Studies in Beaverhead County have found that an average of 1.26 placarded hazardous material vehicles per hour travel on Interstate 15 and 1 per hour travel on Montana Highway 41. Chemicals transported on the Union Pacific Railway between Silver Bow, MT and Idaho through Beaverhead County include anhydrous ammonia, ammonium nitrate, white dry phosphorus, and sulfuric acid. [Beaverhead County, no date] The Union Pacific Railroad has hazardous cargo everyday on its trips north and south through the county.

Figure 4-20. Figure 4.6.1A Diesel Spill Burn.

Gas, propane, and other hazardous materials are delivered throughout the county year round, creating a potential disaster every time one of the delivery trucks goes on the road. The need for gas, propane, fertilizers, and other toxic materials is very high in agricultural communities. Several storage facilities for these materials are in close proximity to communities in the county.

As is common in most mountainous regions, many of the transportation routes follow a river or stream located in the valley. When a hazardous material incident occurs in Beaverhead County, there is a very good chance it will not only involve dirt or surface material but will also involve flowing water in ditches, rivers, or small streams. Other potential concerns for spills/leaks are icy road conditions during winter months, earthquakes strong enough to rupture gas lines, propane lines, and damage bridges and highways, as well as sabotage, and terrorism.

Another potential and growing hazard for Beaverhead County is the development of hazardous methamphetamine labs. Criminals have come to realize the vastness and remoteness of Montana. This is especially true in western Montana where forest and remote roads provide concealment for illegal operations. Materials used in portable meth labs are toxic, lethal, and hazardous.

4.6.1.1 WARNINGS, WATCHES, AND ADVISORIES

In the event of a hazardous material release, the National Weather Service has the ability to issue a variety of warnings or statements. For example, a Hazardous Materials Warning, a warning of the release of a non- radioactive hazardous material that may recommend evacuation or shelter in place, may be issued using information reported by state or local officials. Other warnings and statements for civil danger, civil emergency, evacuation immediate, local area emergency, radiological hazard, and shelter in place are also available to state and local emergency officials if needed. [National Weather Service, 2006]

4.6.2 HISTORY

Based on information from the National Response Center database, local fire departments, and the County Disaster and Emergency Services Coordinator, Table 4.6.2A lists the hazardous material incidents for Beaverhead County. Note this database likely does not contain all incidents.

4.6.3 PROBABILITY AND MAGNITUDE

Since 1983, 45 reports of hazardous material incidents have been documented. Based on this history, a hazardous material release can be expected about 1–2 times per year in Beaverhead County. The frequency of relatively minor hazardous material releases is likely much greater as not all incidents get recorded in the databases.

Although only hazardous material releases with limited damages have occurred in Beaverhead County in the past, the potential exists for a release with human and property impacts. A serious, yet plausible, scenario includes the release of a substance such as anhydrous ammonia or propane from a train derailment. Affected areas from these types of releases could extend as far away as 1.4 miles downwind. The greatest magnitude events include those that occur within close proximity to a populated area.

Overall Hazardous Material Release Probability: Moderate-High

Table 4-17. Table 4.6.2A Hazardous Materials Release From 1983 to 2016

Date	Location	Material	Cause/Impacts
Apr. 19, 1983	Dell	Creosote, 40,000 gallons	Train derailment due to track washout.
May 19, 1983	Ibeyville Ditch	Arsenic Mixture, 10 semi loads	Wrong mixture sprayed. Two cows killed.
Aug. 10, 1989	Unknown	Road Oil, 250 gallons	Released near stream by county road department.
Aug. 11, 1990	Paradise Inn, Dillon	Chlorine Gas	
Aug. 26, 1990	North Montana Street	Ammonium Nitrate, 2,000 pounds	Truck accident.
Aug. 30, 1990	Cenex, Dillon	Propane	
Sep. 22, 1991	I-15, Mile 2	Diesel, 150 gallons	Truck accident.
Oct. 18, 1991	I-15, Mile 41	Diesel, 200 gallons	Truck accident.
Nov. 29, 1991	Between I-15 and Clark Canyon Reservoir	Diesel, 200 gallons	Truck accident.
Dec. 13, 1991	I-15, Mile 52	Diesel, 200 gallons	Truck accident.
Jul. 1, 1992	Beaverhead County Airport	Jet Fuel, 45 gallons	Overfill release.
Aug. 8, 1992	Scenic Byway	Gasoline, 15 gallons	Car accident. Leaking into creek.
Aug. 13, 1993	Mono Creek	Diesel	
Dec. 27, 1993	Beaverhead County Landfill	Powdered Sulfur, 400 pounds	Fire.
Jan. 12, 1994	I-15, Mile 18	Diesel	Truck accident. Spill into Beaverhead River.
Dec. 29, 1994	Monida	Diesel	
Mar. 1, 1995	Cenex Bulk Plant	Diesel, 500 gallons	Overfill release.
Apr. 25, 1995	Highway 41, Mile 10	Ammonia Nitrate	Truck accident.
May 3, 1995	600 Vigilante Drive	Diesel	
Jun. 18, 1995	Town Pump #2	Diesel, 50 gallons	Overflow due to unattended pump.
Oct. 28, 1995	1405 Ten Mile Road	Chlorine	Leak at city water plant.
Jul. 6, 1996	Town Pump	Gasoline	Overflow due to unattended pump.
Feb. 14, 1996	10 mile north of Wisdom	Diesel, 98 gallons Radiator Coolant	Truck accident in Big Hole River.
Feb. 18, 1997	I-15, Mile 5	Ammonium Nitrate, 24,000 pounds	Truck accident.
Oct. 9, 1998	Elk Horn Mine	Toxic fumes	Fire in a mine building.
Jan. 12, 1999	Highway 41, Mile 11	Diesel, 150 gallons	Truck accident.
Apr. 26, 1999	Monida, 12 miles E	Diesel	Faulty valve on a bulk storage tank on a ranch.

Table 4-18. Table 4.6.2A Hazardous Materials Release From 1983 to 2016

Date	Location	Material	Cause/Impacts
Apr. 5, 2000	Barrett Minerals	Sodium Hydroxide, Muriatic Acid	Toxic fumes created by putting the wrong materials in the wrong tanks.
Feb. 25, 2001	Big Sky Truck Stop	Diesel, 50 gallons	Overflow due to unattended pump.
Mar. 6, 2001	Ray Gram Ranch	Dynamite	Old dynamite found.
May 22, 2001	Lima DOT Scales	Solid Nitrous Oxide	Leak in tank trailer. Also mercury not labeled properly.
Jun. 5, 2001	335 W. Reeder St., Dillon	Shingle Oil, 55 gallons	Vandalism.
Sep. 7, 2001	Sec. 29, 7S, 8W	Natural Gas	Backhoe hit a natural gas transmission pipeline.
Nov. 3, 2001	I-15, Mile 61 Northbound	Diesel, 300 gallons	Truck accident.
Dec. 14, 2001	Poindexter Slough	Diesel	Fire resulted.
Aug. 25, 2002	Hairpin Ranch	Weed spray	Back siphon of weed spray into well.
Sep. 19, 2002	Iron Mask Mine	Empty herbicide barrels, 7 barrels	
Jan. 28, 2003	Town Pump #1	Contaminant, 300 gallons	
Mar. 3, 2003	Downtown Dillon	Trichlorosilane	No spill, but was left unattended.
Jun. 19, 2003	Highway 43, Mile 10	Fuel, 30 gallons	Truck accident.
Sep. 16, 2007	Beaverhead River, Dillon	Diesel	Truck accident.
Nov. 27, 2007	Dell	Fertilizer Diesel	Truck-train collision at rail crossing.
Jan. 15, 2008	Reichle School	Diesel, 200 gallons	Vandals released the fuel from a storage tank; damage also occurred to the school.
Feb. 12, 2009	Barrett Hospital	Undetermined chemicals	Patient contaminated with unknown chemical resulted in medical staff exhibiting respiratory problems. Decontamination of all involved.
May. 18, 2014	C&C FEEDS	Ammonia Nitrate	Spilling of Ammonia Nitrate onto the ground that was unloaded form railroad cars an transferred to grain tucks

Source: National Response center, 2016; Beaverhead County Disaster and Emergency Services, 2009.

Table 4-19. Table 4.6.2B Beaverhead County Hazardous Material Release Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damages
None					

Figure 4-21. Figure 4.6.3A Mono Creek Semi Fire.

4.6.4 MAPPING

A hazardous material release can occur anywhere, however, buffer zones around the primary hazardous materials transportation routes show the areas that would most likely be affected by a transportation-related hazardous material incident. Table 4.6.4A shows the evacuation radii for a few common hazardous materials. This list is generalized for planning purposes and is certainly not all-inclusive. Emergency responders should rely on other sources for more detailed information.

Table 4-20. Table 4.6.4A Evacuation Radii for Hazardous Material Releases

Material	Potential Hazard	Initial Isolation	Evacuation
Anhydrous Ammonia	Corrosive, Toxic	500 feet	Up to 1.4 miles
Diesel Fuel/Gasoline	Highly Flammable	150 feet	Up to ½ mile
Ammonium Nitrate Fertilizers	Oxidizer	150 feet	Up to ½ mile
Propane	Extremely Flammable	330 feet	Up to 1 mile

Source: US Department of Transportation, 2008.

4.6.5 VULNERABILITIES

The buffers around the highways shown in Map 4.6.4B represent those areas with an enhanced risk from a hazardous materials release based on their proximity to regular hazardous materials transportation routes and infrastructure. Along the highways, buffer zones of 150 feet, 330 feet, ½ mile, and 1 mile were established based on the initial isolation and evacuation radii for diesel fuel/gasoline and propane releases, as shown in Table 4.6.4A. For the railroad, the buffers were 500 feet and 1.4 miles for anhydrous ammonia. Note that the actual evacuation zones are highly dependent on factors such as wind speed, wind direction, material released, and quantity released. Like most other hazards, in an actual event, the entire risk area likely won't be affected, but a small section surrounding the spill location may.

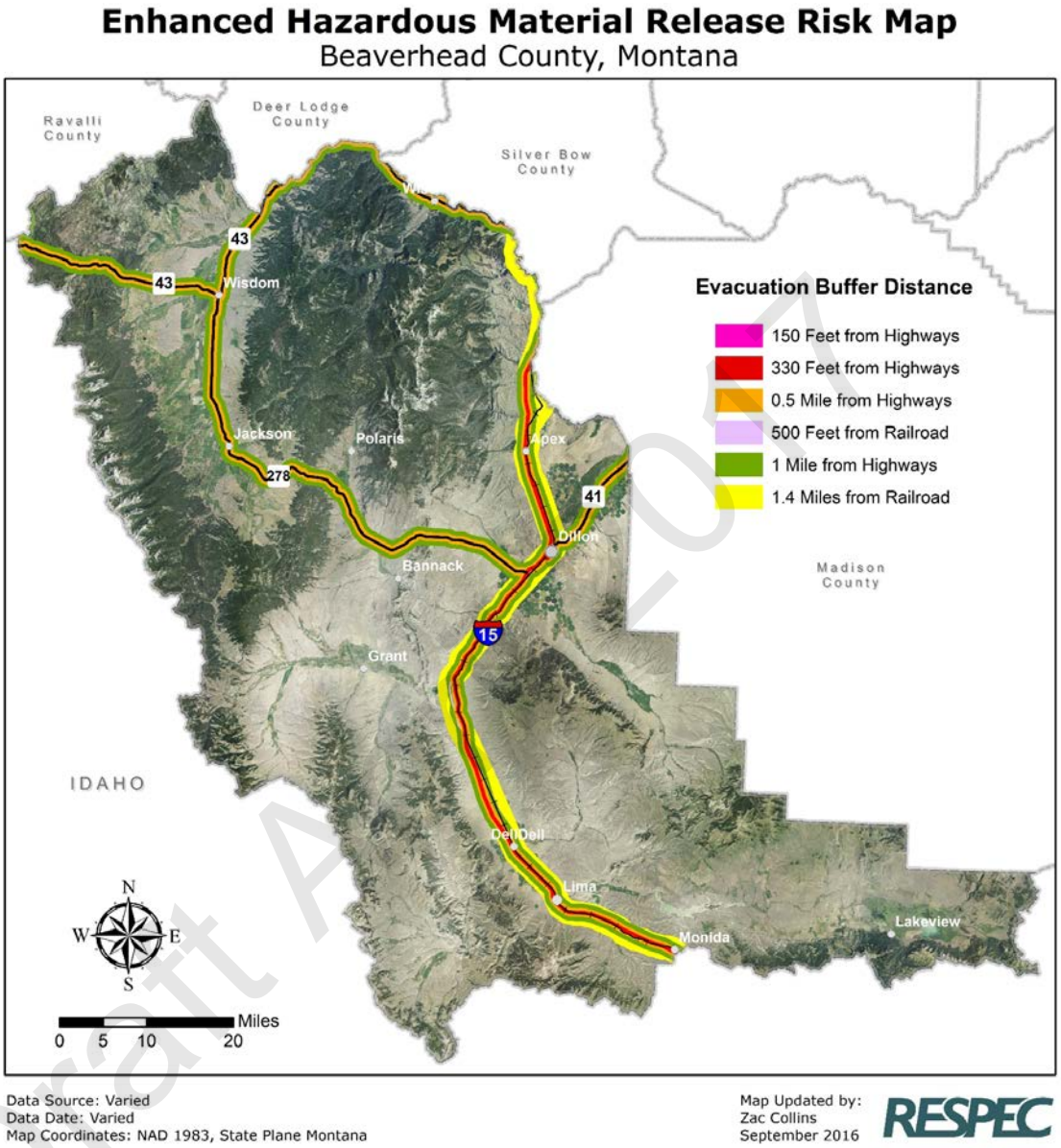

Figure 4-22. Map 4.6.4B.

4.6.5.1 CRITICAL FACILITIES

Based on these buffer zones, the highest risk critical facilities can be identified. Should a hazardous material release affect one of the critical facilities, the level of emergency services available could be reduced. A release near a special needs facility may present unique evacuation challenges. Of the 60 mapped critical facilities in Beaverhead County, 15 are within 150 feet of a primary highway and an additional 8 are within 330 feet.

Most other critical facilities fall within a ½ mile or 1 mile of the major roadways or within 500 feet or 1.4 miles of the railroad and are also at risk. The exceptions are:

- Beaverhead County Landfill
- Dillon Water Treatment Plant

- Grant School
- Grant Volunteer Fire Department
- Grasshopper Valley Volunteer Fire Department (Polaris)
- Montana National Guard Armory
- Polaris Post Office
- Polaris School.

Possible losses to critical facilities include:

- Critical functional losses
- Contamination
- Structural and contents losses, if an explosion is present

Expected Hazardous Material Release Impact to Critical Facilities: Low-Moderate

4.6.5.2 CRITICAL INFRASTRUCTURE

Most hazardous material releases do not usually have an effect on infrastructure, particularly underground infrastructure. Some critical infrastructure uses hazardous materials to operate such as chlorine for water treatment and PCBs for electric transformers. Similarly, the contamination of the water supply may be treated like a hazardous material release. Propane, oil, and natural gas, necessary fuels for heating, can also be hazardous if released during their delivery because of their explosive potential. Transportation may be limited if a key roadway or railway is blocked by an incident.

Possible losses to critical infrastructure include:

- Contamination
- Blocked roadways
- Physical losses, if an explosion is present

Expected Hazardous Material Release Impact to Critical Infrastructure: Low

4.6.5.3 STRUCTURES

Comparing the structure databases to the buffer zones, Tables 4.6.5B shows the estimated number of structures within the high hazard areas.

Table 4-21. Table 4.6.5B Structure Vulnerabilities to Hazardous Material Releases

Within Buffer Zone	Estimated Total Number of Structures
150 feet of highways	244 structures
330 feet of highways	554 structures
½ mile of highways	2,727 structures
1 mile of highways	3,177 structures
500 feet of railroad	411 structures
1.4 miles of railroad	2,897 structures

Montana State Library, 2016

Fortunately, unless an explosion is present with the release, structures are typically not damaged in a hazardous materials release.

Possible losses to structures include:

- Inaccessibility
- Contamination
- Structural and contents losses, if an explosion is present.

Expected Hazardous Material Release Impact to Structures: Low-Moderate

4.6.5.4 POPULATION

The population impacts are often greater than the structural impacts during a hazardous material release. Depending on the material, the health impacts to humans can be long and short term. A release in Beaverhead County could threaten the population. Table 4.6.5C shows the estimated population within each of the buffer zones. These estimates are based on 2.3 people per structure. Greater population concentrations may be found in communities, special needs facilities, and businesses. Generally, an incident will affect only a subset of the total population at risk.

Table 4-22. Table 4.6.5C Population Vulnerabilities to Hazardous Material Releases

Within Buffer Zone	Estimated Total Number of Structures	Estimated Population
150 feet of highways	244 structures	561 people
330 feet of highways	544 structures	1,274 people
½ mile of highways	2,727 structures	6,272 people
1 mile of highways	3177 structures	7,307 people
500 feet of railroad	411 structures	945 people
1.4 miles of railroad	2,897 structures	6,663 people

In a hazardous material release, 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 evacuate, depending on the weather conditions, material released, and public notification.

Expected Hazardous Material Release Impact to the Population: Moderate-High
Except Dillon and Lima: High

4.6.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Business closures and associated business disruption losses.

Possible ecologic losses include:

- Loss of wildlife
- Habitat damage

- Reduced air and water quality.

Possible social losses include:

- Cancelled activities
- Emotional impacts of significant population losses and illnesses.

Expected Hazardous Material Release Impact to the Values: Low-Moderate
Except Dillon and Lima: Moderate

4.6.5.6 FUTURE DEVELOPMENT

Beaverhead County and the surrounding areas are rich in natural resources and the continued development of industries related to these natural resources is a distinct possibility. New development may increase the number of people and facilities exposed to hazardous material releases.

Expected Hazardous Material Release Impact to Future Development: Low-Moderate

4.6.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the hazardous material release hazard include:

- Estimating what substances and the quantity that may be released in any given location.

Other hazards often related to hazardous material releases include:

- Transportation accident
- Aircraft accident
- Environmental contamination
- Flood
- Strong wind
- Tornado
- Wildfire
- Structure collapse
- Winter storm
- Earthquake
- Terrorism
- Urban fire.

4.7 SEVERE WEATHER

Including tornadoes, hail, downbursts, lightning, strong winds, blizzards, winter storms, heavy snow, ice storms, and extreme cold

4.7.1 DESCRIPTION

Extreme weather conditions can exist during any season in southwest Montana. Thunderstorms, strong winds, and winter weather can all be hazardous under the right conditions and locations. Strong winds and tornadoes can take down trees, damage structures, tip high profile vehicles, and create high velocity flying debris. Large hail can damage crops, dent vehicles, break windows, and injure or kill livestock, pets, and people. Winter storms can cause hazardous driving conditions, power outages, and community isolation.

4.7.1.1 TORNADOES

Tornadoes form when the right amount of shear is present in the atmosphere and causes the updraft and downdraft of a thunderstorm to rotate. A funnel cloud is the rotating column of air extending out of

a cloud base, but not yet touching the ground. The funnel cloud does not become a tornado until it touches the ground. Once in contact with the surface, it can create great damage over a small area. In 1971, Dr. Theodore Fujita developed the Fujita tornado damage scale to categorize various levels of tornado damage. In 2006, enhancements to this scale resulted in more accurate categorizations of damage and the associated wind speeds. Both scales are shown in Table 4.7.1B.

Figure 4-23. Figure 4.7.1A Funnel Cloud in the Beaverhead Valley.

Table 4-23. Table 4.7.1B Tornado Scales

Scale	Estimated wind speed (*mph)	Relative frequency	Average Damage Path Width
F0	40–72	0.389	10–50 meters (33–164 ft.)
Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged			
F1	73–112	0.356	30–150 meters (98–492 ft.)
Moderate damage. The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.			
F2	113–157	0.194	110–250 meters (360–820 ft.)
Significant damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; high-rise windows broken and blown in; light-object missiles generated.			
F3	158–206	0.049	200–500 meters (660–1,640 ft.)
Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.			
F4	207–260	0.011	400–900 meters (1,300–3,000 ft.)
Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.			
F5	261–318	<0.1%	1,100 meters (3,600 ft.)
Incredible damage. Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air farther than 100 meters (330 ft.); trees debarked; steel reinforced concrete structures badly damaged			

Source: Storm Prediction Center, 2016.

4.7.1.2 HAIL

Hail develops when a supercooled droplet collects a layer of ice and continues to grow, sustained by the updraft. Once the hail stone cannot be held up any longer by the updraft, it falls to the ground. Hail up to 2.75 inches in diameter, the size of baseballs, has been reported in Beaverhead County. Nationally, hailstorms cause nearly $1 billion in property and crop damage annually, as peak activity coincides with peak agricultural seasons. Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life.

4.7.1.3 DOWNBURSTS

Downburst winds, which can cause more widespread damage than a tornado, occur when air is carried into a storm's updraft, cools rapidly, and comes rushing to the ground. Cold air is denser than warm air, and therefore, wants to fall to the surface. On warm summer days, when the cold air can no longer be supported up by the storm's updraft, or an exceptional downdraft develops, the air crashes to the ground in the form of strong winds. These winds are forced horizontally when they reach the ground and can cause significant damage. These types of strong winds can also be referred to as straight-line winds. Downbursts with a diameter of less than 2.5 miles are called microbursts and those with a diameter of 2.5 miles or greater are called macrobursts. A derecho, or bow echo, is a series of downbursts associated with a line of thunderstorms. This type of phenomenon can extend for hundreds of miles and contain wind speeds in excess of 100 mph.

Figure 4-24. Figure 4.7.1C Thunderstorm Wind Damage on July 14, 2008.

4.7.1.4 LIGHTNING

Although not considered severe by National Weather Service definition, lightning and heavy rain can also accompany thunderstorms. Lightning develops when ice particles in a cloud move around, colliding with other particles. These collisions cause a separation of electrical charges. Positively charged ice particles rise to the top of the cloud and negatively charged ones fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge called a stepped leader toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder. [National Weather Service, 2009b]

4.7.1.5 STRONG WINDS

Strong winds can also occur outside of tornadoes, severe thunderstorms, and winter storms. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems (one high pressure, one low pressure) are, the stronger the pressure gradient, and therefore, the stronger the winds are.

4.7.1.6 BLIZZARDS

Blizzards, as defined by the National Weather Service, are a combination of sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling or blowing snow for 3 hours or more. A blizzard, by definition, does not indicate heavy amounts of snow, although they can happen together. The falling or blowing snow usually creates large drifts from the strong winds. The reduced visibilities make travel, even on foot, particularly treacherous. The strong winds may also support dangerous wind chills. Ground blizzards can develop when strong winds lift snow off the ground and severely reduce visibilities.

4.7.1.7 HEAVY SNOW

Large quantities of snow may fall during winter storms. Six inches or more in 12 hours or 8 inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. Heavy wet snow before the leaves fall from the trees in the fall or after the trees have leafed out in the spring may cause problems with broken tree branches and power outages.

4.7.1.8 ICE STORMS

Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into the warm layer of air, it melts to rain, and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating a smooth layer of ice. This phenomenon is called freezing rain. Similarly, sleet occurs when the rain in the warm layer subsequently freezes into pellets while falling through a cold layer of air at or near the Earth's surface. Extended periods of freezing rain can lead to accumulations of ice on roadways, walkways, power lines, trees, and buildings. Almost any accumulation can make driving and walking hazardous. Thick accumulations can bring down trees and power lines.

4.7.1.9 EXTREME COLD

Extended periods of cold temperatures frequently occur throughout the winter months in Beaverhead County. Heating systems compensate for the cold outside. Most people limit their time outside during extreme cold conditions, but common complaints usually include pipes freezing and cars refusing to start. When cold temperatures and wind combine, dangerous wind chills can develop.

Wind chill is how cold it "feels" and is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually, internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill, exposed skin can freeze in 30 minutes. Wind chill does not affect inanimate objects. [National Weather Service, 2009d]

4.7.1.10 WARNINGS, WATCHES, AND ADVISORIES

To protect people and property, the National Weather Service issues informational products alerting the public to varying degrees of hazardous weather.

The following may be issued for severe thunderstorm events:

- Hazardous Weather Outlook: Hazardous weather outlooks alert the public to the possibility for severe weather in the area from one to seven days in advance.
- Severe Thunderstorm Watch: Severe thunderstorm watches are issued by the Storm Prediction Center when conditions for severe thunderstorms appear favorable for an area over the next several hours. Watches are typically in effect for 4-6 hours.
- Severe Thunderstorm Warning: Severe thunderstorm warnings are issued when Doppler radar indicates or the public reports a thunderstorm with wind gusts of 58 mph or greater and/or hail ¾ inch or larger in diameter. The warning is usually valid for 30-60 minutes.
- Tornado Watch: Tornado watches are issued by the Storm Prediction Center when conditions for tornadoes appear especially favorable for an area over the next several hours. Watches are typically in effect for 4-6 hours.
- Tornado Warning: Tornado warnings are issued when Doppler radar indicates or the public reports a tornado. The warning is usually valid for 15-45 minutes.

Sources: National Weather Service, 2006; Storm Prediction Center, 2016.

The National Weather Service issues the following products for non-thunderstorm high winds:

- High Wind Watch: A high wind watch is issued when conditions are favorable for non-thunderstorm sustained winds of 40 mph or greater or gusts of 58 mph or greater for a period of one hour or more, but the timing, location, and/or magnitude are still uncertain.
- High Wind Warning: High wind warnings are issued when non-thunderstorm sustained winds of 40 mph or greater or gusts of 58 mph or greater for a period of one hour or more are expected.

Source: National Weather Service, 2006

The following products can be issued during hazardous winter weather:

- Winter Storm Watch: Winter storm watches are issued to give the public 12-48 hours of advance notice of the potential for snow 6 inches or more in 12 hours or 8 inches or more in 24 hours AND sustained or frequent wind gusts of 25-34 mph occasionally reducing visibilities to ¼ mile or less for three hours or more.
- Winter Weather Advisory: Winter weather advisories are issued when a combination of winter weather elements that may cause significant inconveniences are occurring, imminent, or have a high probability of occurring.
- Winter Storm Warning: Winter storm warnings are generally issued when snow 6 inches or more in 12 hours or 8 inches or more in 24 hours AND sustained or frequent wind gusts of 25-34 mph occasionally reducing visibilities to ¼ mile or less for three hours or more are occurring, imminent, or have a high probability of occurring.

- Blizzard Watch: Blizzard watches are issued to give the public 12-48 hours of advance notice of possible blizzard conditions (sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling and/or blowing snow for 3 hours or more).
- Blowing Snow Advisory: Blowing snow advisories are issued for visibilities intermittently at or below ½ mile because of blowing snow.
- Blizzard Warning: Blizzard warnings are issued when blizzard conditions (sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling and/or blowing snow for 3 hours or more) are occurring, imminent, or have a high probability of occurring.
- Freezing Rain Advisory: Freezing rain advisories are issued when an accumulation of ice will make roads and sidewalks slippery, but significant and damaging accumulations of ice are not expected.
- Ice Storm Warning: Ice storm warnings are issued when a significant and damaging accumulation of ice is occurring, imminent, or has a high probability of occurring.
- Snow Advisory: Snow advisories are issued when snow accumulations of 2-5 inches in 12 hours are expected.
- Sleet Advisory: Sleet advisories are issued when sleet accumulations causing hazardous conditions are expected.
- Heavy Snow Warning: Heavy snow warnings are issued when snow accumulations of 6 inches or more in 12 hours or 8 inches or more in 24 hours are expected.
- Wind Chill Watch: Wind chill watches are issued to give the public 12-48 hours advanced notice of the potential for wind chills of -40°F or colder with a wind speed of 10 mph or higher and a duration of 6 hours or more.
- Wind Chill Advisory: Wind chill advisories are issued when wind chills of -20°F to -39°F with a wind speed of 10 mph or higher and a duration of 6 hours or more are expected.
- Wind Chill Warning: Wind chill warnings are issued when wind chills of -40°F or colder with a wind speed of 10 mph or higher and a duration of 6 hours or more are expected.

Source: National Weather Service, 2006

4.7.2 HISTORY

Severe weather reports are collected from weather observing stations and trained spotters by the National Weather Service (NWS) office in Great Falls. These records are archived by the National Climatic Data Center. Since official records can only indicate events that have been reported to the National Weather Service, events are often underreported in rural area and areas lacking trained spotters.

4.7.2.1 TORNADOES

Since 1950, 11 tornado events have been recorded in Beaverhead County as shown in Table 4.7.2A.

Table 4-24. Table 4.7.2A Reported Tornadoes

Location	Date	Magnitude	Impacts
Beaverhead County	08/02/1959	Unknown	
Beaverhead County	05/19/1962	F2	$25,000 estimated property damage.
Beaverhead County	06/14/1962	F2	
Beaverhead County	07/14/1962	Unknown	
Beaverhead County	05/29/1965	Unknown	$300 estimated property damage.
Beaverhead County	06/06/1976	Unknown	$2,500,000 estimated property damage.
Beaverhead County	07/03/1988	F1	$2,500 estimated property damage.
Beaverhead County	05/16/1991	F0	$25,000 estimated property damage.
Dillon, 30 miles southeast	09/05/1995	F0	
Dillon, 10 miles west	07/19/1997	F0	
Dillon	7/10/2016	F0	

Source: National Climatic Data Center, 2016.

4.7.2.2 HAIL

Since 1950, 44 severe hail reports (3/4 inches or greater) have been recorded in Beaverhead County. Table 4.7.2B shows those reports of 1.50 inches in diameter or greater and other damaging events.

Table 4-25. Table 4.7.2B Severe Hail Reports

Location	Date	Size	Impacts
Beaverhead County	07/07/1958	2.00 inches	
Beaverhead County	07/09/1963	2.75 inches	
Red Rock Lakes	06/14/1996	0.75 inches	Vehicle damage
Argenta	07/19/1997	1.75 inches	Vehicle damage
Wise River	07/19/1997	1.00 inches	Window and roof damage
Lima, 6 miles east	08/13/1999	1.75 inches	
Dillon	06/09/2006	1.00 inches	Aircraft damage
Lima, 6 miles east-southeast	08/09/2008	1.25 inches	Car accident
Wise River	8/6/2009	2.75 inches	

Source: National Climatic Data Center, 2016.

4.7.2.3 DOWNBURSTS

Since 1950, 33 severe thunderstorm wind reports (58 mph or greater) have been recorded in Beaverhead County. Table 4.7.2C lists the reports of 75 mph or greater or causing damages.

Table 4-26. Table 4.7.2C Severe Thunderstorm Wind Reports of 75 mph or Greater (and Other Select Events)

Location	Date	Speed	Impacts
Beaverhead County	08/05/1957	75 mph	
Beaverhead County	06/03/1957	86 mph	
Beaverhead County	07/07/1983	81 mph	
Beaverhead County	07/08/1983	81 mph	
Dillon	05/17/1994	Unknown	Roof of a building downtown torn off. $500,000 estimated property damage.
Wise River	06/15/1995	60 mph	Windows and a barn roof damaged.
Dell	07/06/1995	Unknown	Dry microburst. Roof, siding, and tree damage. Bucket of gravel blown into a bar at a local inn.
Beaverhead County	07/11/1995	81 mph	
Lima, 4 miles northeast	07/15/2006	70 mph	Power outages.
Polaris	08/01/2016	90 mph	

Source: National Climatic Data Center, 2016.

4.7.2.4 LIGHTNING

On June 18, 1995, a farm worker near Dillon was killed by lightning while working in a hay field. [National Climatic Data Center, 2009]

4.7.2.5 STRONG WINDS

Since 1950, 12 strong non-thunderstorm wind reports (58 mph or greater) have been recorded in Beaverhead County. Table 4.7.2D lists the reports indicating damages.

Table 4-27. Table 4.7.2D Strong Non-Thunderstorm Wind Reports of 75 mph or Greater (and Other Select Events)

Location	Date	Speed	Impacts
Beaverhead County	12/04/1995	Unknown	Roof damage. Power outages.
Beaverhead County	04/30/2001	Unknown	Wind damage was reported in Beaverhead County.
Beaverhead County	12/29/2011	Unknown	Wind damage was reported in Beaverhead County.
Beaverhead County	03/28/2015	Unknown	Wind damage was reported in Beaverhead County.

Source: National Climatic Data Center, 2016.

4.7.2.6 WINTER WEATHER

Snow and cold are normal occurrences in Beaverhead County throughout the late fall, winter, and early spring months. Summaries of the more significant events due to their extreme conditions or damages are shown in Table 4.7.2E. The National Climatic Data Center also lists several other lower impact types of common winter weather events. During the winter months, travelers often become stranded in Beaverhead County. Monida Pass, located 65 miles south of Dillon on Interstate 15, is closed at least once per year and usually more due to heavy snow and strong winds. Travelers on the north side of the pass then become stranded in Dillon or Lima.

Table 4-28. Table 4.7.2E Significant Winter Weather Events

Date	Type	Impacts
Feb. 1–7, 1989	Winter Storm	Beaverhead County was affected by significant winter storms and a local disaster was declared.
Feb. 21, 1997	Avalanche	A snowmobiler was killed by an avalanche near Jackson.
Nov. 15, 1998	Avalanche	A hunter was killed by an avalanche in the Lima Peaks area, south of Dillon.
Jan. 17, 2001	Avalanche	A snowmobiler was killed by an avalanche northwest of Jackson.
Jan. 21–22, 2002	Winter Storm	Near blizzard conditions with winds gusting to 30 mph and 14 inches of new snow.
Feb. 24, 2003	Extreme Cold	Temperature dropped to -49°F at Wisdom.
Jan. 1, 2005	Avalanche	One skier was killed and one was severely injured by an avalanche in the Centennial Mountains.
Jan. 8, 2005	Winter Storm	Visibilities to less than one-half mile closed Monida Pass.
Jan. 1, 2007	Avalanche	A snowmobiler was killed on Mt. Jefferson.
Jun. 11, 2008	Heavy Snow	The wet snow downed tree limbs and power poles.
April 5, 2010	Winter Storm	A Pacific storm system brought heavy snow to portions of Southwest Montana. Snow amounts in excess of 6 inches were common.
May 29, 2011	Winter Storm	A Pacific storm brought moisture and instability to southwest Montana. Snow amounts in excess of 10 inches was reported at several mountain locations.
Nov 2, 2015	Winter Storm	A storm system developed over the Great Basin and tracked northeastward into central and eastern Montana the first week of November. Heaviest snow amounts were in the mountains but the storm's impacts at lower elevations included power outages and numerous vehicle slide offs on area roads

Events with over 6 inches of snow common, but no impacts listed.
Source: National Climatic Data Center, 2016; West Wide Avalanche Network, 2016.

Table 4-29. Table 4.7.2F Beaverhead County Severe Weather Declared Disasters and Emergencies

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.7.3 PROBABILITY AND MAGNITUDE

Table 4.7.3A shows a summary of the severe weather events.

Table 4-30. Table 4.7.3A Severe Weather Events Historical Summary

Event Type	Beaverhead County
Reported Tornadoes	Past 57 years (1959-2016): 11 events Highest Magnitude on record: F2 Since 1959: 6 damaging events $2,552,800 estimated property damage since 1959
Reported Severe Hail	Past 58 years (1958-2016): 44 events Highest Magnitude on record: 2.75" Since 1950: 5 damaging events Unknown property damage
Reported Severe Thunderstorm Winds	Past 59 years (1957-2016): 16 events Highest Magnitude on record: 90 mph Since 1950: 3 damaging events $500,000+ estimated property damage since 1957
Reported Lightning Events	Past 15 years (1994-2008): 1 fatality
Reported Strong Non-Thunderstorm Winds	Past 15 years (1994-2016): 28 events Highest Magnitude on record: 75 mph Since 1950: 2 damaging events Unknown property damage
Reported Winter Weather Events (to include Avalanche, Blizzard, Extreme cold/Wind Chill, Heavy Snow,& Winter Storm	Past 15 years (1994-2016): 86 events 5 avalanche fatalities Since 1950: 1 damaging event Unknown property damage

Source: National Climatic Data Center, 2016.

Based on the historical record, the following can be expected on average:

- In an average 10 year period, 1-2 tornadoes.
- In an average year, 2 severe hail events.
- In an average year, 1 severe thunderstorm wind event.
- In an average year, 1 strong non-thunderstorm wind event.
- In an average year, 3-4 documented winter weather events.

Reported severe weather events over the past fifteen years provide an acceptable framework for determining the magnitude of such storms that can be expected and should be planned for. The Federal Emergency Management Agency places this region in Zone II (160 mph) for structural wind design. [Federal Emergency Management Agency, 2004b] Tornadoes of magnitude F2 or greater are possible. Large hail can damage structures, break windows, dent vehicles, ruin crops, and kill or injure people and livestock. Sizes greater than 2.75 inches are possible. Non-tornadic, thunderstorm and non-thunderstorm winds over 100 mph should also be planned for. These types of winds can remove roofs, move mobile homes, topple trees, take down utility lines, and destroy poorly-built or weak structures. The severe blizzards and winter storms that result in the loss of life, extended road closures, long-term power outages, or significant isolation problems represent high magnitude winter weather events for Beaverhead County. Blizzard conditions continuing for 2 or more days and blocked roadways or power outages for a week or more both represent extreme winter weather conditions that are possible. These types of events present significant transportation, sheltering, and logistical challenges.

Overall Severe Weather Probability: Moderate-High

4.7.4 MAPPING

The science of meteorology and records of severe weather are not quite sophisticated enough to identify what areas of the county are at greater risk for damages. Therefore, all areas of the county are assumed to have the same severe weather risk countywide.

4.7.5 VULNERABILITIES

4.7.5.1 CRITICAL FACILITIES

Many of the critical facilities, although adequate for most events, may not be able to withstand 160 mph winds, as recommended by the Federal Emergency Management Agency. [Federal Emergency Management Agency]. Most structures should be able to provide adequate protection from hail but the structures could suffer broken windows and dented exteriors. Heavy snow loads on roofs, particularly large span roofs, can cause roofs to leak or even collapse depending on their construction. Extremely cold temperatures may cause pipes to freeze and subsequently burst, causing water damage. Probably the greatest issue for critical facilities during significant winter weather is the inaccessibility of such facilities because of poor roadways, utility outages, or dangerous wind chills. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

Because the probability of severe weather is relatively the same across the county, the vulnerabilities to structures depend on the building types and their susceptibility to sustain damages in a wind, tornado, or heavy snow event. Even if a structure performs well in the high winds, flying debris and falling trees may damage the building.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Critical functional losses
- Critical data losses

Expected Severe Weather Impact to Critical Facilities: Low-Moderate

4.7.5.2 CRITICAL INFRASTRUCTURE

Above ground infrastructure, namely overhead power lines, communications towers and lines, and structures, are very susceptible to severe weather. High winds and falling trees can damage this type of infrastructure and disrupt services.

Should an above ground facility such as a water treatment facility or a sewer lagoon be damaged, water and sewer services could also be disrupted. Water infrastructure may also be threatened during rapid freeze and thaw periods that cause underground water mains to burst. This could result in temporary disruptions of running water.

The most difficult network to maintain is the road infrastructure. During periods of heavy snow, ice, or blizzards, roads can quickly become impassable, stranding motorists and isolating communities. Long term road closures during an extended cold period may diminish and threaten propane and fuel supplies. Debris may also block roadways making transportation and commerce difficult if not impossible.

Possible losses to critical infrastructure include:

- Electric power disruption
- Telephone service disruption
- Water and fuel shortages
- Road closures
- Damaged infrastructure components, such as sewer lift stations and treatment plants.

Expected Severe Weather Impact to Critical Infrastructure: Moderate-High

4.7.5.3 STRUCTURES

With the entire county at risk from severe weather, estimates of damages are hard to determine. Realistically, an event involving a tornado or severe thunderstorm would most likely affect a small area. Vehicles damaged by hail or falling debris would be additional losses to individuals, businesses, and government.

Possible losses to structures include:

- Structural losses
- Contents losses
- Vehicle losses
- Displacement losses.

Expected Severe Weather Impact to Structures: Moderate

4.7.5.4 POPULATION

Since structures are vulnerable to severe weather, those inside them are also at risk. The National Weather Service in Great Falls warns for tornadoes, severe thunderstorms, high winds, and winter storms for Beaverhead County. Meteorologists use a variety of tools such as Doppler radar and weather spotters to predict these hazardous events and issue warnings that are broadcast over NOAA Weather Radio and other media. A NOAA weather radio transmitter is located in Dillon, covering parts of the county, and those with specially built receivers can be automatically alerted to weather hazards.

Some short-term events have 15 minutes or more warning time and others have little to no warning. In 2014, the average national tornado warning lead time was 13 minutes. (National Weather Service, 2016) Therefore, the population may have some lead time to take precautions, if they receive the warning. Mobile homes, even if tied down, and automobiles are not safe places. With 809 mobile homes in Beaverhead County, approximately 2, 000 people are at enhanced risk from tornadoes and strong winds. Besides structure failure, wind-driven projectiles and shattered glass can injure or kill occupants. Lightning strikes can occur with little to no warning, causing injury or death to those in the area.

Transportation accidents are more common during poor road and visibility conditions and may result in injuries or death.

An extended power outage during winter may make many homes and offices unbearably cold. Additionally, during extended winter-time power outages, people often make the mistake of bringing portable generators inside or not venting them properly, leading to carbon monoxide poisoning. With poor road conditions, sheltering residents may present significant logistical challenges with getting people to heated facilities, feeding, and providing medical care. These situations, accompanied by stranded motorists that need to be rescued, represent significant threats to the population.

Expected Severe Weather Impact to the Population: Moderate

4.7.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Business closures and associated business disruption losses
- Crop and livestock losses
- Feed losses caused by lightning sparked hay and field fires
- Commerce losses due to closed roads

Possible ecologic losses include:

- Damaged vegetation
- Soil erosion

Possible historic losses include:

- Structural and content losses of historic items
- Roof leaks and collapses
- Pipe ruptures and water damage

Possible social losses include:

- Cancelled school and other activities
- Emotional impacts of significant population losses

Expected Severe Weather Impact to the Values: Moderate

4.7.5.6 FUTURE DEVELOPMENT

The severe weather risk is assumed to be uniform countywide. Therefore, the location of development does not increase or reduce the risk necessarily. Beaverhead County and the jurisdictions lack building codes, and therefore, new development might not be built to current standards for wind resistance or heavy snow loads. Additionally, as homes go up in more remote parts of the county, accessing those rural residents may become impossible should sheltering or emergency services be needed in an extreme event.

Expected Severe Weather Impact to Future Development: Moderate

4.7.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the severe weather hazard include:

- Severe weather events are only recorded if observed and reported to the National Weather Service.
- The rural nature of the area leaves many areas without weather spotters.
- Only a limited number of weather observing stations are located in the county
- Lack of a countywide, multi-agency, historic winter weather database containing information on the winter weather conditions (snow depth, temperature, wind, snowfall rates, water content, and duration) and the associated problems (number of accidents, conditions of roadways, and services needed).
- Historic lightning data is expensive to purchase for analysis.

Other hazards often related to severe weather include:

- Utility and energy failure
- Transportation accident
- Hazardous material release
- Wildfire
- Flash flood.

4.8 TERRORISM AND CIVIL UNREST

4.8.1 DESCRIPTION

Terrorism and civil unrest are human-caused hazards that are intentional and often planned. Terrorism, both domestic and international, is a violent act done to try and influence government or the population of some political or social objective. Terrorist acts can come in many recognized forms or may be more subtle using untraditional methods. The primary recognized forms of terrorism are chemical, explosive, biological, radiological, and cyber; however, terrorism's only limitation is the human imagination.

Chemical terrorism is the use of chemical agents to poison, kill, or incapacitate the population or animals, destroy crops or natural resources, or deny access to certain areas. Chemical agents can be broken into five different categories: nerve agents, vesicants, cyanide, pulmonary agents, and incapacitating agents.

Terrorism using explosive and incendiary devices includes bombs and any other technique that creates an explosive, destructive effect. Bombs can take many forms from a car bomb to a mail bomb. They can be remotely detonated using a variety of devices or directly detonated in the case of a suicide bomb.

Bioterrorism is the use of biological agents, such as Anthrax, Ricin, and Smallpox, to infect the population, plants, or animals with disease or illness.

Radiological terrorism involves the use of radiological dispersal devices or nuclear facilities to attack the population. Exposure to radiation can cause radiation sickness, long-term illness, and even death.

Terrorism experts fear the use of explosive and radiological devices in the form of a "dirty bomb" to attack the population. A "dirty bomb" is a low-tech, easily assembled and transported device made up of simple explosives combined with a suitable radioactive agent.

Cyberterrorism is the attack or hijack of the information technology infrastructure that is critical to the US economy through financial networks, government systems, mass media, or other systems. Any cyber-attack that creates national unrest or instability would be considered cyberterrorism.

Civil unrest and violence typically occur on a smaller scale than terrorism when large groups, organizations, or distraught individuals take action with potentially disastrous or disruptive results. Civil unrest can result following a disaster that creates panic in the community.

Most times, terrorist acts, both domestic and international, are driven by a terrorist group or hate organization. Occasionally, individuals, as was the case in the Oklahoma City bombing, perform independent acts. Usually, the perpetrators have an underlying belief that drives the act. Some of the types of groups that exist in Montana include the following:

- Christian Identity: This religion asserts that whites, not Jews, are the true Israelites favored by God in the Bible. For decades, Identity has been one of the most influential ideologies for the white supremacist movement. [Southern Poverty Law Center, 2016]
- Eco-Terrorists: These environmentally-oriented, subnational groups use or threaten to use violence of a criminal nature against innocent victims or property for environmental-political reasons. They may also aim their attacks at an audience beyond the target, often of a symbolic nature. Organizations identified by the Federal Bureau of Investigation (FBI) as having terrorist cells include the Animal Liberation Front (ALF) and the Earth Liberation Front (ELF). Although supporting organizations generally advocate peaceful demonstrations, the FBI estimates that the ALF/ELF have committed more than 600 criminal acts in the United States from 1996 to 2001, resulting in damages in excess of $43 million. The most destructive acts committed by the ALF/ELF involve arson. [Federal Bureau of Investigation, 2002]
- White Nationalist: Many groups celebrate traditional Southern culture and the Civil War's dramatic conflict between the Union and the Confederacy, but some groups go further and embrace racist attitudes towards blacks, and in some cases, white separatism. *"These groups range from those that use racial slurs and issue calls for violence to others that present themselves as serious, non-violent organizations and employ the language of academia"* [Southern Poverty Law Center, 2016]
- Neo-Nazi: These groups share a hatred for Jews and a love for Adolf Hitler and Nazi Germany. While they also hate other minorities, homosexuals, and even sometimes Christians, they perceive "the Jew" as their cardinal enemy, and trace social problems to a Jewish conspiracy that supposedly controls governments, financial institutions, and the media. [Southern Poverty Law Center, 2016]

4.8.1.1 WARNINGS, WATCHES, AND ADVISORIES

When notified by a government official, the National Weather Service has the ability to send alert messages through the Emergency Alert System and over NOAA Weather Radio. Examples include the following:

- Local Area Emergency Message: This message defines an event that by itself does not pose a significant threat to public safety and/or property, but the event could escalate, contribute to other more serious events, or disrupt critical public safety services. Instructions, other than public protective actions, may be provided by authorized officials. Examples of when this message may be used include: utility disruptions, road closures, or a potential terrorist threat where the public is asked to remain alert.
- Civil Emergency Message: This message outlines a significant threat or threats to public safety and/or property that is imminent or in progress. The hazard is usually less specific or severe than those requiring a Civil Danger Warning.
- Law Enforcement Warning: This warning is issued for a bomb explosion, riot, or other criminal event. An authorized law enforcement agency may block roads, waterways, or facilities, evacuate or deny access to affected areas, and arrest violators or suspicious persons.
- Radiological Hazard Warning: This warning warns of the loss, discovery, or release of a radiological hazard such as the theft of a radiological isotope used for medical, seismic, or other purposes, discovery of radioactive materials, or a transportation accident involving nuclear weapons, nuclear fuel, or radioactive wastes. Authorized officials may recommend protective actions be taken if a radioactive hazard is discovered.
- Civil Danger Warning: This warning is issued when an event presents a danger to a significant civilian population. The message usually warns of a specific hazard and outlines specific protective actions such as evacuation or shelter in place.
- Shelter In Place Warning: This warning is issued when the public is recommended to shelter in place (go inside, close doors and windows, turn off air conditioning or heating systems, and turn on the radio or TV for more information). Examples include hazardous material releases or radioactive fallout.

Source: National Weather Service, 2006.

4.8.2 HISTORY

Historically, terrorism has been present in the world since the beginning. Greek historians wrote about the use of psychological warfare against their enemies. Roman emperors would banish citizens, expropriate property, and even execute citizens in order to maintain civil obedience to the empire. Even the Spanish used arbitrary arrest, torture, and execution as punishment against what was considered religious heresy.

In the United States, terrorism has been prevalent as well. The Ku Klux Klan was formed after the Civil War to intimidate those individuals who supported Reconstruction. Terrorism tactics continued in the late 19th century. Several adherent anarchists felt the best way for political and social change to take place was to assassinate the people in power.

Terrorism was quite prevalent in the 20th century taking on many changes in the way it was used and executed. Today in the 21st century, there are many prominent terrorist groups organized around the world. Their tactics differ from past tactics in that victims are frequently innocent civilians who are in the wrong place at the wrong time or have been randomly singled out for one reason or another.

Fortunately, Beaverhead County has not been the location of a modern terrorism event, however, the Rainbow Gathering of 2000 could be used as an example of civil unrest in Beaverhead County. During the Rainbow Gathering, approximately 24,000 non-residents lived in commune style on National Forest lands outside Dillon. The Rainbow culture lacks structure and is made up of "free-spirited" individuals, and while they generally promote non-violence and respect for others, such a large gathering could have invited civil unrest and certainly put a strain on law enforcement resources.

Table 4-31. Table 4.8.2B Beaverhead County Terrorism and Civil Unrest Declared Disasters and Emergencies (Page 1 of 2)

Declaration	Location	Date	Magnitude	Casualties	Damages
N/A	Statewide	January–February 1979	Activation of National Guard for State Institutions Strike	None	$1,393,714 State*
State EO 03-91	Statewide	April 1991	Activation of National Guard and Assistance Statewide for State Institutions Strike	None	Unknown
State EO 10-96	Statewide	April 23, 1996	Incident Response for Anniversary of Waco and Oklahoma City incidents	None	$4,368 State*
State EO 01-00	Beaverhead County	July 2000	Rainbow Family Gathering	None	$77,606 State $23,911 Local
State EO 23-01	Statewide	September 11, 2001	Emergency Declaration following the World Trade Center and Pentagon terrorist attacks	None	Unknown
State EO 28-01	Statewide	September 11, 2001	Executive Order establishing the Montana Homeland Security Task Force and designating the Disaster and Emergency Services Division as lead agency	None	Unknown
State EO 26-01	Statewide	September 28, 2001	National Guard activation to provide personnel for airport security	None	Unknown
State EO 13-04	Statewide	September 2 2004	Executive Order authorizing Incident Response authority in the State of Montana due to an escape of Department of Corrections convict in the City of Helena	None	Unknown

Table 4-31. Table 4.8.2B Beaverhead County Terrorism and Civil Unrest Declared Disasters and Emergencies (Page 2 of 2)

Declaration	Location	Date	Magnitude	Casualties	Damages
State EO 26-2006	Statewide	September 28, 2001	Executive Order authorizing Incident Response authority in the State of Montana due to a Department of Corrections prisoner escape from a prison transport vehicle within the City of Helena and Lewis & Clark County	None	Unknown

* Figures are statewide.
Source: Montana Disaster and Emergency Services, 2016.

4.8.3 PROBABILITY AND MAGNITUDE

The probability of a terrorist or civil unrest event affecting Beaverhead County directly is difficult to determine. The county is not considered a specific terrorist target nor is it an area at high risk for civil unrest. As with any area, a shooting by a disgruntled person, employee, or student is always possible. A large scale attack cannot be ruled out, and therefore, a small probability exists. The remoteness and vastness of the county may even promote concealment or hiding for individual terrorist or groups of terrorist and their coerce activities.

Of greater probability is a terrorist attack that has an indirect effect on the county through its economy. The September 11th terrorist attacks in New York, Washington, and Pennsylvania had a significant impact on the national economy and required the activation of local resources. Another attack could have a similar effect. Such an attack in another part of the country has a greater probability than a direct attack within Beaverhead County, but even the probability of such an attack elsewhere is unknown and is the subject of much debate.

An attack on the United States that collapses the economy or requires warfare and the drafting of soldiers is considered a high magnitude event. On a smaller but very significant scale would be an attack on a facility such as a school or business involving shooters, homemade bombs, or the taking of hostages. High schools across the country have struggled with similar events, and therefore, such an incident is possible, although not likely, in Beaverhead County.

Overall Terrorism and Civil Unrest Probability: Low

4.8.4 MAPPING

Given the uncertainties associated with terrorism and civil unrest, uniform risk is assumed throughout the county.

4.8.5 VULNERABILITIES

4.8.5.1 CRITICAL FACILITIES

Critical facilities play prominent roles in Beaverhead County. Often, terrorists target facilities that are highly important for government services and community stability. Threat data is not specific enough to identify what facilities are most vulnerable, therefore, all critical facilities are considered to have the same risk countywide. Given the rural nature of the region, a major terrorist attack making a direct impact in Beaverhead County is not expected. Perhaps the greatest threat to the communities is a disgruntled student, employee, or resident threatening others with violence. The extreme example of a bomb, depending on its size, could cause structural losses to a critical facility.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Critical functional losses
- Critical data losses.

Expected Terrorism and Civil Unrest Impact to Critical Facilities: Low-Moderate

4.8.5.2 CRITICAL INFRASTRUCTURE

Terrorism officials emphasize that potential targets include our nation's delicate infrastructure. Should an attack occur, Beaverhead County could locally lose electricity, telephone, or internet services. More localized incidents could disrupt water or sewer services. Other attacks could limit fuel or propane supplies and affect transportation and heating capabilities.

Possible losses to critical infrastructure include:

- Electric power disruption
- Telephone service disruption
- Fuel shortages.

Expected Terrorism and Civil Unrest Impact to Critical Infrastructure: Low-Moderate

4.8.5.3 STRUCTURES

Structure losses are possible from terrorism and civil unrest but are not likely. Looting, however, can be associated with these types of events. Therefore, this hazard places both the population and property at risk. Communities and places of public gathering are generally going to be the areas of greatest risk.

Possible losses to structures include:

- Structural losses
- Contents losses
- Vehicle losses
- Displacement losses.

Expected Terrorism and Civil Unrest Impact to Structures: Low

4.8.5.4 POPULATION

The effects of terrorism and civil unrest are usually felt by the population. During times of unrest, the greatest risk is to human lives. Terrorists typically try to make a dramatic statement that will generate media interest. Attacking the population through a large loss of life is a common tactic. Depending on the type of attack, casualties could be light or involve much of the Beaverhead County population.

Expected Terrorism and Civil Unrest Impact to the Population: Moderate-High

4.8.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- General national economic slowdowns
- Livestock losses through intentional disease spread
- Tourism losses during terrorism fears.

Possible ecologic losses include:

- Environmental contamination.

Possible social losses include:

- Cancelled activities
- Emotional impacts of significant population losses
- Loss of sense of security.

Expected Terrorism and Civil Unrest Impact to the Values: Moderate

4.8.5.6 FUTURE DEVELOPMENT

Development should have little to no impact on the terrorism hazard, except for the increase in population and the associated increase in potential for life and property losses should an event occur.

Expected Terrorism and Civil Unrest Impact to Future Development: Low

4.8.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the terrorism and civil unrest hazard include:

- Inability to quantify the probability and magnitude of an event
- General uncertainties related to terrorist attacks and civil unrest incidents.

Other hazards often related to terrorism and civil unrest include:

- Any hazard that can be "imagined and created"
- Hazardous material release
- Dam failure
- Communicable disease
- Aircraft accident
- Wildfire
- Urban fire.

4.9 TRANSPORTATION ACCIDENT

Including Railroad and Motor Vehicle Accidents

4.9.1 DESCRIPTION

A transportation accident, for the purposes of this plan, is any large-scale vehicular or railroad accident involving mass casualties. Mass casualties can be defined as an incident resulting in a large number of deaths and/or injuries that reaches a magnitude that overwhelms the ability of local resources to adequately respond.

An interstate, state highways, county, city, and town roadways, airports, and air traffic routes all pass through Beaverhead County. Major roadways in the county include Interstate 15 and Highways 41, 43, and 278. Multi-vehicle accidents are many times related to weather, either obscuring the vision of drivers or hindering their control of a vehicle.

Union Pacific Railroad operates a main line through the county, generally along Interstate 15. The railroad transports goods and raw materials along this line twice daily.

Beaverhead County High School has a transportation department that operates 12 separate bus routes. These buses are on the road with students for approximately 860 miles per day. One route alone covers 192 miles daily and is one of the longest school bus routes in the United States. Another school bus travels 90 miles per day while five other buses are traveling between 50 and 70 miles per day each. Three buses cover 25 to 45 miles each day, and only one bus travels less than 10 miles per day. A number of these buses encounter railroad crossings daily, and all of the buses are traveling on two lane highways. Some are on secondary dirt roads.
[Dillion Tribune, 2016]

Greyhound Lines operates commercial bus service through Beaverhead County Monday through Friday and uses Interstate 15. Multiple bus tours travel through the county during the summer months.

4.9.2 HISTORY

The history of transportation accidents in Beaverhead County consists primarily of small magnitude incidents, some with fatalities, but most with very little effect on the entire community. Traffic accidents along the roadways occur regularly, usually inconveniencing travelers, overwhelming local emergency resources, and occasionally causing delays. Table 4.9.2A shows the traffic fatalities in Beaverhead County from 1980 to 2016.

Table 4-32. Table 4.9.2A Traffic Fatalities

Year	# Fatalities	Year	# Fatalities	Year	# Fatalities	Year	# Fatalities
1980	6	1990	3	2000	5	2010	6
1981	11	1991	3	2001	2	2011	3
1982	4	1992	3	2002	5	2012	4
1983	6	1993	6	2003	4	2013	3
1984	2	1994	12	2004	5	2014	0
1985	4	1995	10	2005	4	2015	6
1986	5	1996	9	2006	3		
1987	4	1997	2	2007	1		
1988	6	1998	3	2008	8		
1989	3	1999	2	2009	6		
Annual Average	5.1	Annual Average	5.3	Annual Average	4.3	Annual Average	3.7

Source: National Highway Traffic Safety Administration, 2016.

Over the past 30 years, Beaverhead County has had 14 railroad incidents:

- 1978 – Rear End Collision
- 1979 – Derailment
- 1979 – Derailment
- 1979 – Fire/Violent Rupture

- 1981 – Side Collision
- 1982 – Delayed 1 Hour 25 Min. Account Unit 3144 Turbo Burst Into Fire. Fire Department Dillon Extinguished Fire and Unit Sent to Salt Lake for Repairs
- 1984 – Derailed 12 cars account high water Red Rock River undercut culvert north side of track at Mp 289.44
- 1990 – Train went in emergency brake application, found #2 axle on up 37729 broke in half and L2 wheel cone from under car north end
- 2005 – Crew did not stop and inspect cars when detector said there was a problem. Two cars derailed and were dragged 2 ½ miles
- 2005 – Msbpc-03 was southbound into Dillon on main track when Slc1289 derailed account hot box burnt off journal on Slc1289. A total of ten cars derailed.
- 2005 – Shoving back into industry when Mp268258 on mainline, rolled into side of train hitting Mp268322, derailing Mp268258, A-end only, and sideswiped Mp268322
- 2007 – Lead unit up3597, struck a trailer of fertilizer on Main St. xing
- 2010 – Lead unit Up6933, struck a tractor pulling a trailer and two hay trailers at a county road crossing. The tractor did not stop at the stop sign. Damage was incurred
- 2016 – Machine operator on Tko was traveling on the main track back to Dillon, when the Tko arm dropped down while driving.

[Federal Railroad Administration, 2016]

Table 4-33. Table 4.9.2B Beaverhead County Transportation Accident Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damages
None					

4.9.3 PROBABILITY AND MAGNITUDE

Lacking a history of vehicular accidents resulting in mass casualties, the probability of such can only be theorized and expressed qualitatively. The probability is increased during winter storms, periods of poor visibility from snow, smoke, or dust, during holiday festivities with more instances of drinking and driving, and during times of increased traffic volume. Accidents with minor damage and injuries occur regularly. Serious, fatal accidents are less frequent but still occur.

Any mass casualty incident that overwhelms the emergency response resources within the county and neighboring counties, such as a bus crash, represents a high magnitude event.

Overall Transportation Accident Probability: Low-Moderate
Except Lima: Moderate

4.9.4 MAPPING

The Introduction section shows the major transportation routes within the county. Generally, those areas are at greater risk for a transportation accident, however, a mass casualty transportation accident cannot be ruled out anywhere in the county. Some risk exists countywide.

4.9.5 VULNERABILITIES

4.9.5.1 CRITICAL FACILITIES

Except in the very rare case of a train or vehicle crashing into a critical facility, the facilities should remain unaffected by a transportation accident. An accident involving a first response agency or blocking a primary transportation route could delay emergency services.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Functionality losses
- Increased public safety calls.

Expected Transportation Accident Impact to Critical Facilities: Low

4.9.5.2 CRITICAL INFRASTRUCTURE

In most cases, infrastructure remains unaffected during transportation accidents. The most likely impact would be the closure of a major roadway due to a vehicular accident, thus resulting in travel inconveniences and long detours. Theoretically, a vehicle can take out power lines, telephone lines, or other important pieces of infrastructure resulting in service disruptions.

Possible losses to critical infrastructure include:

- Possible loss of infrastructure services

Expected Transportation Accident Impact to Critical Infrastructure: Low

4.9.5.3 STRUCTURES

Like the critical facilities, except in the very rare case of a train or vehicle crashing into a structure, buildings should be unaffected by a transportation accident. For example, should structures be affected, damages could vary in the tens or hundreds of thousands of dollars depending on the structure or structures impacted. Should an accident occur in a developed area, structural losses in the neighborhood of $357,908 (2 homes × $178,954/average housing unit) could be expected.
Possible losses to structures include:

- Structural losses
- Contents losses.

Expected Transportation Accident Impact to Structures: Low

4.9.5.4 POPULATION

Of all the resources and values, transportation accidents pose the most common risk to the population. Accidents involving trains, vans, or busses could have mass casualties. The magnitude of such

population impacts varies from the size of the vehicle to the number of vehicles involved. Anywhere from 2 to 50 people or more could be involved.

Expected Transportation Accident Impact to the Population: Moderate

4.9.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Commerce losses due to closed roadways or railways.

Possible social losses include:

- Emotional impacts due to mass casualties.

Expected Transportation Accident Impact to the Values: Low-Moderate
Except Lima: Moderate

4.9.5.6 FUTURE DEVELOPMENT

Future development, particularly the associated increase in traffic, may increase the probability of a major transportation accident. Otherwise, the specific locations of where development occurs, except for possibly in the immediate vicinity of the railroad or highways, should not significantly affect the vulnerabilities from this hazard.

Expected Transportation Accident Impact to Future Development: Low

4.9.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the transportation accident hazard include:

- Difficulties in predicting the location and magnitude of future accidents.

Other hazards often related to transportation accidents include:

- Hazardous material release
- Severe weather
- Smoke
- Flood
- Terrorism.

4.10URBAN FIRE

4.10.1 DESCRIPTION

Fire is the result of three components: a heat source, a fuel source, and an oxygen source. When combined, these three sustaining factors will allow a fire to ignite and spread. Within a structure, a small flame can get completely out of control and turn into a major fire within seconds. Thick black smoke can fill a structure within minutes. The heat from a fire can be 100°F at floor level and rise to 600°F at eye level. In five minutes, a room can get so hot that everything in it ignites at once; this is called flashover. [US Fire Administration, 2009]

Figure 4-25. ???.

Fires classified as urban fires generally occur in cities or towns. These fires have the ability to spread quite rapidly to adjoining buildings or structures. Urban fires damage and destroy a great number of schools, homes, commercial buildings, and vehicles across the nation every year.

Although structure fires are usually individual disasters and not community-wide ones, the potential exists for widespread structure fires that displace several businesses or families. Communities with buildings relatively close together, such as Dillon, are especially vulnerable. Lima does not have an attached downtown area, and therefore, is less susceptible to this type of fire. Fires that rage uncontrollably despite firefighting efforts and burn several structures or an important community facility could have significant economic and quality of life impacts. Strong winds common to the area are known to carry fire easily. Large fires of this nature have also been known to require significant community resources if lives are lost.

Smoke detectors, automatic fire alarm systems, automatic sprinkler systems, fire doors, and fire extinguishers can all prevent deaths, injuries, and damages from fire. Automatic sprinkler systems are especially important in preventing a small fire from becoming a conflagration.

Beaverhead County has seven volunteer fire departments based in Dillon, Lima, Grant, Polaris, Jackson, Wisdom, and Wise River. Dillon and the other communities in Beaverhead County are like many other small towns around the state; most of the downtown areas were built in the early to mid 1900's. Buildings were constructed with common walls separating adjoining businesses and apartments. Because of the close proximity of buildings to each other and lack of building codes during construction, many of the communities' business districts could be devastated if fire were to ever break out. Commercial fires that have occurred in the past have affected multiple businesses through either fire damage or smoke damage.

Figure 4-26. ???.

4.10.2 HISTORY

Beaverhead County, the City of Dillon, and the Town of Lima have experienced devastating fires for individuals and businesses. Table 4.10.2A list some of the more disastrous urban fires in the Dillon area. None of these fires have resulted in a major loss of life.

4.10.3 PROBABILITY AND MAGNITUDE

Beaverhead County has had a number of significant historical structure fires over the past century. Recent years have seen a decline in the number of major fires, probably due to the lack of development and improvements in firefighting. Several important structures exist that could have significant impacts to community members should they be lost. Estimating the probability of fires in these buildings is difficult to determine. The structures lacking automatic sprinkler systems have a greater probability of a major structure fire. In 2014 there were 15.8 deaths per 1,000 fires in Montana, compared to the 5.5 deaths per 1,000 fires nationally [US Fire Administration, 2016]

A realistic yet devastating scenario for Beaverhead County is the destruction of several buildings or critical facilities. The county, city, and town do carry insurance for their buildings for fire. Of even greater magnitude would be a structure fire in which several people were trapped and killed.

Overall Urban Fire Probability: Low-Moderate
Except Lima: Low

4.10.4 MAPPING

Mapping does not enhance this hazard profile because the hazard is at the building scale; data to this level of detail currently does not exist.

Table 4-34. Table 4.10.2A Beaverhead County Urban Fires and Property Loss (01/01/1990–12/31/2016)

Property Type	Fires		Property Loss	
	#	%	#	%
Dwellings	81	78.64%	724,963	4.57%
Apartments	4	3.88%	3,781	0.02%
Mobile Homes	13	12.62%	143,470	0.90%
Hotels, Motels	0	0.00%	0	0.00%
Other Residential	5	4.85%	15,001,200	94.51%
Total Residential	103	100.00%	15,873,414	100.00%
Public Assembly	0	0.00%	0	0.00%
Eating, Drinking	2	20.00%	0	0.00%
Education	0	0.00%	0	0.00%
Institution	2	20.00%	1,500	0.73%
Stores, Offices	6	60.00%	203,502	99.27%
Total Public, Merc	10	100.00%	205,002	100.00%
Basic Industry	1	3.45%	0	0.00%
Manufacturing	4	13.79%	68,050	13.15%
Residential Garage	2	6.90%	70,050	13.54%
Storage	16	55.17%	243,325	47.03%
Construction	0	0.00%	0	0.00%
Non-Building Structures	6	20.69%	135,950	26.28%
Total Industry, etc	29	100.00%	517,375	100.00%

Montana Department of Justice, 2016.

4.10.5 VULNERABILITIES

Any building is vulnerable to structure fire, however, sprinkler systems can minimize fire losses. Those structures that do not have a sprinkler system are at greater risk for fire losses. Any urban fires in buildings without sprinkler systems would likely suffer heavy losses.

4.10.5.1 CRITICAL FACILITIES

All critical facilities are at risk from fire. Structure fires at a critical facility could lead to losses in critical functions, records, and supplies or temporary delays in emergency response. Facilities housing vulnerable populations present building evacuation challenges, depending on the type of facility, and may result in special needs sheltering or school cancellations.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Critical functional losses
- Critical data losses.

Expected Urban Fire Impact to Critical Facilities: Moderate

4.10.5.2 CRITICAL INFRASTRUCTURE

Depending on the type of infrastructure, an urban fire could result in short-term disruptions while services are rerouted. In the case of a supporting facility, such as the water treatment plant or a sewer lift station, long-term disruptions could be seen. For example, a fire at an electric substation may leave an area without power for several hours or days. A fire at the water treatment plant may leave the community without water for days or weeks.

Possible losses to critical infrastructure include:

- Service disruptions
- Physical damages to infrastructure.

Expected Urban Fire Impact to Critical Infrastructure: Low

4.10.5.3 STRUCTURES

Fire losses to residential and commercial structures are usually covered by insurance, but can be devastating to the building occupants, particularly for primary residences. These types of events often do not result in community-wide disasters, unless the structure is critically important to the economy. Fortunately, Montana is known for its kindness of neighbors and the communities usually rally to support those affected. The American Red Cross also provides emergency assistance to families in these types of situations.

Possible losses to structures include:

- Structural losses
- Contents losses
- Displacement losses.

Expected Urban Fire Impact to Structures: Low-Moderate

4.10.5.4 POPULATION

Depending on the time and location, a major urban fire could result in the loss of life either to firefighters or building occupants. The potential for this type of loss is difficult to determine due to advances in firefighter safety and the installation of sprinkler and alarm systems in some structures. Those structures lacking smoke detectors or adequate exits are especially dangerous to the population. Should lives be lost, significant resources could be needed to manage the recovery.

Expected Urban Fire Impact to the Population: Moderate

4.10.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Business closures and associated business disruption losses.

Possible ecologic losses include:

- Poor air and water quality.
- Possible historic losses include:

Structural and content losses of historic structures

- Smoke and water damage to historic items.
- Possible social losses include:
- Emotional impacts of significant population losses.

Expected Urban Fire Impact to the Values: Low-Moderate

4.10.5.6 FUTURE DEVELOPMENT

Most development, unless urban or industrial in nature, will have little impact on the potential for a significant urban fire. All structures, including new development, will continue to be at risk for fire, but development that includes fire suppression and alerting systems will better protect contents and occupants. Some commercial and multi-residential development is regulated with respect to fire regulations, but most new development is not.

*Expected Urban Fire Impact to Future Development:*Low-Moderate

4.10.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the urban fire hazard include:

- Lack of an evaluation of important structures and their fire potential.

Other hazards often related to urban fires include:

- Wildfire
- Lightning
- Strong wind
- Hazardous material release
- Terrorism and civil unrest.

4.11 UTILITY AND ENERGY FAILURE

4.11.1 DESCRIPTION

A utility or energy failure occurs when there is an interruption in the distribution of supplies or interruption in the collection of waste materials. Utilities and energies include, but are not limited to, potable water supplies, electricity, propane, sewage treatment/disposal, natural gas, gasoline/diesel fuels, telephone and internet services, and garbage disposal. Normal activities usually cannot be sustained in a specific area or region because of the failure. History indicates failures can occur at special times during a year or because of specific events.

The public has come to rely upon utility, communication, energy, and fuel services for everyday life and basic survival. Many in Beaverhead County depend on the typical utility, energy, and communication infrastructure such as water, sewer, electricity, propane, natural gas, telephone, internet, and gasoline. Water and sewer services are either provided through a public system or through individual wells and septic systems. Electricity is primarily provided by regional electric companies through overhead or buried lines. Homes and businesses are heated with fuels such as natural gas, propane, and electricity. Those buildings heated with propane typically have a nearby tank that is refilled regularly by a local vendor but still rely on electricity to power their heating systems. Natural gas is provided through underground piping. Telephone, cellular telephone, and internet services are provided by several local and national companies. Privately-owned gas stations are located throughout the county.

Almost any hazard can cause a utility or energy failure, but disruptions can also occur due to human error, equipment failures, global markets, or low supplies. The most common hazards that interrupt electric services are heavy snow, ice, and wind. Terrorist activities have to be one of the major concerns for such failures. Water supplies may be threatened by drought. Sewer services can be disrupted by flood. Often these types of outages are short lived. Crews quickly respond and resolve the problem causing the failure. During a widespread or complicated outage, services may be down for days or even weeks. Most problems arise during these longer term outages. For example, electricity is needed to maintain water supplies and sewer systems, but also to run blowers for heating systems. Essentially, without electricity, most facilities are without heat, water, fuel, or other appliances during a long term outage. This problem becomes particularly significant during the cold winter months. Telephone services are important for day-to-day business, but are most important for 911 communications in an emergency. Without telephone service, emergency services can be severely delayed. In most cases, a long term utility failure would force many businesses to close until the services were restored. Gasoline shortages are also common during times of disaster. Oil embargos, wars, and world politics are all events that could affect the availability of petroleum products in Beaverhead County.

During winter months natural gas shortages can occur because of increased use for heating. Winter storms can cause electrical and telephone failure due to downed poles and lines. Often times, wars or national politics affect the availability of crude oil for the manufacture of gasoline and diesel fuel. Other events that could cause a utility or energy failure include accidents, drought, sabotage, wildland fires, demand or overload, or terrorist activities.

Beaverhead County and its communities could experience a number of different types of utility failures. The two most likely failures are in the distribution of electricity and natural gas. Either of these could prove to be most devastating during the winter months. Other utilities and energies that would present hardships if failure or a shortage were to occur include potable water systems, sewage treatment and disposal plants, garbage disposal, and petroleum products such as gasoline and diesel.

Electrical service is provided by two power companies in Beaverhead County. Vigilante Electric Cooperative Inc. supplies the county with electricity while NorthWestern Energy is responsible for supplying electricity and natural gas. Idaho Power has transmission lines crossing the county. Vigilante

Electric primarily serves the outlying areas and rural communities of Beaverhead County. NorthWestern Energy is responsible for supplying Dillon and areas in close proximity of Dillon.

Along with above ground electrical utility lines, Vigilante Electric and NorthWestern Energy have numerous substations. NorthWestern Energy also has a network of underground natural gas lines. Each jurisdiction is responsible for the care and operation of other utilities and energies including the water plant, sewage plant, and gasoline, diesel, and propane bulk plants.

Beaverhead County is very rural and depends on power and gas for survival. Winters can be long and very cold, necessitating the availability of electricity, natural gas, propane, and gasoline and diesel fuels. Homes and businesses need heating fuels, while the agriculture industry must have diesel and gasoline in order to keep the farm or ranch operating. The size of the county, its dispersed population, and lack of commodities in most of the small communities dictates travel in order to survive. During summer months, the agriculture industry again requires large quantities of fuel in order to complete their farming operations. Warnings, Watches, and Advisories

In the event of a utility or energy failure, the National Weather Service has the ability to send out messages over the Emergency Alert System and NOAA Weather Radio (the radios often have battery back-ups). Examples of alerts include:

- Local Area Emergency Message: This message defines an event that by itself does not pose a significant threat to public safety and/or property, but the event could escalate, contribute to other more serious events, or disrupt critical public safety services. Instructions, other than public protective actions, may be provided by authorized officials. Examples of when this message may be used include: utility disruptions, road closures, or a potential terrorist threat where the public is asked to remain alert.
- 911 Telephone Outage Emergency Message: This message notifies the public of a local or state 911 telephone network outage by geographic area or telephone exchange. The message may provide alternative phone numbers to reach 911 or dispatch personnel.

Source: National Weather Service, 2006.

4.11.2 HISTORY

Residents of Beaverhead County regularly experience short-term utility and energy outages for a variety of reasons. Typically, these short-term outages do not cause significant problems.

On October 17, 1973, the Organization of the Petroleum Exporting Countries (OPEC) imposed an oil embargo on the United States. The embargo came at a time when 85% of American workers drove to their places of employment each day. President Nixon set the nation on a course of voluntary rationing. He called upon homeowners to turn down their thermostats and for companies to trim work hours. Gas stations were asked to hold their sales to a maximum of ten gallons per customer. In the month of November 1973, Nixon proposed an extension of Daylight Savings Time and a total ban on the sale of gasoline on Sundays. The price at the pump rose from 30 cents a gallon to about $1.20 at the height of the crisis.

Beaverhead County has not experienced gasoline shortages like large metropolitan areas, however, drastic price fluctuations have occurred, thus affecting travel, availability of fuels, and the economics of the county. Increases in gasoline and diesel prices create hardships on consumers, especially those in the agriculture industry.

Historically, electrical failures have affected the residents of Beaverhead County. From 2000-2003 in Beaverhead County, an average 7,389 Vigilante Electric customers and an average 1,202 NorthWestern Energy customers were affected by electric outages annually. The annual average consumer-hours lost were 15,951 consumer-hours for Vigilante Electric and 3,956 consumer-hours for NorthWestern Energy in Beaverhead County. The primary cause of failures for Vigilante Electric was power supply interruptions from NorthWestern Energy. The primary causes of failures for Northwestern Energy were equipment failures, storms, and lightning. These figures are well within national standards and power outages can happen at any time in Beaverhead County and last for prolonged periods of time. Repair time can be lengthy due to the distances repair people must travel in order to find the problem and the remoteness of power lines.

Communication failures in Beaverhead County have been experienced by main lines being cut for needed work to be done as well as by human error. On October 10th 2016 utility ground work being performed by a private contractor severed a fiber optic cable near Helena. The cut was described as a "long-haul fiber line cut" cut by Three Rivers Communication CEO David Gibson. Gibson stated "When you cut the freeway, you cut everything downstream." Three Rivers Communication rents space on the line to communication companies such as Charter, Vison Net, and Version. This cut effected communications for Dillon, Lima, Monida, and Twin Bridges, Sheridan, Whitehall, Bigsky and Ennis. All in all the line was cut for 7 hours leaving these areas without cell phone, or internet. Dillion Tribuen, October 11th, 2016

Table 4-35. Table 4.11.2B Beaverhead County Utility and Energy Failure Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damages
None					

4.11.3 PROBABILITY AND MAGNITUDE

With a limited history of events, the probability of utility and energy failures can only be theorized. Generally, electric power outages are the most common and are often short-lived; electric outages do have the potential to cause significant problems. Gasoline shortages have also been problems in the past but have been limited to economic and social losses. Natural gas, propane, and water shortages are possible, but given a limited history of such, are somewhat less likely.

Possibly the most significant utility or energy failure scenario for Beaverhead County is the loss of electricity for a week or more during a particularly cold winter spell. Without generators, an extended power outage could additionally lead to the loss of running water, sewer services, and the ability to heat buildings, which in turn may lead to pipe ruptures. Any equipment such as medical equipment, computers, and cell phones requiring power to run would eventually be incapacitated. Those facilities with generators would still be able to use appliances, equipment, and heating systems, however,

community water and sewer services may not be available. Such a long term outage could lead to emergency sheltering and necessitate the activation of other emergency resources.

Overall Utility and Energy Failure Probability: Low-Moderate

4.11.4 MAPPING

The utility and energy failure potential is uniform across the county, therefore, mapping does not enhance this hazard profile.

4.11.5 VULNERABILITIES

4.11.5.1 CRITICAL FACILITIES

Most utility and energy failures do not directly impact structures; however, an electric outage during winter could result in frozen and burst water pipes, causing water damage within the interiors of structures. A natural gas, propane, or fuel oil shortage could produce similar results.

Electricity and gasoline disruptions could also limit the ability to provide emergency services. For example, medical and special needs facilities require electricity for certain types of medical equipment to work. Gas station pumps may not operate without electricity, and therefore, emergency vehicles may not have enough fuel during long term outages. Gasoline shortages could also limit the fuel available for emergency responders.

Possible losses to critical facilities include:

- Critical functional losses.

Expected Utility and Energy Failure Impact to Critical Facilities: Low-Moderate

4.11.5.2 CRITICAL INFRASTRUCTURE

Energy providers typically rely on established infrastructure to provide services and materials. Therefore, energy failures are often related to problems with the infrastructure. Minor damages or problems may indicate a short-term outage whereas large scale damages may suggest a long-term outage. Many services rely on other utilities to operate. For example, the water supply pumps and sewer lift stations both require electricity to continue operations. One or both may go down during long-term electric outages. Propane and gasoline refills require the transportation network to be open since deliveries are done by truck. This interdependency can lead to more complex utility outage problems.

Possible losses to critical infrastructure include:

- Widespread and prolonged loss of electric service
- Widespread and prolonged loss of communication services
- Loss of potable water
- Loss of sewer services
- Lack of heating fuels
- Loss of communications.

Expected Utility and Energy Failure Impact to Critical Infrastructure: Moderate

4.11.5.3 STRUCTURES

Similar to critical facilities, structures across the county could be without heat during an electricity, natural gas, propane, or fuel failure. During cold weather, structures without heat may be uninhabitable for a time. Generally, structures are not directly affected by utility and energy failures, but in some cases, direct damages may result.

Possible losses to structures include:

- Functional losses

Expected Utility and Energy Failure Impact to Structures: Low-Moderate

4.11.5.4 POPULATION

Over the past 100 years, the population has become more and more dependent on the nation's critical infrastructure and systems. Heat, running water, sanitation, communications, grocery stores, and pharmacies all require electricity, and without these services in the long term, the population may suffer. Natural gas, propane, fuel oil, and electricity are critical for heat, especially during the cold winter months. Approximately, 3,961 people in Beaverhead County rely on natural gas for heat, 1,854 rely on electric heat, and 1,111 rely on propane. Personal and commercial food supplies may spoil during extended power outages. Water is needed for cooking, cleaning, and drinking, and sewer is needed for sanitation. Each is important for the health and safety of humans. Without these services, emergency resources may be needed. Emergency supplies can often hold the populations over temporarily but may take some time before arriving, in which case, individuals may need to rely on their own personal supplies.

Expected Utility and Energy Failure Impact to the Population: Low-Moderate

4.11.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Business closures and associated business disruption losses
- General economic slowdown due to higher energy or material costs
- Reduction in commerce due to fuel shortages.

Expected Utility and Energy Failure Impact to the Values: Moderate-High

4.11.5.6 FUTURE DEVELOPMENT

Where future development occurs is not directly tied to increased utility and energy failures. Increased populations add to the challenges of managing a long-term failure but would not increase the damages necessarily.

Expected Utility and Energy Failure Impact to Future Development: Low

4.11.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the utility and energy failure hazard include:

- Quantifying the type and length of failures that begin to cause significant problems
- Limited historical occurrence and related data prevents accurately estimating potential losses.

Other hazards often related to utility and energy failures include:

- Strong winds
- Heavy snow
- Ice storms
- Tornadoes
- Lightning
- Terrorism and civil unrest.

4.12VOLCANIC ASHFALL

4.12.1 DESCRIPTION

Beaverhead County does not have any known active volcanoes, however, the Yellowstone Caldera within Yellowstone National Park is about 50 miles away, and dense volcanic ash can travel hundreds of miles. The last non-hydrothermal eruption in the Yellowstone Caldera was thousands of years ago. Currently, the most active region in the continental United States is the Cascade Range to the west in Washington and Oregon, about 400 miles away. This region includes the volcanoes at Mount St. Helens, Mount Rainer, and Mount Hood. Beaverhead County lies within reasonable range of ashfall from these volcanoes under normal upper atmospheric wind and stability conditions. In addition to ashfall and other effects, large eruptions have been known to change weather patterns globally.

The Yellowstone Caldera, one of the world's largest active volcanic systems, has produced several giant volcanic eruptions in the past few million years, as well as many smaller eruptions and steam explosions. Although no eruptions of lava or volcanic ash have occurred for many thousands of years, future eruptions are likely. Over the next few hundred years, hazards will most likely be limited to ongoing geyser and hot- spring activity, occasional steam explosions, and moderate to large earthquakes. To better understand Yellowstone's volcano and earthquake hazards and to help protect the public, the US Geological Survey, the University of Utah, and Yellowstone National Park formed the Yellowstone Volcano Observatory, which continuously monitors activity in the region. [US Geological Survey, 2005]

If a large caldera-forming eruption were to occur at Yellowstone, its effects would be felt worldwide. Thick ash deposits would bury vast areas of the United States, and the injection of huge volumes of volcanic gases into the atmosphere could drastically affect global climate. Fortunately, the Yellowstone volcanic system shows no signs that it is headed toward such an eruption. The probability of a large caldera-forming eruption within the next few thousand years is exceedingly low. Any renewed volcanic activity at Yellowstone would most likely take the form of non-explosive lava eruptions. [US Geological Survey, 2005]

The Cascade Region does not have the same caldera-forming potential as Yellowstone, but has been much more active in recent years. The volcanoes in this region can drop and have dropped measurable ash over Montana. Volcanic ashfall may not sound harmful hundreds of miles away, but depending on the volume of ash that falls, it can create problems. Ash in the air can affect those with respiratory

sensitivities, reduce visibilities, and clog air intakes. Its corrosive properties can damage vehicles and other machinery. When wet, the ash becomes glue-like and hard to remove.

4.12.2 HISTORY

On May 18, 1980, Mount St. Helens in the Cascade Range of Washington erupted, sending ash high into the atmosphere. Over the course of several days, the ash fell from the sky, primarily over eleven states, including Montana. Less than a half inch fell over Beaverhead County, as shown in Figure 4.12.2A. The Montana Governor asked businesses to close and individuals with breathing problems to stay indoors until the threat was assessed. No reports of structure damage were received, and the health concerns lasted for a 3-day period.

The Yellowstone region has produced three exceedingly large volcanic eruptions in the past 2.1 million years. In each of these cataclysmic events, enormous volumes of magma erupted at the surface and into the atmosphere as mixtures of red-hot pumice, volcanic ash (small, jagged fragments of volcanic glass and rock), and gas that spread as pyroclastic ("fire-broken") flows in all directions. Rapid withdrawal of such large volumes of magma from the subsurface then caused the ground to collapse, swallowing overlying mountains and creating broad cauldron-shaped volcanic depressions called "calderas." [US Geological Survey, 2005] Studies have shown that ash from each of these eruptions fell where Beaverhead County now sits.

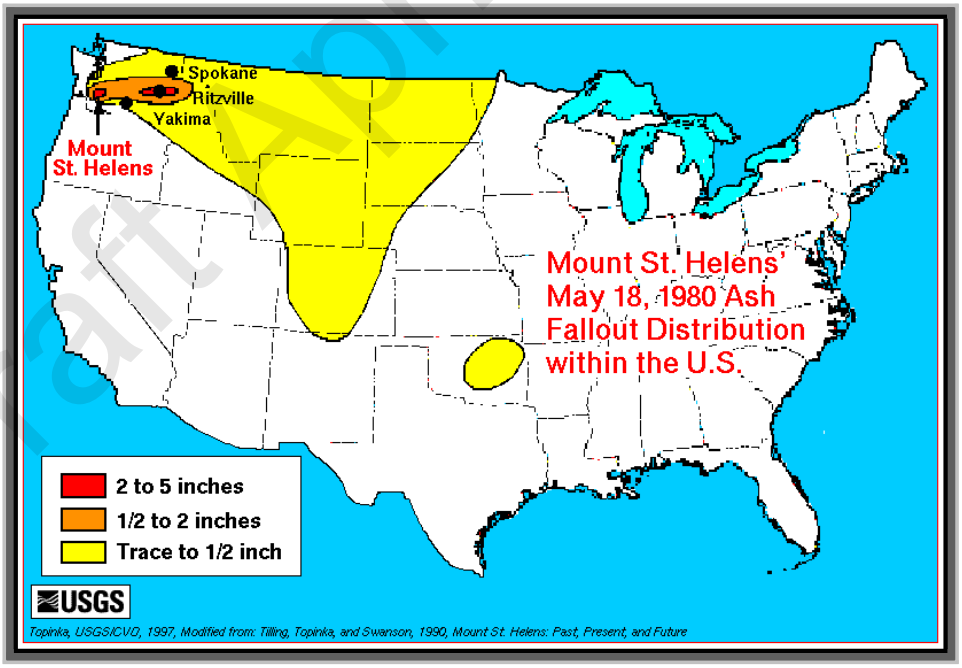

Figure 4-27. Figure 4.12.2A Generalized Map of United States Ashfall From Mount St. Helens. (Source: Cascades Volcano Observatory, 2006)

4.12.3 PROBABILITY AND MAGNITUDE

Volcanic eruptions are rare events when compared to other hazards. Scientists evaluate natural hazards by combining their knowledge of the frequency and the severity of hazardous events. In the Yellowstone region, damaging hydrothermal explosions and earthquakes can occur several times a century. Lava flows and small volcanic eruptions occur only rarely - none in the past 70,000 years.

Massive caldera-forming eruptions, the most potentially devastating of Yellowstone's hazards, are extremely rare - only three have occurred in the past several million years. US Geological Survey, University of Utah, and National Park Service scientists with the Yellowstone Volcano Observatory (YVO) see no evidence that another such cataclysmic eruption will occur at Yellowstone in the foreseeable future. Recurrence intervals of these events are neither regular nor predictable. [US Geological Survey, 2005] Figure 4.12.3A shows the probability of the various events that can occur in Yellowstone National Park.

The Cascade region, being more active, has a higher probability of eruptions over the next 100 years. Based on eruptions in the Cascade region over the past 4,000 years, the probability of an eruption is about 1.25 percent in any given year or approximately 1–2 eruptions per 100 years within the Cascade Range.

A large caldera-forming eruption of Yellowstone Park is always possible with devastating consequences for many communities across the United States. Given the extremely low probability of such an event, however, a more realistic magnitude over the next 500 years will be considered for planning purposes. A Cascade Range eruption that leaves an inch or more of ash over Beaverhead County is a high magnitude volcanic ashfall event for this area. Such an event would not only affect the county, but many other communities throughout the region. Rainfall would additionally compound problems with the ash removal.

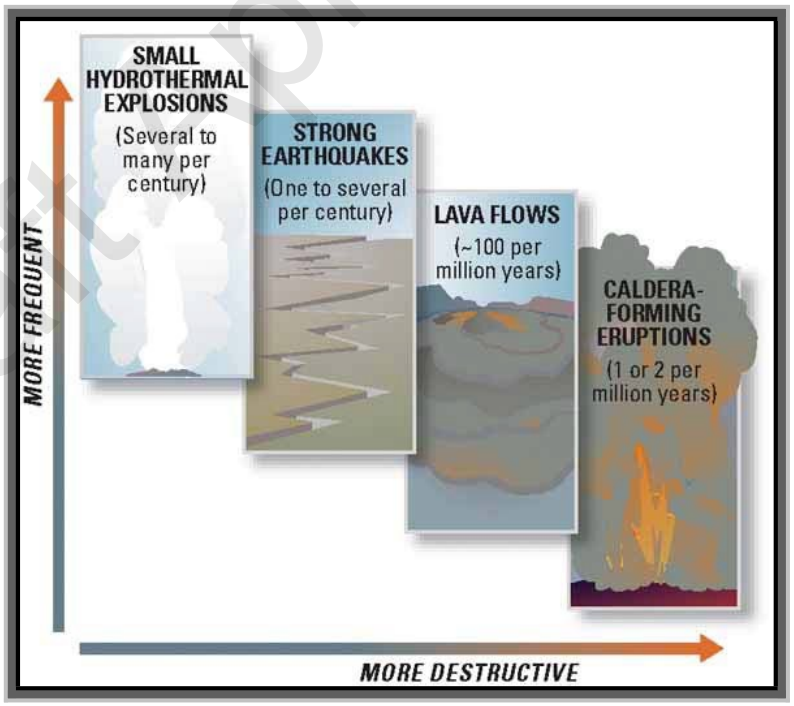

Figure 4-28. Figure 4.12.3A Recurrence Intervals for Geological Events in Yellowstone National Park (Source: US Geological Survey, 2005)

Overall Volcano Probability: Low

4.12.4 MAPPING

Following an eruption, the areas affected by ash will depend on the type of eruption, atmospheric stability, and wind conditions. Forecasts estimating the amount of ash will generally be issued at that time. Given the broad, regional nature of volcanic ashfall, Beaverhead County is assumed to have the same risk countywide.

4.12.5 VULNERABILITIES

4.12.5.1 CRITICAL FACILITIES

Theoretically, large amounts of wet volcanic ash could weigh enough to bring down even strong roofs. A more likely problem is the removal of ash from building air intakes and vehicles. This removal takes time and care since volcanic dust is corrosive to metals. In most cases, critical facility clean-ups would be done by the building owner or facility maintenance. Additionally, emergency responders may look to alternatives to driving in ashfall given its corrosive properties and potential to damage vehicle engines. With the reduced visibilities and volcanic ash in the air, aircraft may not be able to fly to the affected area to provide medical or emergency supplies.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Functionality losses
- Clean-up costs
- Increased public safety calls.

Expected Volcano Impact to Critical Facilities: Low-Moderate

4.12.5.2 CRITICAL INFRASTRUCTURE

Because volcanic ash is corrosive, particularly when wet, above ground infrastructure such as power lines, telephone lines, and sewer lift stations may experience mechanical and connectivity problems. With only an inch or two of ash, however, such damages and disruptions would probably be relatively minor.

Possible losses to critical infrastructure include:

- Possible temporary loss of infrastructure services.

Expected Volcano Impact to Critical Infrastructure: Low

4.12.5.3 STRUCTURES

Like the critical facilities, structures throughout the county are vulnerable to ashfall, however, the greatest challenge would most likely be the removal of the ash and not structural damages. Heavy ash does have the potential to clog air systems. Many residents would need guidance and assistance in removing ash from their personal property.

Possible losses to structures include:

- Structural losses

- Contents losses
- Clean-up costs.

Expected Volcano Impact to Structures: Low-Moderate

4.12.5.4 POPULATION

Light ashfall does not usually significantly affect the general population, but those with respiratory sensitivities may experience additional problems. Ashfall conditions that exist for several days could lead to significant health problems even in the general population. Most communities recommend staying indoors, closing windows, and turning off air conditioners, thus minimizing the human exposure to the ash. Local officials would probably have some warning before the ash began to fall. Earthquakes would likely warn of any activity in the Yellowstone Caldera. The degree of population impacts will greatly vary, depending on the type of event.

Expected Volcano Impact to the Population: Moderate

4.12.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Losses to agriculture due to livestock health and feed and crop productivity issues
- Tourism losses due to minimized travel to the area.

Possible ecologic losses include:

- Wildlife losses due to food shortages
- Fish and aquatic losses due to changes in water properties from the ash.

Possible social losses include:

- Emotional impacts due to isolation in closed up buildings
- Cancelled activities during emergency travel only periods.

Expected Volcano Impact to the Values: Low-Moderate

4.12.5.6 FUTURE DEVELOPMENT

Future development will have little to no effect on the volcano vulnerabilities. An increase in the population and number of structures would increase the overall exposure.

Expected Volcano Impact to Future Development: Low

4.12.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the volcano hazard include:

- Difficulties in predicting future volcanic activity and the associated impacts due to the low frequency of eruptions.

Other hazards often related to volcanoes include:

- Earthquake.

4.13WILDFIRE

4.13.1 DESCRIPTION

A wildfire is an uncontrolled fire in a vegetated area. Wildfires are a natural part of the ecosystem. They have a purpose in nature and following years of fire suppression, many areas have built up fuels that can lead to larger, more intense fires. In Beaverhead County, timber, shrubs, grasses, and rangeland make up the primary fuel sources. These fuels burn rapidly and readily when cured. These types of fires have the potential to destroy structures and natural resources while producing heavy amounts of smoke, particularly when spread by strong winds. Negative impacts of wildfire include loss of life, property and resource damage or destruction, severe emotional crisis, widespread economic impact, disrupted and fiscally impacted government services, and environmental degradation.

Any flame source can trigger a wildfire, but they are most often triggered by lightning and the railroad. Once ignited, ambient conditions dictate whether the fire will spread or not. Moist, cool, and calm conditions or a lack of fuels will suppress the fire, whereas, dry, warm, and windy conditions and dry fuels will contribute to fire spread. The terrain, accessibility, and capabilities of the fire agencies are also factors in the fire's growth potential. Problems with wildfire occur when combined with the human environment. People and structures near wildfires can be threatened unless adequately protected through evacuation, mitigation, or suppression.

Wildfire occurrence is weather dependent and highly variable from year to year. Fire season generally runs from March through November but wildfires can occur at any time of year. The light, flashy fuels and the heavy, fire-sustaining timber present in the region are capable of producing large, fast moving wildfires. The Beaverhead-Deer Lodge National Forest, Anaconda-Pintler Wilderness, and other state and federal lands regularly experience wildfires and the mixed fuels and rugged terrain of those areas make firefighting especially difficult. Timber areas, shrubs, native grasses, and non-irrigated lands in the remainder of the county also present wildfire hazards. Dry grass, sagebrush, dead timber, downfall, and vast evergreen forest are the primary fuels for southwest Montana wildfires. Infestations of pine beetles have also created wide areas of dead timber throughout Beaverhead County.

Figure 4-29. Figure 4.13.1A 2003 Hidden Lake Fire.

Beaverhead County has large areas of government owned lands. The Beaverhead-Deer Lodge National Forest is managed by the US Forest Service. Scattered across the county are large tracts of land

managed by the US Bureau of Land Management and state government. This scattering of government and private ownership can present unique firefighting challenges and opportunities. Map 3.4A in the Current Land Use section shows the government land ownership in the county.

The wildland urban interface is defined as the zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel. In southwest Montana, the wildland urban interface is widespread. Private land is readily dispersed throughout Beaverhead County adjacent to federal and state lands, including many tracts developed within federal and state land boundaries. Several subdivisions have been developed next to federal and state lands of which have vast amounts of timber. Resorts, dude ranches, and other businesses are also within the wildland urban interface. Because of the location of private lands and rural developments in relationship to federal and state lands, wildfires could prove to be disastrous for many Beaverhead County residents.

Since fire suppression activities became common practice about 100 years ago, the natural cycle of frequent, low-intensity, surface fires was disrupted, and fuels, particularly in forested areas, have built up to hazardous levels. Those same habitats that would experience low-intensity fires now experience stand- replacing, high intensity fires. Changes to the ecosystem can have profound effects on the intensity and severity of wildland fires. To qualify the changes, fire ecologists use the term, fire regime condition class. Fire regime condition classes measure the degree of departure from "natural" conditions. Table 4.13.1B shows the classes and definitions accepted by many agencies. Any work done to reduce a condition class or to maintain a condition class at Class I helps to lessen the intensity of future wildfires and increases the ability of firefighting agencies to control the fire.

Table 4-36. Table 4.13.1B Fire Regime Condition Class

Condition Class	Frequency	Severity	Severity Description
I	0–35 years	Low/Mixed	Generally low severity fires replacing less than 25% of the dominant overstory vegetation. Can include mixed-severity fires that replace up to 75% of the overstory.
II	0–35 years	Replacement	High severity fires replacing greater than 75% of the dominant overstory vegetation.
III	35–200 years	Mixed/Low	Generally mixed severity. Can also include low severity fires.
IV	35–200 years	Replacement	High severity fires.
V	200+ years	Replacement/ Any Severity	Generally replacement severity. Can include any severity type in this frequency range.

Source: US Forest Service, 2016.

According to the Beaverhead County Community Wildfire Protection Plan written in 2005, the following areas of the county are considered high hazard:

- Elk Lake Lodge
- Red Rock riparian corridor
- Beaverhead riparian corridor
- Big Hole riparian corridor

- Lemhi Pass to Bar TT Ranch
- Lower Grasshopper Creek
- Upper Rattlesnake, Trout, and Birch Creeks
- East Pioneer Mountains, eastern portion and Interstate 15 corridor
- Pioneer Mountains National Scenic Byway between Wise River and the Grasshopper Valley
- Steele Creek
- Southwest Big Hole Valley (especially the vicinity of Van Houten Campground and Skinner Meadows)
- Big Hole Battlefield National Monument, State Highway 43, and Trail Creek corridors
- Poindexter Slough.

Source: Beaverhead County, 2005b and US Forest Service, 2015.

Additional communities at risk from wildfire include:

- Argenta
- Bannack
- Dell*
- Dewey
- Dillon*
- Grant
- Jackson*
- Lakeview
- Lima*
- Monida
- Polaris*
- Wisdom*
- Wise River*

* listed in Federal Register

Source: Beaverhead County, 2005b

Figure 4-30. Figure 4.13.1C 2000 Mussigbrod Fire.

4.13.1.1 WARNINGS, WATCHES, AND ADVISORIES

The National Weather Service issues several products to alert for significant wildfire potential or hazards. These include:

- Fire Weather Watch: A fire weather watch is issued when Red Flag conditions (see below) are expected in the next 24 to 72 hours.
- Red Flag Warning: A red flag warning is issued when Red Flag criteria are expected within the next 12 to 24 hours. A Red Flag event is defined as weather conditions that could sustain extensive wildfire activity and meet one or more of the following criteria in conjunction with "Very High" or "Extreme" fire danger:
- Sustained surface winds, or frequent gusts, of 25 mph or higher
- Unusually hot, dry conditions (relative humidities less than 20 percent)
- Dry thunderstorm activity forecast during an extremely dry period
- Anytime the forecaster foresees a change in weather that would result in a significant increase in fire danger. For example, very strong winds associated with a cold front even though the fire danger is below the "Very High" threshold.
- Fire Warning: A fire warning may be issued by local officials when a spreading wildfire or structure fire threatens a populated area. Information in the warning may include a call to evacuate areas in the fire's path as recommended by officials according to state law or local ordinance.
- Dense Smoke Advisory: Dense smoke advisories are issued when the widespread visibilities are expected at a ¼ mile or less for a few hours or more due to smoke.

Source: National Weather Service, 2006.

4.13.2 HISTORY

Beaverhead County has a long history of wildfires ranging from small to large. Some have caused damages and others have not. The extent of damages often depends on the fire spread rate, the effectiveness of suppression and mitigation measures, and the property and infrastructure in the fire's path. The history of wildfires can be difficult to compile because of the various firefighting entities involved and a variety of recordkeeping measures over the years. Table 4.13.2B lists some of the more significant wildfires in Beaverhead County. Fortunately, to date, none of these fires has resulted in the loss of structures. According to the Beaverhead County Community Wildfire Protection Plan, the county experiences an average of 14 wildfires per year. [Beaverhead County, 2005b]

Figure 4-31. Figure 4.13.2A 2003 Hidden Lake Fire.

Table 4-37. Table 4.13.2B Historic Wildfires (Greater Than 1,000 Acres)

Name	Date	Size	Additional Information
Mud Lake Fire	1987	1,800 acres	North of Wisdom
Elliott Fire	4/17/1987		Beaverhead River corridor north of Dillon Threatened structures Burned over firefighters
Sweetwater Fire	8/11–9/25/1988	7,567 acres	Madison County border, southeast of Dillon
Medicine Lodge Fire	7/20–31/1989	1,254 acres	South of Grant
Unknown	1991	Unknown	Local wildfire disaster was declared
Unknown	1994	Unknown	2 federal fire suppression assistance grants were made available to the county
Teddy Creek Fire	1999	2,516 acres	Blacktail Mountains
Snowline Fire	7/26–28/2000	3,059 acres	6 miles southeast of Lima Federal disaster was declared for most of the state in 2000
Mussigbrod Complex	7/31–9/24/2000	84,939 acres	12 miles northwest of Wisdom, only partially in Beaverhead County West side of Big Hole River 6 injuries 38 structures threatened $10,000 estimated property damage $11.5 million estimated suppression costs
Sheep Creek Fire	8/15–25/2002	2,016 acres	16 miles west of Wisdom, Chief Joseph Creek Federal and state lands only Highway 43 closed for a time $2.8 million estimated suppression costs Federal disaster was declared for most of the state in 2000
Hidden Lake Fire	7/18–8/3/2003	3,435 acres	4 miles northeast of Polaris, Grasshopper Valley 51 structures threatened $2.6 million estimated suppression costs
Winslow Fire	8/12–9/8/2003	13,558 acres	5 miles southwest of Lakeview, Centennial Valley 40 structures threatened $6.4 million estimated suppression costs
Clark's Canyon Fire	8/24–9/4/2006	15,387 acres	17 miles south of Dillon $750,000 estimated suppression costs

Sources: Beaverhead County, 2016; Montana Department of Natural Resources and Conservation, 2016; Rocky Mountain Research Station, 1999; National Climatic Data Center, 2009.

Table 4-38. Table 4.13.2C Beaverhead County Wildfire Declared Disasters and Emergencies

Declaration	Year	Additional Information	Casualties	Damages/Assistance
FEMA-2110-FSA-MT FEMA-2111-FSA-MT	1994	Beaverhead County, plus 12 other counties		$2,904,088 PA*
MT-09-00 (state)	2000	Beaverhead County, Mussigbrod Fires and Snowline Fire		$4,807 state share $50,912 local share
FEMA-2318-FSA-MT	2000	Beaverhead County, plus 1 other county		$143,015 PA*
FEMA-1340-DR-MT	2000	Beaverhead County, plus 47 other counties and 6 reservations		$11,579,000 IA*

* Figures are for all Montana counties/reservations incuded in the declaration.
Source: Montana Disaster and Emergency Services, 2016.

4.13.3 PROBABILITY AND MAGNITUDE

Wildfires are an annual occurrence in Beaverhead County. The frequency and size of the wildfires depends on the ambient conditions and other factors. On average, Beaverhead County has 8 wildfires annually. The probability of a damaging wildfire that burns uncontrollably despite firefighting efforts is difficult to assess. Generally, the summer months, particularly during droughts, create conditions favorable to wildfires. If the weather conditions and fuels allow, especially if the winds are strong, wildfires can grow rapidly with little warning. The probability of wildfires is slightly elevated during active ignition periods such as the Fourth of July holiday and before fire restrictions are in place.

The largest wildfire on record for Beaverhead County is the Mussigbrod Fire that burned about 85,000 acres in Beaverhead and neighboring counties. Wildfires of this magnitude are clearly possible and can be expected in the future. Based on this history, wildfires burning tens of thousands of acres are certainly possible. Of greater significance, however, is a wildfire that spreads into communities destroying structures and infrastructure, even if not large in size.

Overall Wildfire Probability: Moderate-High
Except the Town of Lima: Moderate
Except the City of Dillon: Low-Moderate

4.13.4 MAPPING

Wildfire potential is mapped in a variety of ways. Since many factors play into wildfire risk, components are often mapped individually. Vegetation type outlines the type of fuels available for wildfires. In the case of agriculture, the flammability depends on the crop and its condition at that point in the growing season. Grasslands and scrublands are not usually managed significantly and may contain a build-up of flashy fuels year round. Dense, evergreen, timber areas are usually at risk for crown fires. Map 4.13.4A shows the wildfire risk areas and the local structure data to show the area's most vulnerable from wildfires. The wildfire risk areas were created using the vegetation type. Areas within the general proximity of evergreen trees were categorized as "high" hazard. Areas within the general proximity of scrublands and prairie grasses were categorized as "moderate" hazard. All other areas were categorized as "low" hazard. These generalizations allow for planning estimations. The actual wildfire hazard for a particular structure can only be determined based on a site evaluation.

4.13.5 VULNERABILITIES

Wildfires have the greatest potential to threaten structures lacking defensible space. Defensible space is a buffer zone between a structure and flammable fuels. Irrigation, mowed areas, fuels thinning, roads, and waterways can serve as buffers to wildfires in some cases. The threat to an individual structure can truly only be assessed on a case-by-case basis.

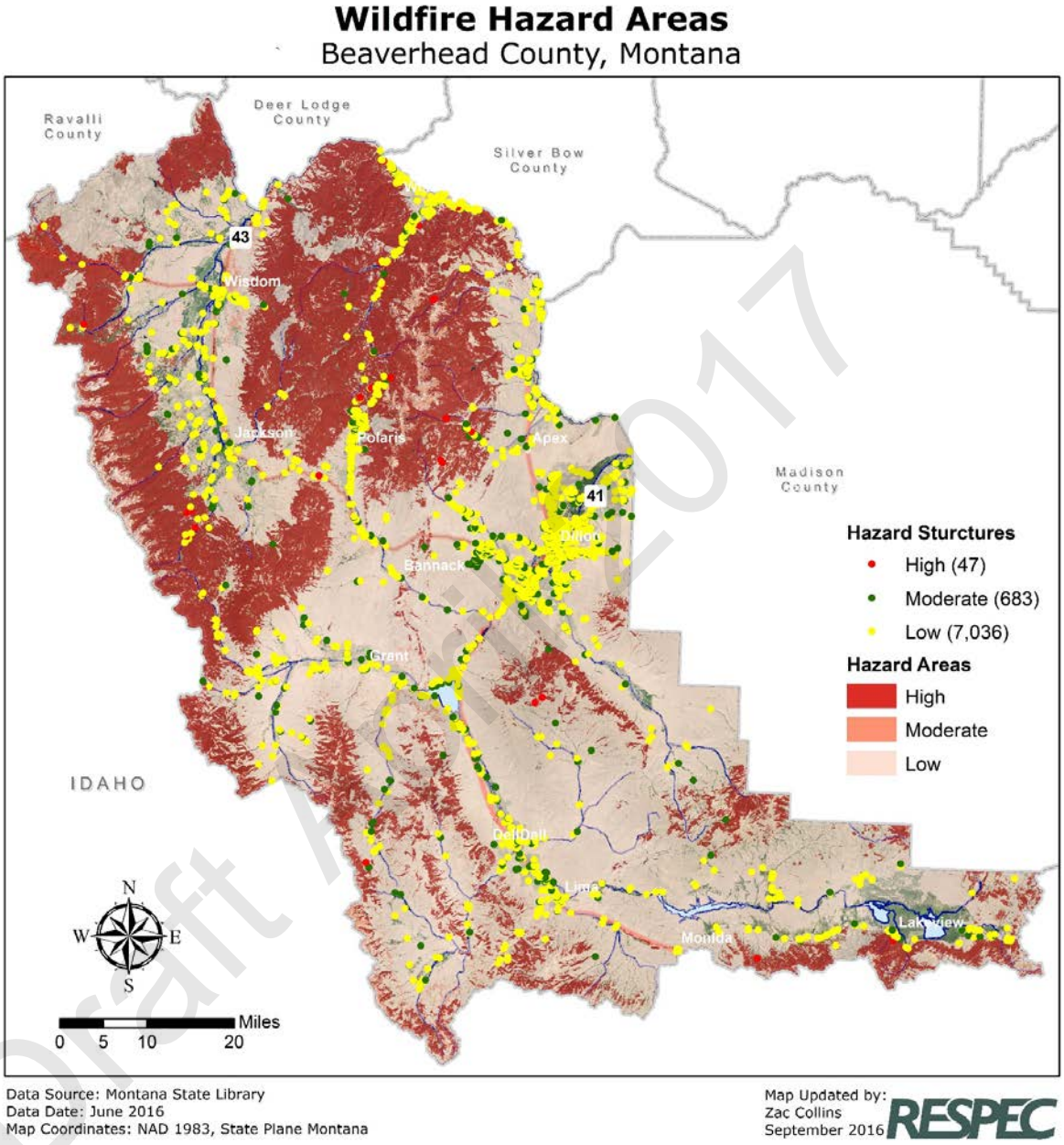

Figure 4-32. Map 4.13.4A.

4.13.5.1 CRITICAL FACILITIES

Using the criteria that those structures in the general proximity of forested areas are at greatest risk for wildfire impacts and those in the scrublands and prairie areas are at moderate risk, Table 4.13.5A shows the critical facilities with moderate wildfire risk. None of the critical facilities are considered to be at high risk.

Table 4-39. Table 4.13.5A Critical Facilities at High or Moderate Wildfire Risk

Facility	Risk Area
Beaverhead County Landfill	Moderate
Dillon Water Treatment Plant	Moderate
Grasshopper Valley Volunteer Fire Department, Polaris	Moderate
Jackson Post Office	Moderate
Jackson Grade School	Moderate
Jackson Sewage Treatment Facility	Moderate
Jackson Volunteer Fire Department	Moderate
Lima Water Treatment Facility, Spring, and Intake	Moderate
Montana Department of Transportation Shop, Wisdom	Moderate
Montana National Guard Armory	Moderate
Polaris Grade School	Moderate
Polaris Post Office	Moderate
Wisdom Community Center	Moderate
Wisdom Grade School	Moderate
Wisdom Post Office	Moderate
Wisdom Sewage Treatment Facility	Moderate
Wisdom Volunteer Fire Department	Moderate
Wise River Community Center	Moderate
Wise River Grade School	Moderate
Wise River Post Office	Moderate
Wise River Volunteer Fire Department	Moderate

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Critical functional losses
- Critical data losses.

Expected Wildfire Impact to Critical Facilities: Moderate
Except Dillon and Lima: Low-Moderate

4.13.5.2 CRITICAL INFRASTRUCTURE

Often, regional electric infrastructure passes through wildland and non-irrigated agricultural areas. In particular, the electric substations, transmission lines, and telephone lines are usually buffered by or overhang natural fuels. A wildfire could disrupt electricity or communications should this infrastructure be damaged. Propane tanks also become hazardous infrastructure when a wildfire threatens a structure.

Possible losses to infrastructure include:

- Electric power disruption
- Telephone service disruption
- Water shortages.

Expected Wildfire Impact to Critical Infrastructure: Moderate
Except the Dillon and Lima: Low-Moderate

4.13.5.3 STRUCTURES

All residences, ranches, and businesses could potentially be threatened by wildfires. Comparing the estimated structure locations to the hazard areas, an estimated 382 structures with a total building value exposure of $54,031,206 are at high risk from wildfires. An additional 210 structures with a total building value exposure of $27,468,179 are at moderate risk from wildfires. These calculations were done by buffering the wildfire risk polygons by 200 ft and selecting the structures with in these selections. The value of these selected structures where then calculated using the county parcel data set.

Figure 4-33. Figure 4.13.5B Water Curtain on a Structure During the Pattengail Fire on August 7, 2007.

A damage factor is rather difficult to determine because the losses will be highly dependent on the fire characteristics and its location. Not all areas in the high and moderate risk areas will be affected by one particular wildfire, however, structures in the fire perimeter could have a high loss rate. Given an assumption that 10% of the structures in the high hazard area could be lost in a probable wildfire, the structure losses from that fire would roughly total $5.4 million or about 38 structures. History has shown that personal property losses can be much greater than just that of residences. Outbuildings, fences, equipment, livestock, pastures, and crops are often additional losses.

Possible losses to structures include:

- Structural losses
- Contents losses
- Vehicle and equipment losses
- Displacement losses

Expected Wildfire Impact to Structures: Moderate-High
Except Dillon and Lima: Low-Moderate

4.13.5.4 POPULATION

Generally, the population at risk can evacuate before a wildfire moves into their area. Using the estimate of 592 structures in the high and moderate hazard areas, roughly 1,361people in Beaverhead County live with elevated wildfire risk. Occasionally when strong winds are in place, wildfires can move very rapidly and catch people by surprise, or people may just refuse to evacuate; fatalities and injuries are possible. In these types of situations, firefighters can also be at risk from rapidly moving wildfires. Many times, wildfire fatalities of the evacuating population occur when frantic drivers or poor visibilities due to smoke cause an accident.

Expected Wildfire Impact to the Population: Moderate

4.13.5.5 ECONOMIC, ECOLOGIC, HISTORIC, AND SOCIAL VALUES

Possible economic losses include:

- Crop and forage losses
- Livestock losses
- General agricultural economic losses, such as outbuildings, fencing, and equipment losses.

Possible historic losses include:

- Wooden structures preserved for historic purposes, such as those at Elkhorn Hot Springs, Bannack
- State Park, and numerous Forest Service cabins are particularly at risk from wildfire.
- Structure and site losses
- Contents losses.

Possible social losses include:

- Restricted recreational activities due to burn bans and closures.

Expected Wildfire Impact to the Values: Moderate
Except Dillon and Lima: Low-Moderate

4.13.5.6 FUTURE DEVELOPMENT

Remote, isolated, forested areas are becoming more popular places to live or to have a second home, as national trends show. Growth in these parts of Beaverhead County is occurring. Regulating growth in these areas is a delicate balance between protecting private property rights and promoting public safety. Future development could have a negative impact on the wildfire vulnerabilities, putting more people and property in harm's way. Currently, Beaverhead County does consider the wildfire risk when reviewing proposed subdivisions, however, new development that does not have to go through subdivision review is not subject to the regulations.

Expected Wildfire Impact to Future Development: Moderate-High
Except Dillon and Lima: Low-Moderate

4.13.6 DATA LIMITATIONS AND OTHER FACTORS

The data limitations related to the wildfire hazard include:

- Lack of a comprehensive, multi-agency, historic wildfire digital database containing information on start location, cause, area burned, suppression costs, and damages.

Other hazards often related to wildfire include:

- Drought
- Smoke
- Poor air conditions
- Aircraft accidents
- Thunderstorms
- Flash flood, in and around the burn area.

4.14RISK ASSESSMENT SUMMARY

The risk assessment represents an approximate history and estimated vulnerabilities to Beaverhead County and the incorporated jurisdictions from the hazards identified. As with any assessment involving natural or human-caused hazards, all potential events may not be represented here and an actual incident may occur in a vastly different way than described. This assessment, however, will be used, where possible, to minimize damages from these events in the future.

Every type of event is different, ranging from population to property to economic impacts. Incidents also have different probabilities and magnitudes even within hazards. For example, a light snowstorm will be different than a blizzard and a moderate flood will be different from both of those. Some hazards have estimates of dollar losses and population impacts whereas others are more qualitatively assessed based on the information available during the risk assessment process.

The hazards are prioritized using the best possible information on risks and vulnerabilities to provide guidance when selecting mitigation strategies. Generally, an evaluation of a specific mitigation activity will capture the benefits of such actions, including considering the probability of the hazard occurring and the disaster losses to be mitigated.

The following factors were considered when prioritizing the hazards:

- Probability or Frequency of a “Disastrous” Event
- Impact to Critical Facilities
- Impact to Critical Infrastructure
- Impact to Structures
- Impact to the Population
- Impact to Economic, Ecologic, Historic, and Social Values
- Impact to Future Development.

For more information on these determinations, see the individual hazard profiles.

Table 4.14A provides a summary of the probabilities and impacts to the jurisdictions from each hazard. Based on this information, Table 4.14B shows the hazard prioritizations for Beaverhead County as a whole while the Tables 4.14C and 4.14D are specific to Dillon and Lima. Map 4.14E shows a composite hazard map.

Table 4-40. Table 4.14A Hazard Ratings (Page 1 of 2)

Beaverhead County							
	Probability	Critical Facilities	Critical Infrastructure	Structures	Population	Values	Future Development
Aircraft Accident	Low-Moderate	Low	Low	Low	Moderate	Low-Moderate	Low
Disease And Environmental Contamination	Moderate	Low-Moderate	Low-Moderate	Low	High	Moderate-High	Low-Moderate
Drought	Moderate	Low	Low-Moderate	Low	Low-Moderate	Moderate-High	Low-Moderate
Earthquake	Low-Moderate	Moderate	Moderate-High	Moderate-High	Moderate	Moderate-High	Moderate-High
Flood	Moderate-High	Moderate	Moderate-High	Moderate-High	Moderate	Moderate	Moderate
Hazardous Material Release	Moderate-High	Low-Moderate	Low	Low-Moderate	Moderate-High	Low-Moderate	Low-Moderate
Severe Weather	Moderate-High	Low-Moderate	Moderate-High	Moderate	Moderate	Moderate	Moderate
Terrorism And Civil Unrest	Low	Low-Moderate	Low-Moderate	Low	Moderate-High	Moderate	Low
Transportation Accident	Low-Moderate	Low	Low	Low	Moderate	Low-Moderate	Low
Urban Fire	Low-Moderate	Moderate	Low	Low-Moderate	Moderate	Low-Moderate	Low-Moderate
Utility And Energy Failure	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Moderate-High	Low
Volcanic Ashfall	Low	Low-Moderate	Low	Low-Moderate	Moderate	Low-Moderate	Low
Wildfire	Moderate-High	Moderate	Moderate	Moderate-High	Moderate	Moderate	Moderate-High
City of Dillon							
	Probability	Critical Facilities	Critical Infrastructure	Structures	Population	Values	Future Development
Aircraft Accident	Low-Moderate	Low	Low	Low	Moderate	Low-Moderate	Low
Disease And Environmental Contamination	Moderate	Low-Moderate	Low-Moderate	Low	High	Moderate-High	Low-Moderate
Drought	Moderate	Low	Low-Moderate	Low	Low-Moderate	Moderate-High	Low-Moderate
Earthquake	Low-Moderate	Moderate	Moderate-High	Moderate-High	Moderate	Moderate-High	Moderate-High
Flood	Moderate-High	Moderate	Moderate-High	Moderate-High	Moderate	Moderate	Moderate
Hazardous Material Release	Moderate-High	Low-Moderate	Low	Low-Moderate	High	Moderate	Low-Moderate
Severe Weather	Moderate-High	Low-Moderate	Moderate-High	Moderate	Moderate	Moderate	Moderate
Terrorism And Civil Unrest	Low	Low-Moderate	Low-Moderate	Low	Moderate-High	Moderate	Low
Transportation Accident	Low-Moderate	Low	Low	Low	Moderate	Low-Moderate	Low
Urban Fire	Low-Moderate	Moderate	Low	Low-Moderate	Moderate	Low-Moderate	Low-Moderate

Table 4-40. Table 4.14A Hazard Ratings (Page 2 of 2)

City of Dillon							
Utility And Energy Failure	Low-Moderate	Moderate	Low	Low-Moderate	Moderate	Low-Moderate	Low-Moderate
Volcanic Ashfall	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Wildfire	Low	Low-Moderate	Low	Low-Moderate	Moderate	Low-Moderate	Low
Town of Lima							
	Probability	**Critical Facilities**	**Critical Infrastructure**	**Structures**	**Population**	**Values**	**Future Development**
Aircraft Accident	Low-Moderate	Low	Low	Low	Moderate	Low-Moderate	Low
Disease And Environmental Contamination	Moderate	Low-Moderate	Low-Moderate	Low	High	Moderate-High	Low-Moderate
Drought	Moderate	Low	Low	Low	Low	Moderate	Low-Moderate
Earthquake	Low-Moderate	Moderate	Moderate-High	Moderate-High	Moderate	Moderate-High	Moderate-High
Flood	Moderate	Moderate	Moderate-High	Moderate-High	Moderate	Moderate	Moderate
Hazardous Material Release	Moderate-High	Low-Moderate	Low	Low-Moderate	High	Moderate	Low-Moderate
Severe Weather	Moderate-High	Low-Moderate	Moderate-High	Moderate	Moderate	Moderate	Moderate
Terrorism And Civil Unrest	Low	Low-Moderate	Low-Moderate	Low	Moderate-High	Moderate	Low
Transportation Accident	Moderate	Low	Low	Low	Moderate	Moderate	Low
Urban Fire	Low	Moderate	Low	Low-Moderate	Moderate	Low-Moderate	Low-Moderate
Utility And Energy Failure	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Moderate-High	Low
Volcanic Ashfall	Low	Low-Moderate	Low	Low-Moderate	Moderate	Low-Moderate	Low
Wildfire	Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate

Table 4-41. Table 4.14B Beaverhead County Hazard Prioritizations

Level	Hazard
High Hazard	Earthquake Flood Wildfire Severe Weather
Moderate Hazard	Disease and Environmental Contamination Hazardous Material Release Utility and Energy Failure Drought Urban Fire
Low Hazard	Terrorism and Civil Unrest Volcanic Ashfall Aircraft Accident Transportation Accident

Table 4-42. Table 4.14C City of Dillon Hazard Prioritizations

Level	Hazard
High Hazard	Earthquake Flood Severe Weather Disease and Environmental Contamination Hazardous Material Release
Moderate Hazard	Utility and Energy Failure Drought Urban Fire Wildfire
Low Hazard	Terrorism and Civil Unrest Volcanic Ashfall Aircraft Accident Transportation Accident

Table 4-43. Table 4.14D Town of Lima Hazard Prioritizations

Level	Hazard
High Hazard	Earthquake Flood Severe Weather Disease and Environmental Contamination Hazardous Material Release
Moderate Hazard	Utility and Energy Failure Wildfire Terrorism and Civil Unrest Urban Fire
Low Hazard	Transportation Accident Drought Volcanic Ashfall Aircraft Accident

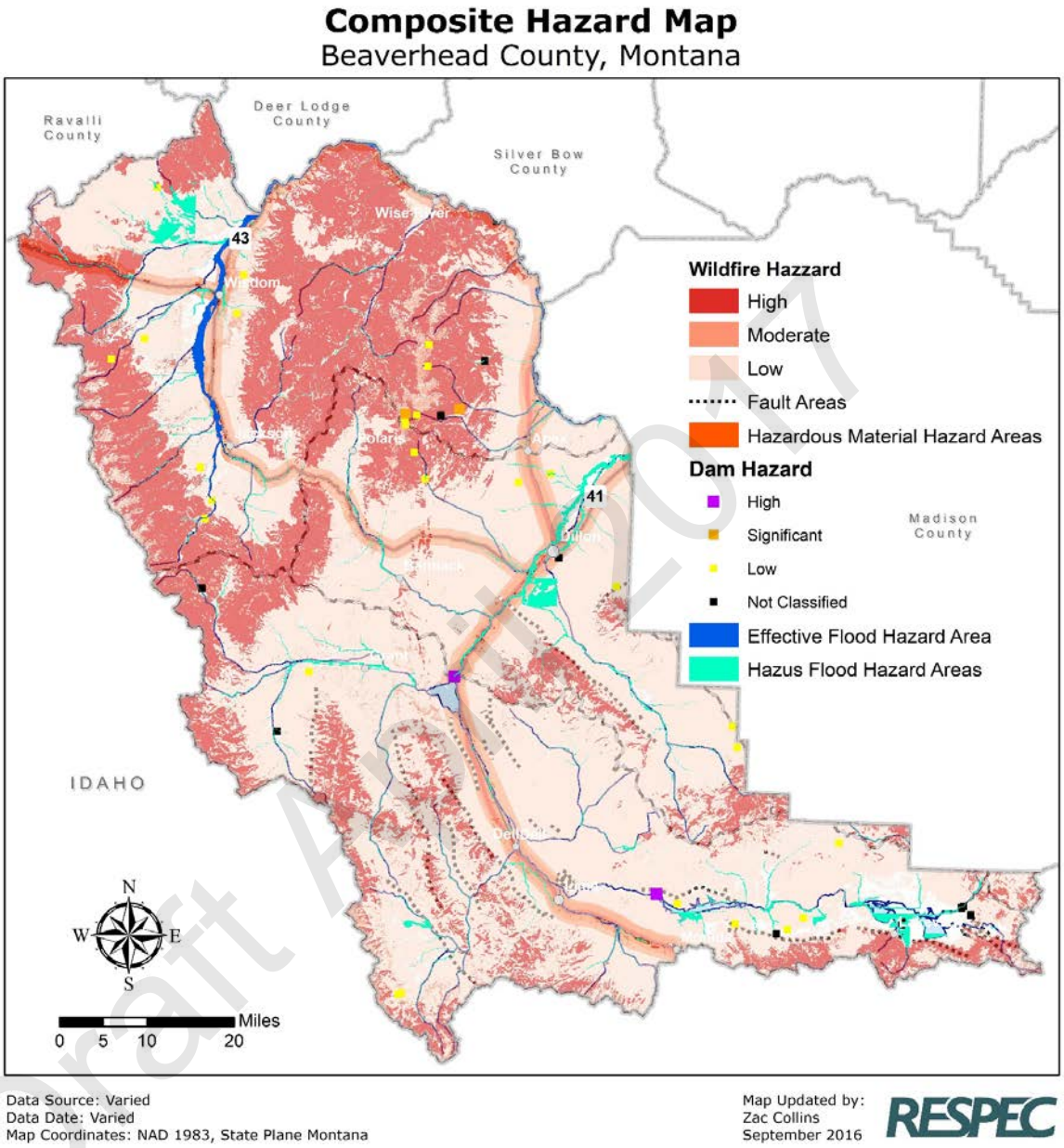

Figure 4-34. ???.

5.0 MITIGATION STRATEGY

Hazard mitigation, as defined by the Disaster Mitigation Act of 2000, is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. Studies on hazard mitigation show that for each dollar spent on mitigation, society saves an average of four dollars in avoided future losses. [Multihazard Mitigation Council, 2005] Mitigation can take many different forms from construction projects to public education.

The development of a mitigation strategy allows Beaverhead County, the City of Dillon, and the Town of Lima to create a vision for preventing future disasters, establish a common set of mitigation goals, prioritize actions, and evaluate the success of such actions. The mitigation strategy is based on the results of the risk assessment and recommendations by stakeholders and the public. The goals are broad, visionary, forward- looking statements that outline in general terms what the county and jurisdictions would like to accomplish. Goals are usually not measurable or fully attainable but rather ideals to which the county and communities should strive for as they develop and implement mitigation projects.

Rather than wait until a disaster occurs, Beaverhead County, the City of Dillon, and the Town of Lima have developed this strategy to move in a more proactive direction for disaster prevention. All losses cannot be entirely mitigated, however, some actions can be taken, as funding and opportunities arise, that may reduce the impacts of disasters, thus, saving lives and property.

For the 2004 plan, specific mitigation goals and projects were developed for Beaverhead County based input received at the public meetings held in Dillon and Lima and interviews with people having interest in the plan. A matrix was developed for project ranking that emphasized cost-benefit. Project prioritization was according to input from local officials and the public during public meetings. Each person in attendance completed a priority worksheet.

In 2009, initial mitigation goals and objectives were reviewed by the public, refined in public meetings during which suggestions from the attendees were incorporated, and also took into account recommendations from existing policies, plans, and studies. Many of the mitigation actions were carried over from the 2004 plan and new ones were developed based on direct input from stakeholders; the projects were then prioritized. Objectives were developed to link the actions and the goals.

The mitigation goals and objectives from the 2009 plan were reviewed by the Beaverhead County LEPC and __ Watershed Council. Each goal and objective were reviewed as well as notes given for the goals after meeting were held. Each Goal was given a note to either remove it from the list, keep in on the list, or move it up in priority. A review was also done to remove projects that had been completed and did not need to be listed for future use. More information on the changes to the mitigation strategy since 2004 can be found in Appendix J.

5.1 GOALS, OBJECTIVES, AND PROPOSED ACTIONS

The mitigation goals, objectives, and proposed actions for Beaverhead County, the City of Dillon, and the Town of Lima follow. Each of the actions specifies the jurisdiction or jurisdictions involved, the type

of project, its priority, the responsible agencies and partners, resources needed, and the goal timeframe for completion.

For clarification and prioritization purposes, each action is categorized by its project type. The types of projects include:

- Supportive: Usually supportive projects are important components of all types of mitigation activities. For example, a coordinator or staff position is often critical to applying for and implementing mitigation grants.
- Educational/Informational: These projects typically do not mitigate a hazard directly, however, by educating the public or others, those individuals may then take their own mitigation actions. These types of projects may also be used by governing bodies and other authorities to make decisions or develop new policies or projects.
- Policy/Regulatory: Policies and regulations created, updated, or enforced by government entities can have powerful hazard mitigation impacts. Their benefits can often be difficult to measure. Conservation easements are an example of a land use change mechanism enforced by regulatory authorities.
- Property Protection: These actions often directly reduce future property losses through physical changes.
- Infrastructure Protection: These projects often physically reduce losses to critical infrastructure.
- Population Protection: Generally, population protection measures reduce the loss of life and injury by physically changing a threat to people or by prompting a person to take immediate action. For example, warning systems may alert people to imminent hazards.

Additional information on the priorities and goal timeframes can be found in the sections that follow.

5.1.1 GOAL 1: REDUCE RISKS FROM ALL HAZARDS THROUGH COMPREHENSIVE MITIGATION ACTIVITIES

5.1.1.1 OBJECTIVE 1.1: ENHANCE EARLY WARNING SYSTEMS.

Action 1.1.1: Storm Ready Program

- Initiate or continue participation in the National Weather Service's Storm Ready Program to ensure community readiness for severe weather.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Disaster and Emergency Services, Local Elected Officials, National Weather Service
Resources Needed: Staff time and expertise
Goal Timeframe: Ongoing: Already initiated and continuing

Action 1.1.2: NOAA Weather Radios

- Educate, promote, and provide NOAA Weather Radios to the public at a discounted price.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima

Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Disaster and Emergency Services, National Weather Service, Radio Vendors
Resources Needed: Staff time, some funding for promotional materials
Goal Timeframe: Near Term: Initiated within 0–3 years

Action 1.1.3: Dam Early Warning Systems

- Purchase and install early warning systems for dam failure at the Clark Canyon and Lima Dams.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Disaster and Emergency Services, Montana Department of Natural Resources and Conservation, US Bureau of Reclamation, Beaverhead County Red Rock River Water and/or Sewer District
Resources Needed: Staff time and expertise, funding for systems and installation
Goal Timeframe: Near Term: Initiated within 0–3 years

Action 1.1.4: Wisdom Weather Observing Station

- Purchase and install an automated weather observing station (with satellite communications) in Wisdom that will allow forecasters to issue more timely warnings for the area.

Jurisdiction(s): Beaverhead County
Project Type: Population Protection
Priority: Medium
Responsible Agencies and Partners: National Weather Service, Disaster and Emergency Services
Resources Needed: Funding for the station, installation, and maintenance
Goal Timeframe: Mid Term: Initiated within 3–6 years

Background:
This project would help the National Weather Service predict weather events to the north and east of Wisdom, including the communities of Wise River, Melrose, Dewey, and Glen. The problem with automated satellite sites for stream gages and weather stations is the yearly maintenance and operational costs.

Action 1.1.5: City of Lima Warning System

- Research, purchase, and install a warning system for the Town of Lima and the I-90 rest area.
- Research expansion of Dillon system for area

Jurisdiction(s): Town of Lima
Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, Montana Department of Transportation, National Weather Service
Resources Needed: Funding for the research, system(s), installation, and maintenance
Goal Timeframe: Near Term: Initiated within 0–3 years

Action 1.1.6: City of Dillon Warning Systems

- Research, expanding warning system for the City of Dillon and the campus of the University of Montanan – Western to other areas in county (Lima, Jackson, Wisdom, and Wise River.

Jurisdiction(s): City of Dillon
Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, Montana Department of Transportation, National Weather Service
Resources Needed: Funding for the research, system(s), installation, and maintenance
Goal Timeframe: Near Term: Initiated within 0–3 years

5.1.1.2 OBJECTIVE 1.2: IMPROVE THE FUNCTIONALITY OF CRITICAL FACILITIES AND INFRASTRUCTURE DURING DISASTERS

Action 1.2.1: Emergency Communications

- Upgrade and procurement of 2-way radios and Satellite phone in critical areas
- Educations of use of emergency communications
- Creation, maintenance and yearly trial run of Beaverhead County emergency Communications Plan

Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, Search and Rescue, University of Montana - Western
Resources Needed: Funding and expertise for equipment, installation, and maintenance
Goal Timeframe: Mid Term: Initiated within 0–3 years

Background: The communications plan will be used in the event of the loss of communications.

Action 1.2.2: Emergency Power Backup

- Purchase and install back-up power systems for the University of Montana – Western , all schools, other critical infrastructure, and emergency shelter systems and all communication centers
- Install pigtails (electrical wiring) and 2-way switches at all the fire stations and emergency response units for generators.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Radio Station Managers, Disaster and Emergency Services, University of Montana – Western
Resources Needed: Funding and expertise for generators, related equipment, installation, and maintenance
Goal Timeframe: Near Term: Initiated within 0–3 years
Radio Station Background:

The local radio station, which serves Beaverhead and Madison Counties, is part of the Emergency Alert System (EAS) but is not fully compliant because of a lack of emergency backup power at the radio station and the broadcast tower. As part of the warning system for the residents of our community, backup power is essential.

Action 1.2.3: Water Supply/Storage back up

- Install isolation valve to main line to reduce the chance of losing the entire system
- Potable water/Fire water
- Creation, maintenance and yearly trial run of Beaverhead County emergency Communications Plan.

Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, Search and Rescue, University of Montana – Western, Fire service, City of Dillion
Resources Needed: Funding and expertise for equipment, installation, and maintenance
Goal Timeframe: Mid Term: Initiated within 0–3 years

Action 1.2.4: Upgrades and Enhancements of Emergency Secondary Dispatching Center

- Research, Purchase/Upgrade communication equipment
- Research what resources are needed for use in emergency situation
- Educate existing dispatch with resources available at secondary dispatch center.

Jurisdiction(s): Beaverhead County, City of Dillon
Project Type: Population Protection
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, University of Montana – Western
Resources Needed: Funding and expertise for equipment, installation, and maintenance
Goal Timeframe: Mid Term: Initiated within 3–6 years

Action 1.2.5: University of Montana – Western Campus Improvements

- Provide assistance with the purchase and installation of equipment needed to make the campus completely self-sustainable to include communications.

Jurisdiction(s): Beaverhead County, City of Dillon
Project Type: Population Protection
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, University of Montana – Western
Resources Needed: Funding and expertise for equipment, installation, and maintenance
Goal Timeframe: Mid Term: Initiated within 3–6 years

Action 1.2.6: Radio Repeaters to Increase Range Emergency staff

- Purchase and install radio repeaters to increase the range of the existing radio network.

Jurisdiction(s): Beaverhead County, City of Dillon, City of Lima

Project Type: Population Protection
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, Search and Rescue, University of Montana – Western
Resources Needed: Funding and expertise for equipment, installation, and maintenance
Goal Timeframe: Mid Term: Initiated within 0–3 years

5.1.1.3 OBJECTIVE 1.3: MITIGATE THE IMPACT OF HAZARDS ON FUTURE DEVELOPMENT THROUGH LAND USE AND BUILDING REGULATIONS

Action 1.3.1: Subdivision Regulations

- Update countywide subdivision regulations to adopt higher minimum standards for subdivisions that improve their all-hazard disaster resistance.
- Also include Fire Wise information in the regulations by:
  - Conduct wildfire home site evaluations and homeowner and landowner education, including defensible space workshops, throughout the county.
  - Encourage homeowners and landowners in the wildland urban interface to use fire-resistant materials and to create defensible space from wildfires around their homes and outbuildings using Firewise principles.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Policy/Regulatory
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Planning Department, Fire Department
Resources Needed: Staff time and expertise, political support
Goal Timeframe: Near Term: Initiated within 0–3 years

Action 1.3.2: Building Codes

- Encourage all jurisdictions in the county to adopt and enforce the state's building codes.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Policy/Regulatory
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Code Enforcement
Resources Needed: Staff time and expertise, political support, funding for personnel, training, and supplies for additional code enforcement
Goal Timeframe: Mid Term: Initiated within 3–6 years

Action 1.3.3: Growth Policy

- Update the countywide growth policy to encourage growth in low hazard areas and allow for the consideration of high hazard areas during subdivision reviews.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Policy/Regulatory
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Planning Department
Resources Needed: Staff time and expertise, political support
Goal Timeframe: Mid Term: Initiated within 3–6 years

Action 1.3.4: Conservation Easements

- Use conservation easements in high hazard areas such as flood and wildfire areas to serve a dual purpose, to keep development from high hazard areas and to conserve wildland areas.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Policy/Regulatory
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Planning Department, Private Conservation Entities
Resources Needed: Staff time and expertise, funding for easement purchases
Goal Timeframe: Mid Term: Initiated within 3–6 years

5.1.1.4 OBJECTIVE 1.4: EDUCATE BUSINESSES AND THE PUBLIC ON SIMPLE MITIGATION ACTIVITIES

Action 1.4.1: Public Education

- Provide outreach and informational materials to the public regarding mitigation activities they can undertake at home and at work.
- Continue to encourage the thought process about how to mitigate risks and vulnerabilities to our communities.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Disaster and Emergency Services, Schools, Fire Departments
Resources Needed: Staff time and expertise, some funding for materials
Goal Timeframe: Ongoing: Already initiated and continuing

Action 1.4.2: Builder Education

- Educate builders on construction methods, materials, siting, and other items that will make structures more disaster resistant to all hazards.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Planning Departments, Disaster and Emergency
Services, Builders' Associations
Resources Needed: Staff time and expertise, some funding for materials
Goal Timeframe: Near Term: Initiated within 0–3 years

5.1.2 GOAL 2: REDUCE IMPACTS FROM FLOODING

5.1.2.1 OBJECTIVE 2.1: REDUCE LOSSES TO ROAD INFRASTRUCTURE FROM FLOODING

Action 2.1.1: Culvert, Drainage, and Road Improvements

- Replace or add culverts or make other drainage improvement for flood prone areas

- Example 1 On Blacktail Deer Creek, install a diversion control structure in the creek channel, remove the permanent earthen structure that inhibits natural winter flows, and elevate the Buster Brown Road Bridge over Blacktail Deer Creek.
- Example 2 Upgrade the bridge over Junction Creek at Slater Street in Lima and improve the bank where the overflow channel meets the creek to reduce future residential flooding.

/ Maintain culvert and channel capacities by keeping them free of debris.

/ In the area of the upper section of Blacktail Creek research the need for channel restoration.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Infrastructure Protection
Priority: High
Responsible Agencies and Partners: Road Departments, Montana Department of Transportation
Resources Needed: Staff time and expertise, funding for the improvements and maintenance Goal
Timeframe: Ongoing: Already initiated and continuing

Blacktail Deer Creek Background:
Each winter, Blacktail Deer Creek ices up and threatens the county road about 7 miles up the Blacktail Road near the junction with Buster Brown Road. Although few residential structures at risk from this wintertime flooding and icing, public safety is a concern when Blacktail Road and Buster Brown Road are overtopped with water and ice.

Culvert and Channel Debris Background:
Following years of drought and minimal flows in many of the major streams in Beaverhead County, the potential for flooding both from high water and icing when moisture conditions return to normal exists. This is because these streams have not flushed themselves for several years and the stream banks have encroached on the normal stream channels, thus narrowing the water carrying capacity of these streams. Trees, brush, grass, and debris are the cause of this encroachment. An area north of Dillon on the Beaverhead River is an example. The area experienced this problem the last time Beaverhead River ran 200 cubic feet per second (measured at the Dillon gauge) during a spring runoff event. Several areas were flooded or threatened to flood because of the narrowed and filled in channels.

5.1.2.2 OBJECTIVE 2.2 IMPROVE UNDERSTANDING OF THE FLOOD HAZARD

Action 2.2.1: Floodplain Mapping

/ In unmapped areas, implement floodplain studies and mapping of streams with flood potential.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Floodplain Administrators, Local Elected Officials, Federal Emergency Management Agency
Resources Needed: Staff time and expertise, funding for the studies and mapping
Goal Timeframe: Near Term: Initiated within 0–3 years

Action 2.2.2: Flood Insurance Education

/ Educate property owners on the availability and importance of flood insurance.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Floodplain Administrators, Disaster and Emergency Services
Resources Needed: Staff time and expertise, some funding for materials
Goal Timeframe: Mid Term: Initiated within 3–6 years

Action 2.2.3: Stream Gages

- Install stream gages with satellite communications in several unmonitored streams in the county.

Jurisdiction(s): Beaverhead County
Project Type: Population Protection
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, US Geological Survey, National Weather Service
Resources Needed: Staff time and expertise, funding for the gages and maintenance
Goal Timeframe: Mid Term: Initiated within 3–6 years

Background: Several streams in the county have the potential to flood lower elevations in the county. If these streams were monitored, early warning of increase flows could be given to communities downstream.

5.1.2.3 OBJECTIVE 2.3: PROTECT STRUCTURES FROM FLOOD DAMAGES

Action 2.3.1: Acquisitions, Relocations, and Elevations

- Consider acquisition, relocation, or elevation of flood prone structures.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Property Protection
Priority: Low
Responsible Agencies and Partners: Floodplain Administrators, Disaster and Emergency Services
Resources Needed: Staff time, funding for projects
Goal Timeframe: Long Term: Initiated within 7–10 years

Action 2.3.2: Flood Ordinances

- Continue to enforce flood ordinances and participate in the National Flood Insurance Program.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Policy/Regulatory
Priority: High
Responsible Agencies and Partners: Local Elected Officials, Floodplain Administrators
Resources Needed: Staff time and expertise, political support
Goal Timeframe: Ongoing: Already initiated and continuing

5.1.3 GOAL 3: MINIMIZE RISK OF WILDFIRE AT THE URBAN INTERFACE

5.1.3.1 OBJETIVE 3.1: MAXIMIZE MITIGATION EFFORTS BY USING A COMBINATION OF PROGRAMS TARGETING THE WILDLAND URBAN INTERFACE

Action 3.1.1: Wildfire Plan

- Update the Community Wildfire Protection Plan.

Jurisdiction(s): Beaverhead County
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Fire Departments, Disaster and Emergency Services
Resources Needed: Staff time and expertise, funding for professional services
Goal Timeframe: Ongoing: Already initiated and continuing

Action 3.1.2: Firewise Program

- Conduct wildfire home site evaluations and homeowner and landowner education, including defensible space workshops, throughout the county.
- Encourage homeowners and landowners in the wildland urban interface to use fire-resistant materials and to create defensible space from wildfires around their homes and outbuildings using Firewise principles.
- Continue to plan for, support, educate, and train residents on fire prevention.

Jurisdiction(s): Beaverhead County
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Fire Departments, Disaster and Emergency Services, Homeowners Associations, Landowners
Resources Needed: Staff time and expertise, funding for professional services and materials
Goal Timeframe: Ongoing: Already initiated and continuing

Action 3.1.3: Hazardous Fuels Treatments

- Encourage a variety of treatments to reduce hazardous fuels, particularly in the wildland urban interface, including, but not limited to, vegetation treatments, prescribed burning, and grazing.
- Work with state, federal, and private agencies to focus treatment efforts in the most vulnerable areas, including electric infrastructure.
- Educate the public on wildfire mitigation grant funding available for individual properties.

Jurisdiction(s): Beaverhead County
Project Type: Property Protection
Priority: Medium
Responsible Agencies and Partners: Fire Departments, Disaster and Emergency Services, Homeowners Associations, Landowners, Montana Department of Natural Resources and Conservation, US Forest Service, US Bureau of Land Management, Rocky Mountain Elk Foundation, Beaverhead County Conservation
District, Beaverhead County Weed Department
Resources Needed: Staff time and expertise, funding for treatments

Goal Timeframe: Ongoing: Already initiated and continuing

Action 3.1.4: Fire Safe Montana Program

- Encourage community with in the wildland –urban Interface to create an individual Wildfire Protection Plan.
- Educate community about Wildfire Risk

Jurisdiction(s): Beaverhead County
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Fire Departments, Disaster and Emergency Services, Homeowners Associations, Landowners
Resources Needed: Staff time and expertise, funding for professional services and materials
Goal Timeframe: 0–3 years

5.1.4 GOAL 4: REDUCE RISK OF HAZARDOUS MATERIAL INCIDENTS

5.1.4.1 OBJECTIVE 4.1: IMPROVE INFORMATION, COORDINATION, AND SECURITY BEFORE FUTURE HAZARDOUS MATERIAL RELEASES

Action 4.1.1: Continued Hazardous Material Training for First Responders

- Training for HazMat awareness, operations, Technician level, and higher levels of training.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Disaster and Emergency Services, Fire Departments, Hazardous Material Transporters and Facility Managers
Resources Needed: Staff time and expertise, funding for professional services
Goal Timeframe: Mid Term: Initiated within 0–3 years

Action 4.1.2: Hazardous Material Study

- Study the amount, type, and frequency of hazardous materials passing through Beaverhead County, Dillon, and Lima
- Continue building partnerships through the Local Emergency Planning Committee.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: Medium
Responsible Agencies and Partners: Disaster and Emergency Services, Fire Departments, Hazardous Material Transporters and Facility Managers
Resources Needed: Staff time and expertise, funding for professional services
Goal Timeframe: Mid Term: Initiated within 3–6 years

Action 4.1.3: Hazardous Material Site Security

- Improve security measures at fixed facilities housing hazardous materials. Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima

Project Type: Property Protection

Priority: Low
Responsible Agencies and Partners: Disaster and Emergency Services, Fire Departments, Hazardous Material Facility Managers
Resources Needed: Staff time and expertise, funding for security equipment and installation
Goal Timeframe: Long Term: Initiated within 7–10 years

5.1.5 GOAL 5: REDUCE RISK OF DISEASE, ENVIRONMENTAL HAZARDS, AND TERRORIST ACTS

5.1.5.1 OBJECTIVE 5.1: PREVENT RISKS TO HUMAN HEALTH AND SAFETY THROUGH COORDINATION, PLANNING, AND POLICIES

Action 5.1.1: Public Health Planning

- Continue coordination between public health agencies, healthcare providers, and other emergency responders.
- Continue to focus on public health issues and mitigation in terrorism planning.
- Increase surveillance planning with the hospital and medical community.
- Include mitigation ideas in after action reports.
- Update Emergency Preparedness plan

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: Low
Responsible Agencies and Partners: Health Department, Healthcare Providers, Hospital, Disaster and Emergency Services
Resources Needed: Staff time and expertise, funding for professional services
Goal Timeframe: Ongoing: Already initiated and continuing

Action 5.1.2: Active Shooter Preparedness/Training

- Work with local officials to look at the need for Active Shooter Taring.
- Attain effective and regular training for the proper local agencies

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: Disaster and Emergency Services, Law Enforcement, Department of Homeland Security, Local Hospital, All Schools, Private Contractors
Resources Needed: Staff time and expertise, Funds for Training
Goal Timeframe: 0–3 Years

Action 5.1.3: Environmental Laws, Rules, and Regulations

- Update and continue to enforce environmental laws, rules, and regulations to protect air, soil, and water.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Policy/Regulatory
Priority: Low
Responsible Agencies and Partners: Health Department, Local Elected Officials, Environmental / Public Health

Resources Needed: Staff time and expertise
Goal Timeframe: Ongoing: Already initiated and continuing

Action 5.1.4: Terrorism Planning

- Continue mitigation planning for weapons of mass destruction and terrorist events.
- Work with energy companies to identify areas of risk and vulnerability and develop strategies to mitigate shortfalls.
- Identify areas of risk for local water supply
- Include mitigation ideas in after action reports.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: Low
Responsible Agencies and Partners: Disaster and Emergency Services, Law Enforcement, Energy Companies, Environmental/Public Health
Resources Needed: Staff time and expertise
Goal Timeframe: Ongoing: Already initiated and continuing

5.1.6 GOAL 6: REDUCE IMPACT OF EARTHQUAKES

5.1.6.1 OBJECTIVE 6.1: MINIMIZE EARTHQUAKE LOSSES TO PUBLIC SCHOOLS

Action 6.1.1: Earthquake Education and Assessments

- Work with public schools to enhance education and training on earthquakes.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: High
Responsible Agencies and Partners: School Administrators, Disaster and Emergency Services
Resources Needed: Staff time and expertise, some funding for materials
Goal Timeframe: Near Term: Initiated within 0–3 years

Action 6.1.2: Earthquake School Retrofits and other Public Buildings

- Conduct earthquake risk assessments at each public school
- Perform simple mitigation activities such as filming windows and securing equipment.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Property Protection
Priority: High
Responsible Agencies and Partners: School Administrators, Disaster and Emergency Services
Resources Needed: Staff time and expertise, funding for professional services and materials Goal Timeframe: Near Term: Initiated within 0–3 years

5.1.7 GOAL 7: REDUCE IMPACT OF COUNTYWIDE WEATHER HAZARDS SUCH AS DROUGHT AND WINTER WEATHER

5.1.7.1 OBJECTIVE 7.1: USE INFORMATION AND EDUCATION STRATEGIES TO MINIMIZE THE IMPACT OF DROUGHT

Action 7.1.1: Drought Education

- Continue to mitigate the drought hazard through public education and awareness
- Develop aerial photographs and Geographic Information System (GIS) mapping of irrigation areas to determine accurate irrigation acres and areas
- Investigate new technology for irrigation use in low water years.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Water Users' Associations, Extension Office
Resources Needed: Staff time and expertise, funding for professional services
Goal Timeframe: Mid Term: Initiated within 3–6 years

Action 7.1.2: Watershed Drought Management Plans

- Create and update Drought Management Plans for all watersheds
- Develop relationships with locals to assist in targeting conservation for irrigators and fishing.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Water Users' Associations, Extension Office, Watershed Groups
Resources Needed: Staff time and expertise, funding for professional services
Goal Timeframe: Mid Term: Ongoing

Action 7.1.3: Climatic Resiliency/ Watershed Restoration Plans

- Create and update state adopted watershed restoration plans
- Develop complete stream and river restoration projects for wetlands, decrease in water temperature, runoff storage, and sediment reduction
- Investigate new technology for irrigation use in low water years.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Educational/Informational
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Water Users' Associations, Extension Office, Watershed Groups
Resources Needed: Staff time and expertise, funding for professional services
Goal Timeframe: Mid Term: Initiated within 3-6 years

5.1.7.2 OBJECTIVE 7.2: MINIMIZE WEATHER IMPACTS TO CRITICAL INFRASTRUCTURE

Action 7.2.1: Electric Infrastructure Protection

- Reduce the pole spans to strengthen the electric infrastructure
- Bury electric lines.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Infrastructure Protection
Priority: High

Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, Electric Companies
Resources Needed: Staff time and expertise, funding for professional services and implementation
Goal Timeframe: Near Term: Initiated within 0–3 years

Action 7.2.2: Snow Fences

- Install snow fences (living or artificial) along critical roadways prone to drifting snow and strong winds.

Jurisdiction(s): Beaverhead County, City of Dillon, Town of Lima
Project Type: Infrastructure Protection
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Disaster and Emergency Services, Road Departments, Montana Department of Transportation
Resources Needed: Staff time and expertise, funding for professional services and implementation
Goal Timeframe: Mid Term: Initiated within 3–6 years

5.1.8 GOAL 8: MINIMIZE IMPACT OF AIRCRAFT ACCIDENTS

5.1.8.1 OBJECTIVE 8.1: IMPROVE SAFETY AND SECURITY AIRPORT CAPABILITIES

Action 8.1.1: Airport Incident Training

- Education for emergency incidents that occur at the local airport

Jurisdiction(s): Beaverhead County, City of Dillon Project Type: Population Protection
Priority: Medium
Responsible Agencies and Partners: Local Elected Officials, Airport Manager
Resources Needed: Staff time and expertise, funding for equipment and installation
Goal Timeframe: Long Term: Initiated within 0–3 years

Action 8.1.2: Airport Security Improvements

- Improve the security at the Dillon airport.

Jurisdiction(s): Beaverhead County, City of Dillon Project Type: Population Protection
Priority: Low
Responsible Agencies and Partners: Local Elected Officials, Airport Manager Resources Needed: Staff time and expertise, funding for equipment and installation
Goal Timeframe: Long Term: Initiated within 7–10 years

Action 8.1.3: Airport Instrument Approach

- Purchase and install equipment to allow for instrument approaches to the Dillon airport.

Jurisdiction(s): Beaverhead County, City of Dillon
Project Type: Population Protection
Priority: Low
Responsible Agencies and Partners: Local Elected Officials, Airport Manager Resources Needed: Staff time and expertise, funding for equipment and installation
Goal Timeframe: Long Term: Initiated within 7–10 years

5.1.9 GOAL 9: CONTINUE TO EMPHASIZE PREPAREDNESS, RESPONSE, AND RECOVERY ACTIVITIES IN ALL TYPES OF EMERGENCY MANAGEMENT PLANNING

Note: Although the purpose of this plan is for mitigation, the following activities were listed in the previous mitigation plan but are not considered mitigation. These activities remain important to the communities, but will not be analyzed and prioritized as the mitigation activities are.

Goal: Enhance Emergency Management/Response Systems

Goal: Enhance Mass Sheltering Capabilities

- Continue to encourage, support, and assist volunteer fire departments' training.
- Purchase response equipment.
- Continue response planning and response training.
- Support the Public Health Task Order (Terrorism Plan).
- Continue to endorse training for weapons of mass destruction/terrorism type events with community responders and public health workers.
- Develop mass casualty response cache for medical and extraction response.
- Continue training local law enforcement, emergency medical services, and search and rescue for locating down aircraft.
- Update old emergency locator transmitter detection equipment.
- Update computer programs for search.
- Continue working and training with other aircraft agencies (Montana Aeronautics and Air Force) for coordinated response to aircraft emergencies.
- Continue to train and equip emergency responders, public health workers, and the citizens in the area of terrorist activities.
- Develop more mature planning and exercising documents.
- Develop and enhance plans for re-location and sheltering people affected by energy shortages.
- Update mass casualty planning annex.
- Enhance training and exercising in the mass casualty area.
- Develop a mass casualty response cache for medical and extraction response.
- Continue training local law enforcement, health workers, hospital, emergency medical services, and search and rescue for mass casualty type incidents.
- Work with the college to ensure emergency procedures are in place/operable.
- Upgrade the dispatch console for the emergency operations center and 911 backup with the equipment necessary to be Project 25 and digital compliant.
- Upgrade the telephone system to improve the multiple tasks of communication.
- Identify additional shelter sites on the west side of the Beaverhead River in Dillon.
- Update the Emergency Operations Plan for Lima, especially the evacuation plan.

5.2 ACTION PRIORITIZATION

Each of the proposed projects has value, however, time and financial constraints do not permit all of the proposed actions to be implemented immediately. By prioritizing the actions, the most critical, cost effective projects can be achieved in the short term. The prioritization of the projects serves as a guide for choosing and funding projects, however, depending on the funding sources, some actions may be best achieved outside the priorities established here.

To ensure that community goals and other factors are taken into account when prioritizing projects, a prioritization model that uses the following factors has been developed: cost, staff time, feasibility, population benefit, property benefit, values benefit, maintenance, and hazard rating. *Cost* considers the direct expenses associated with the project such as material and contractor expenses. *Staff time* evaluates the amount of time needed by a local government employee to complete or coordinate the project. *Feasibility* assesses the political, social, and/or environmental ramifications of the project and the likelihood such a project would proceed through permitting, public review processes, and/or private business implementation. The feasibility factor is essentially a summarization of FEMA's Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) evaluation criteria as shown in Table 5.2A. Population benefit considers the possible prevention of deaths and injuries through the project's implementation. Property benefit estimates the reduction of property losses, including structures and infrastructure, from the hazard being mitigated. Values benefit considers the economic, ecologic, historic, and social benefits of the project. Maintenance rates the amount of work required to keep the mitigation measure effective and useful. The hazard rating is based on the results of the risk assessment and is a measure of the history, probability, magnitude, and vulnerabilities of the hazard.

Table 5-1. Table 5.2A FEMA's STAPLEE Criteria

Criteria	Considerations
Social	Community Acceptance Effects on Segment of Population
Technical	Technical Feasibility Long-Term Solution Secondary Impacts
Administrative	Staffing Funding Allocated Maintenance/Operations
Political	Political Support Local Champion or Proponent Public Support
Legal	State Authority Local Authority Subjectivity to Legal Challenges
Economic	Benefit of Action Cost of Action Contribution to Economic Goals Outside Funding Requirement
Environmental	Effects on Land/Water Bodies Effects on Endangered Species Effects on Hazardous Material and Waste Sites Consistency with Community Environmental Goals Consistency with Federal Laws

Source: Federal Emergency Management Agency, 2003.

Each of the factors were ranked qualitatively for each of the projects. The methods used to assign a category and the associated score can be generally defined as shown in Table 5.2B. The highest possible score is 30 for projects in which all factors are applicable. Some factors have a greater range than others, thus indicating a higher weighting. These weightings allow for appropriate prioritization of the project. More specifically, 11 of 30 points account for benefits (population benefit, property benefit, and values benefit), 11 of 30 points account for direct and indirect costs (cost, staff time, and maintenance), 5 of 30 points account for the hazard rating (incorporates hazard probability and impacts; see Section 4.14), and 3 of 30 points account for project feasibility.

The actions were prioritized by comparing the scores of actions of similar type. This method allows for more even prioritization of a variety of actions. When evaluating projects for grant applications, established cost-benefit analyses requiring detailed project-specific data should be used.

Note that all actions listed in the strategy have value and are worthy of inclusion in this plan. A low priority does not mean the action is not important, rather, compared to the other actions, its score using the described methodology was lower. Even low priority projects are encouraged immediately should funding, resources, and opportunities allow.

5.3 PROJECT IMPLEMENTATION

A critical component of any mitigation program is the implementation of the mitigation projects. Maintaining this Pre-Disaster Mitigation Plan has primarily been the responsibility of Beaverhead County Disaster and Emergency Services in coordination with other appropriate agencies. However, once a hazard has been identified for mitigation, Disaster and Emergency Services generally steps back from the leadership role and assumes the role of team participant. The lead role in project development should then shift to the department or agency responsible for the project management.

Each proposed action was given a high, medium, or low prioritization based on the score received in Section 5.2 within each type of project. The proposed and prioritized projects are shown in Table 5.3A with the associated goal timeframes for the actions. The timeframes are defined as follows and are generally based on the nature of the project and its priority:

- Near Term: Initiated within 0–3 years
- Mid Term: Initiated within 3–6 years
- Long Term: Initiated within 7–10 years
- Ongoing: Already initiated and continuing.

Some projects may be best achieved outside of the goal timeframes depending on the funding and staff resources available. Others may not be feasible in the goal timeframe because of financial, staff, or political limitations. This prioritized list, however, allows the county and jurisdictions to focus on the types of projects with the greatest benefits. Table 5.2D lists potential ideas for future mitigation grant cycles.

Table 5-2. Table 5.2B Prioritization Criteria

Factor	Threshold	Rating	Score
Cost *Range: 1–5*	Little to no direct expenses	Low	5
	Less than $5,000	Low-Moderate	4
	$5,000–$25,000	Moderate	3
	$25,001–$100,000	Moderate-High	2
	Greater than $100,000	High	1
Staff Time *Range: 1–3*	Less than 10 hours of staff time	Low	3
	10-40 hours of staff time	Moderate	2
	Greater than 40 hours of staff time	High	1
Feasibility *Range: 1–3*	Positive support for the project	High	3
	Neutral support for the project	Moderate	2
	Negative support for the project	Low	1
Population Benefit *Range: 1–4*	Potential to reduce more than 20 casualties	Very High	4
	Potential to reduce 6–20 casualties	High	3
	Potential to reduce 1–5 casualties	Moderate	2
	No potential to reduce casualties	Low	1
Property Benefit *Range: 1–4*	Potential to reduce losses to more than 20 buildings or severe damages to infrastructure	Very High	4
	Potential to reduce losses to 6–20 buildings or substantial damages to infrastructure	High	3
	Potential to reduce losses to 1–5 buildings or slight damages to infrastructure	Moderate	2
	No potential to reduce property losses	Low	1
Values Benefit *Range: 1–3*	Provides significant benefits to economic, ecologic, historic, or social values	High	3
	Provides some benefits to economic, ecologic, historic, or social values	Moderate	2
	No or very little benefit to economic, ecologic, historic, or social values	Low	1
Maintenance *Range: 1–3*	Requires very little or no maintenance	Low	3
	Requires less than 10 hours per year	Moderate	2
	Requires more than 10 hours per year	High	1
Hazard Rating *Range: 1–5*	see Section 4.14	High	5
	see Section 4.14	Moderate	3
	see Section 4.14	Low	1

Table 5-3. Table 5.2C Hazards and Development Mitigated by Each Proposed Project (Page 1 of 4)

	Aircraft Accident	Disease and Environmental Contamination	Drought	Earthquake	Flood	Hazardous Material Release	Severe Weather	Terrorism and Civil Unrest	Transportation Accident	Urban Fire	Utility and Energy Failure	Volcanic Ashfall	Wildfire	Existing Development	Future Development
Action 1.1.1: Storm Ready Program					X		X						X		
Action 1.1.2: NOAA Weather Radios					X		X						X		
Action 1.1.3: Dam Early Warning Systems					X										
Action 1.1.4: Wisdom Weather Observing Station			X		X		X								
Action 1.1.5: Lima Warning System					X	X	X	X		X			X		
Action 1.1.6: City of Dillon Warning System					X	X	X	X		X			X		
Action 1.2.1: Emergency Communications				X	X	X	X	X	X	X	X		x		
Action 1.2.2: Emergency Power Backup			X	X	X		X	X		X	X				
Action 1.2.3: Water Supply/Storage back up		X	X							X			X	X	X
Action 1.2.4: Upgrades and Enhancements of Emergency Secondary Dispatching Center			X	X	X		X	X		X	X				
Action 1.2.5: University of Montana – Western Campus Improvements			X	X	X		X	X		X	X				
Action 1.2.6: Radio Repeaters to Increase Range Emergency staff			X	X	X		X	X		X	X				

Table 5-3. Table 5.2C Hazards and Development Mitigated by Each Proposed Project (Page 2 of 4)

	Aircraft Accident	Disease and Environmental Contamination	Drought	Earthquake	Flood	Hazardous Material Release	Severe Weather	Terrorism and Civil Unrest	Transportation Accident	Urban Fire	Utility and Energy Failure	Volcanic Ashfall	Wildfire	Existing Development	Future Development
Action 1.3.1: Subdivision Regulations	X		X	X	X	X	X	X	X	X	X		X		X
Action 1.3.2: Building Codes				X	X		X	X		X		X	X		X
Action 1.3.3: Growth Policy	X		X	X	X	X	X	X	X	X	X		X		X
Action 1.3.4: Conservation Easements	X		X		X								X		X
Action 1.4.1: Public Education	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Action 1.4.2: Builder Education				X	X		X	X		X		X	X		X
Action 2.1.1: Culvert, Drainage, and Road Improvements					X									X	
Action 2.2.1: Floodplain Mapping					X										
Action 2.2.2: Flood Insurance Education					X									X	
Action 2.2.3: Stream Gages					X										
Action 2.3.1: Acquisitions, Relocations, and Elevations					X									X	
Action 2.3.2: Flood Ordinances					X										X
Action 3.1.1: Wildfire Plan													X		
Action 3.1.2: Firewise Program													X	X	
Action 3.1.3: Hazardous Fuels Treatments													X	X	

Table 5-3. Table 5.2C Hazards and Development Mitigated by Each Proposed Project (Page 3 of 4)

	Aircraft Accident	Disease and Environmental Contamination	Drought	Earthquake	Flood	Hazardous Material Release	Severe Weather	Terrorism and Civil Unrest	Transportation Accident	Urban Fire	Utility and Energy Failure	Volcanic Ashfall	Wildfire	Existing Development	Future Development
Action 3.1.4: Fire Safe Montana Program													X	X	
Action 4.1.1: Continued Hazardous Material Training for First Responders		X		X	X	X		X	X			X			
Action 4.1.2: Hazardous Material Study						X									
Action 4.1.3: Hazardous Material Site Security						X		X							
Action 5.1.1: Public Health Planning		X						X							
Action 5.1.2: Active Shooter Preparedness/Training		X						X							
Action 5.1.3: Environmental Laws, Rules, and Regulations		X				X									
Action 5.1.4: Terrorism Planning								X							
Action 6.1.1: Earthquake Education				X											
Action 6.1.2: Earthquake School Retrofits				X										X	
Action 7.1.1: Drought Education			X												
Action 7.2.1: Electric Infrastructure Protection	X						X	X	X		X	X	X		
Action 7.2.2: Snow Fences			X				X		X						
Action 8.1.1: Airport Incident Training	X							X							

Table 5-3. Table 5.2C Hazards and Development Mitigated by Each Proposed Project (Page 4 of 4)

	Aircraft Accident	Disease and Environmental Contamination	Drought	Earthquake	Flood	Hazardous Material Release	Severe Weather	Terrorism and Civil Unrest	Transportation Accident	Urban Fire	Utility and Energy Failure	Volcanic Ashfall	Wildfire	Existing Development	Future Development
Action 8.1.2: Airport Security Improvements	X														
Action 8.1.3: Airport Instrument Approach	X														

5.4 FUNDING SOURCES

Funding for mitigation projects exists from a multitude of sources. Some sources may be specifically designed for disaster mitigation activities, while others may have another overarching purpose that certain mitigation activities may qualify for. Most mitigation funding sources are recurring through legislation or government support. Some, however, may be from an isolated instance of financial support. Whenever possible, creative financing is encouraged. Often, additional funding sources are found through working with other agencies and businesses to identify common or complementary goals and objectives. Table 5.4A shows the programs that may be available to Beaverhead County, the City of Dillon, and the Town of Lima. The traditional mitigation programs that are especially relevant for the county and communities are shown in bold.

Table 5-4. Table 5.2D Mitigation Prioritization Scores and Implementation Scheme for Mitigation Actions (Page 1 of 4)

	Mitigation Prioritization Scores									Implementation Scheme for Mitigation Actions		
	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	Total	Jurisdiction(s)	Priority	Goal Timeframe
Action 1.1.1: Storm Ready Program	4	2	3	4	1	2	2	5	**23**	All	High	Ongoing
Action 1.1.2: NOAA Weather Radios	4	2	2	4	1	2	2	5	**22**	All	High	Near Term
Action 1.1.3: Dam Early Warning Systems	2	2	2	4	1	2	2	5	**20**	All	High	Near Term
Action 1.1.4: Wisdom Weather Observing Station	3	2	2	2	1	2	2	5	**19**	County	Medium	Mid Term
Action 1.1.5: Lima Warning System	2	2	2	4	1	2	2	5	**20**	Lima	High	Near Term
Action 1.1.6: City of Dillon Warning System	2	2	2	4	1	2	2	5	**20**	Dillon	High	Near Term
Action 1.2.1: Emergency Communications	3	2	2	4	1	3	2	5	**22**	All	High	Long Term
Action 1.2.2: Emergency Power Backup	2	2	2	3	1	2	2	5	**19**	All	Medium	Long Term
Action 1.2.3: Water Supply /Storage back up	3	2	2	3	2	3	3	5	**23**	All	Medium	Long Term
Action 1.2.4: Upgrades and Enhancements of Emergency Secondary Dispatching Center	2	2	2	3	1	2	2	5	**19**	County	Medium	Long Term
Action 1.2.5: University of Montana – Western Campus	1	1	2	2	2	2	2	5	**17**	Dillon	Medium	Mid Term

Table 5-4. Table 5.2D Mitigation Prioritization Scores and Implementation Scheme for Mitigation Actions (Page 2 of 2)

	Mitigation Prioritization Scores									Implementation Scheme for Mitigation Actions		
	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	Total	Jurisdiction(s)	Priority	Goal Timeframe
Action 1.2.6: Radio Repeaters to Increase Range Emergency staff	1	2	2	3	1	2	1	5	**17**	County	Low	Ongoing
Action 1.3.1: Subdivision Regulations	5	2	2	2	3	2	2	5	**23**	All	High	Near Term
Action 1.3.2: Building Codes	3	1	2	4	4	2	1	5	**22**	All	Medium	Mid Term
Action 1.3.3: Growth Policy	5	2	2	2	2	2	2	5	**22**	All	Medium	Mid Term
Action 1.3.4: Conservation Easements	1	2	2	2	4	3	3	5	**22**	All	Medium	Ongoing
Action 1.4.1: Public Education	4	2	2	4	3	2	2	5	**24**	All	High	Ongoing
Action 1.4.2: Builder Education	4	2	2	3	4	2	2	5	**24**	All	High	Near Term
Action 2.1.1: Culvert, Drainage, and Road Improvements	2	2	2	2	3	2	3	5	**21**	All	High	Ongoing
Action 2.2.1: Floodplain Mapping	2	3	2	2	3	2	3	5	**22**	All	High	Near Term
Action 2.2.3: Flood Insurance Education	4	2	2	1	3	2	2	5	**21**	All	Medium	Mid Term
Action 2.2.3: Stream Gages	3	2	2	2	1	2	2	5	**19**	All	Low	Ongoing
Action 2.3.1: Acquisitions, Relocations, and Elevations	1	2	2	2	2	2	3	5	**19**	All	Low	Ongoing
Action 2.3.2: Flood Ordinances	5	2	2	2	3	2	2	5	**23**	County	High	Ongoing

Table 5-4. Table 5.2D Mitigation Prioritization Scores and Implementation Scheme for Mitigation Actions (Page 3 of 4)

	Mitigation Prioritization Scores									Implementation Scheme for Mitigation Actions		
	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	Total	Jurisdiction(s)	Priority	Goal Timeframe
Action 3.1.1: Wildfire Plan	3	2	2	3	3	2	2	5	**22**	County	High	Ongoing
Action 3.1.2: Firewise Program	4	1	2	3	4	2	1	5	**22**	County	High	Ongoing
Action 3.1.3: Hazardous Fuels Treatments	3	2	2	2	2	2	2	5	**20**	County	High	Ongoing
Action 3.1.4: Fire Safe Montana Program	4	1	2	3	4	2	1	5	**22**	County	High	Ongoing
Action 4.1.1: Continued Hazardous Material Training for First Responders	3	3	2	3	2	3	2	5	**23**	All	High	Long Term
Action 4.1.2: Hazardous Material Study	3	2	3	3	1	2	2	3	**19**	All	Medium	Mid Term
Action 4.1.3: Hazardous Material Site Security	3	2	2	3	2	2	2	3	**19**	All	Low	Long Term
Action 5.1.1: Public Health Planning	3	1	2	4	1	2	2	3	**18**	All	Low	Ongoing
Action 5.1.2: Active Shooter Preparedness/Training	2	3	2	4	2	3	2	3	**21**	All	Low	Ongoing
Action 5.1.3: Environmental Laws, Rules, and Regulations	5	2	2	4	1	2	2	3	**21**	All	Low	Ongoing
Action 5.1.4: Terrorism Planning	3	1	2	3	1	2	2	1	**15**	All	Low	Ongoing

Table 5-4. Table 5.2D Mitigation Prioritization Scores and Implementation Scheme for Mitigation Actions (Page 4 of 4)

	Mitigation Prioritization Scores									Implementation Scheme for Mitigation Actions		
	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	Total	Jurisdiction(s)	Priority	Goal Timeframe
Action 6.1.1: Earthquake Education	4	2	2	3	2	2	2	5	**22**	All	High	Near Term
Action 6.1.2: Earthquake School Retrofits	3	2	2	4	2	2	3	5	**23**	All	High	Near Term
Action 7.1.1: Drought Education	4	2	2	2	3	2	2	3	**20**	All	Medium	Mid Term
Action 7.2.1: Electric Infrastructure Protection	2	2	2	2	3	2	3	5	**21**	All	High	Near Term
Action 7.2.2: Snow Fences	3	2	2	2	1	2	2	5	**19**	All	Medium	Mid Term
Action 8.1.1: Airport Incident Training	2	2	2	4	3	2	2	1	**18**	All	Low	Ongoing
Action 8.1.1: Airport Security Improvements	2	2	2	4	2	2	2	1	**17**	All	Low	Ongoing
Action 8.1.2: Airport Instrument Approach	2	2	2	4	1	2	2	1	**16**	All	Low	Ongoing

Table 5-5. Table 5.3A Possible Mitigation Grant Funded Projects

Project Ideas	Potential Federal Funding Programs
Floodplain Mapping of New Areas and Updates of Existing Maps	Map Modernization, DNRC, State Watershed Groups
Firewise Program and Hazardous Fuel Reductions	National Fire Plan Hazardous Fuels Mitigation Program
Earthquake School Retrofits	PDM HMGP
Floodplain Acquisitions, Relocations, and Elevations	PDM HMGP
Culvert, Drainage, and Road Improvements in Flood Prone Areas	PDM HMGP
Electric Infrastructure Protection	PDM HMGP

Table 5-6. Table 5.4A Mitigation Funding Sources (Page 1 of 3)

Name	Description	Managing Agencies
AmeriCorps	Provides funding for volunteers to serve communities, including disaster prevention	Corporation for National & Community Service
Assistance to Firefighters Grants	Provides funding for fire prevention and safety activities and firefighting equipment	Department of Homeland Security
Clean Water Act Section 319 Grants	Provides grants for a wide variety of activities related to non-point source pollution runoff mitigation	US Environmental Protection Agency
Community Development Block Grant (CDBG)	Provides funding for sustainable community development, including disaster mitigation projects	US Housing and Urban Development
Economic Development Administration (EDA) Grants and Investments	Invests and provides grants for community construction projects, including mitigation activities	US Economic Development Administration
Emergency Watershed Protection	Provides funding and technical assistance for emergency measures such as floodplain easements in impaired watersheds	US Natural Resources Conservation Service
Environmental Quality Incentives Program	Provides funding and technical assistance to farmers and ranchers to promote agricultural production and environmental quality as compatible goals	US Natural Resources Conservation Service
Flood Mitigation Assistance Program (FMA)	Provides pre-disaster flood mitigation funding (with priority for repetitive flood loss properties under the National Flood Insurance Program).	Montana Department of Natural Resources and Conservation FEMA – Region VIII
Hazard Mitigation Grant Program (HMGP)	Provides post-disaster mitigation funding.	Montana Disaster & Emergency Services FEMA – Region VIII
Hazardous Fuels Mitigation Program	Provides funding for the reduction of hazardous wildfire fuels.	US Bureau of Land Management
Hazardous Materials Planning and Training Grants	Provides funding for planning and training for hazardous materials releases.	Montana Disaster & Emergency Services
Homeland Security Grants	Through multiple grants, provides funding for homeland security activities. Some projects can be considered mitigation.	Montana Disaster & Emergency Services US Department of Justice US Department of Homeland Security
Housing and Urban Development (HUD) Grants	Provides a number of grants related to safe housing initiatives.	US Housing and Urban Development
Individual Assistance (IA)	Following a disaster, funds can mitigate hazards when repairing individual and family homes.	Montana Disaster & Emergency Services FEMA – Region VIII
Law Enforcement Support Office 1033 Program	Provides surplus military property to local law enforcement agencies.	Montana Public Safety Service Bureau

Table 5-6. Table 5.4A Mitigation Funding Sources (Page 2 of 3)

Name	Description	Managing Agencies
Map Modernization Program	Provides funding to establish or update floodplain mapping.	Montana Department of Natural Resources and Conservation FEMA – Region VIII
National Fire Plan (NFP)	Provides funding for pre-disaster wildfire mitigation.	Montana Department of Natural Resources and Conservation US Forest Service
National Wildlife Wetland Refuge System	Provides funding for the acquisition of lands into the federal wildlife refuge system.	US Fish and Wildlife Service
North American Wetland Conservation Fund	Provides funding for wetland conservation projects.	US Fish and Wildlife Service
NRCS Conservation Programs	Provides funding through a number of programs for the conservation of natural resources.	US Natural Resources Conservation Service
Partners for Fish and Wildlife	Provides financial and technical assistance to landowners for wetland restoration projects in "Focus Areas" of the state.	US Fish and Wildlife Service
PPL Montana Community Fund	Provides grants to Montana organizations in the areas of education, environment, and economic development.	PPL Montana
Pre-Disaster Mitigation (PDM) Grants	Provides grants through a competitive process for specific mitigation projects, including planning.	Montana Disaster & Emergency Services FEMA – Region VIII
Public Assistance (PA)	Following a disaster, funds can be used to mitigate hazards when repairing damages to public structures or infrastructure.	Montana Disaster & Emergency Services FEMA – Region VIII
Reclamation and Development Grants Program	Provides funding from the interest income of the Resource Indemnity Trust Fund to local governments for dam safety and other water related projects.	Montana Department of Natural Resources and Conservation
Renewable Resource Development Grant	Provides funding to protect, conserve, or develop renewable resources, including water.	Montana Department of Natural Resources and Conservation
Repetitive Flood Claims (RFC) Grant	Provides funding to reduce flood damages to insured properties that have had one or more claims to the NFIP.	Montana Department of Natural Resources and Conservation FEMA – Region VIII
Rural Development Grants	Provides grants and loans for infrastructure and public safety development and enhancement in rural areas.	US Department of Agriculture, Rural Development
Rural Fire Assistance (RFA) Grant	Funds fire mitigation activities in rural communities.	National Interagency Fire Center

Table 5-6. Table 5.4A Mitigation Funding Sources (Page 3 of 3)

Name	Description	Managing Agencies
SBA Pre-Disaster Mitigation Loan Program	Provides low-interest loans to small businesses for mitigation projects.	US Small Business Administration (SBA)
Severe Repetitive Loss (SRL) Grant	Provides funding to reduce flood damages to residential insured properties that have had at least four claims to the NFIP.	Montana Department of Natural Resources and Conservation FEMA – Region VIII
Small Flood Control Projects	Authority of USACE to construct small flood control projects.	US Army Corps of Engineers (USACE)
Streambank & Shoreline Protection	Authority of USACE to construct streambank stabilization projects.	US Army Corps of Engineers (USACE)
Wetland Program Development Grants (WPDGs)	Provides funding for studies related to water pollution prevention.	US Environmental Protection Agency

This list of potential funding sources is certainly not all inclusive. Many opportunities for mitigation funding exist both in the public and private sectors such as businesses, foundations, and philanthropic organizations.

5.5 EXISTING PLANNNING MECHANISMS AND CAPABILITIES

Implementing mitigation projects requires cooperation and coordination between a variety of agencies, organizations, and the public. Most mitigation projects are time consuming and may require the attention of local officials with many other priorities. Incorporating mitigation ideas and information into existing planning mechanisms and programs is one way to use existing resources to achieve mitigation objectives.

Beaverhead County, the City of Dillon, and the Town of Lima are in a unique position to perform disaster mitigation for future development. Much of the county has experienced growth over the past several years and Dillon and Lima are seeing increases in the demand for services. Recent economic slowdowns may have tempered growth but also provides the opportunity to look at existing policies and regulations so that future development may be better protected.

Despite the growth in recent years, Beaverhead County is still very much a rural area and has a relatively small tax base that limits the number of resources that can be devoted to mitigation, or even planning for that matter. County government consists of three county commissioners and staff. Dillon and Lima each have a mayor and council. Emergency management is coordinated by one full-time position. Beaverhead County has one planner and one GIS coordinator.

These limited resources, although effective for a rural county, do not allow for many activities beyond the standard course of business; the time that can be devoted to disaster mitigation is limited. Beaverhead County does have an active Local Emergency Planning Committee, with representatives from many agencies, which meets regularly to discuss emergency management and planning issues. In general, the county has only a few planning mechanisms and Dillon and Lima have even fewer as most

of the planning issues are handled by the local elected officials. Table 5.5A lists the existing local plans and development mechanisms.

Table 5-7. Table 5.5A Existing Local Plans and Development Mechanisms

Plan Name	Date
Beaverhead County, City of Dillon, City of Lima – Comprehensive Disaster and Emergency Operations Plan	
Beaverhead County Growth Policy	April 15, 2013
Beaverhead County Community Wildfire Protection Plan	September 2005
Beaverhead County Subdivision Regulations	February 25, 2010
Dillon Community Plan	February 3, 2016
Lima Municipal Codes	

As the jurisdictions develop new plans and existing plans are updated, the new plans and updates will utilize the hazard information and actions identified in this mitigation plan for consideration and inclusion. Given that limited planning mechanisms exist in the county and jurisdictions, the information in this mitigation plan will be valuable for future planning efforts. Most of the integration of mitigation into existing plans will be done by the Beaverhead County Planning Department, however, for more comprehensive integration, local officials and other departments will also need to consider mitigation when making decisions and updating codes, regulations, policies, and plans. Table 5.5B shows examples of how mitigation can be incorporated into existing and future planning documents. Note that some proposed mechanisms may not be feasible at this time or any time in the near future because of the staff, technical expertise, and financial resources needed to implement the program.

Table 5-8. Table 5.5B Incorporation Into Existing and Future Plans

Existing or Anticipated Plan	Mitigation Strategies
Building Codes	Adopt and enforce the state building code. This activity will reduce the risks to future development from hazards such as earthquakes, tornadoes, strong winds, terrorism, urban fires, and winter storms.
Capital Improvement Plans	When developed or updated, consider and include projects related to hazard mitigation, such as transportation and public utility infrastructure improvements, in the capital improvements schedule.
Beaverhead County, City of Dillon, City of Lima – Comprehensive Disaster and Emergency Operations Plan	Integrate the operational, response, training, and preparedness needs that are not directly tied to mitigation into the county's emergency operation plan.
Beaverhead County Growth Policy	When updated, include elements of the risk assessment and mitigation strategy into the county's growth policy, considering sustainability and disaster resistance a top priority.
Beaverhead County Community Wildfire Protection Plan	When updated, continue to emphasize mitigation activities in the strategy portion of the plan.
Beaverhead County Subdivision Regulations	When updated, incorporate elements of the risk assessment and mitigation strategy into the county's subdivision regulations, considering sustainability and disaster resistance a top priority.
Municipal Codes/Ordinances/Zoning	Adopt ordinances that create disaster resistance such as fire reduction ordinances, flood ordinances, and open space zoning in hazard areas.

Note: Some activities such as building codes and land-use regulations are more easily implemented by some communities than others because of the community, planning, and enforcement resources available.

6.0 PLAN MAINTENANCE

An important aspect of any useable plan is the maintenance and upkeep of the document. To facilitate and ensure the plan will remain viable for Beaverhead County and the incorporated jurisdictions for many years, the plan maintenance responsibilities lie with the Beaverhead County LEPC. It is suggested that due to the fact that this committee meets regularly and is responsible for coordinating emergency planning issues for the county and communities, a review of this plan should be on the agenda at least once during the year to keep topics and goals current . Given the broad representation of agencies and jurisdictions, this committee is a good fit, has many members that participated in the initial plan development and update, and eliminates the need for an additional committee. All Local Emergency Planning Committee meetings are open to the public.

6.1 PLAN MONITORING

The plan will be monitored by the Beaverhead County Local Emergency Planning Committee and mitigation progress will be discussed at each meeting, usually monthly. The status of projects will be reported on and new projects will be initiated during this time. Annually, a "Mitigation Year in Review" meeting will be conducted. At this meeting, a list of projects completed during the previous calendar year will be documented and put in Appendix K.

The LEPC will review the goals, objectives, and actions to determine if the actions for which funding exist are proceeding as planned. Review of ongoing projects will be conducted to determine their status, their practicality, and which actions should be revised. If needed, site visits will be conducted. The LEPC will review any new risk information and modify the plan as indicated by the emergence of new vulnerabilities.

6.2 PLAN EVALUATION

The evaluation of the plan will be conducted by the Beaverhead County Local Emergency Planning Committee annually at the "Mitigation Year in Review" meeting. At this meeting, the methods of implementing and maintaining the plan will be evaluated for successes and improvements. Changes to the implementation schedule or plan maintenance will be made as needed to ensure hazard mitigation activities continue. The evaluation will consider the following:

- Changes in land development
- If the nature or magnitude of risks has changed
- If the goals and objectives address current and expected conditions
- The effectiveness of the programs
- If outcomes have occurred as expected
- If other agencies and partners have participated as originally planned
- If current resources are adequate for implementing the plan
- If other programs exist that may affect mitigation priorities.

New stakeholders and interested parties will be identified and invited to participate in the implementation process. The Beaverhead County LEPC maintains a contact list of mitigation stakeholders. Should a hazard event have occurred during the previous year in which a mitigation project was a factor, either positive or negative, a summary report, including avoided losses, will be written and included in Appendix K.

6.3 PLAN UPDATES

As disasters occur, projects are completed, and hazard information is improved, the Beaverhead County Pre-Disaster Mitigation Plan will need to be updated. To remain an active and approved plan, an updated plan must be submitted to Montana Disaster and Emergency Services (DES) and the Federal Emergency Management Agency (FEMA) every five years. The next formal submission is required in 2022. To provide enough time for a full update before this plan expires, the following schedule is recommended:

- Pre-Disaster Mitigation Planning Grant Application Preparations: late 2020
- Pre-Disaster Mitigation Planning Grant Application: early 2021
- Contracting for Professional or Technical Services (if needed): June–August 2021
- Plan Reviews and Modifications: September 2021–May 2022
- Montana DES and FEMA Reviews: June–July 2022
- Final Revisions and Adoption: August 2022
- Final Plan Approval: September 2022.

To facilitate the update process, annual updates to the plan are recommended. Table 6.3A shows the schedule of plan updates.

Table 6-1. Table 6.3A Schedule of Plan Updates

Plan Section	Post-Disaster	Annually	Every 5 Years
Introduction			X
Planning Process and Methodologies	X	X	X
Critical Facilities and Infrastructure			X
Population and Structures			X
Economic, Ecologic, Historic, and Social Values			X
Current Land Use			X
New Development		X	X
Future Development		X	X
Hazard Profiles	X	X	X
Risk Assessment Summary			X
Goals, Objectives, and Proposed Actions	X	X	X
Action Prioritization	X	X	X
Project Implementation	X	X	X
Funding Sources			X
Existing Planning Mechanisms and Capabilities	X	X	X
Plan Maintenance			X
Appendices	X	X	X

6.4 PUBLIC INVOLVEMENT

Beaverhead County is dedicated to involving the public directly in the review and updates of the Pre-Disaster Mitigation Plan. A copy of the Pre-Disaster Mitigation Plan will be available for review at the Beaverhead County Courthouse Commissioners' Office, the Beaverhead County Disaster and Emergency Services' Office, Dillon City Hall, and Lima Town Hall. The public is invited to attend all Local Emergency Planning Committee meetings and the annual "Mitigation Year in Review" meeting to provide input and feedback. In an effort to solicit involvement, a press release will be distributed annually to the Dillon Tribune newspaper prior to the "Mitigation Year in Review" meeting, encouraging the public to attend. Year round, written comments may also be submitted to the Local Emergency Planning Committee at:

Beaverhead County LEPC
c/o Beaverhead County Disaster and Emergency Services
2 S. Pacific St., Ste. #12
Dillon, MT 59725

Received comments will be reviewed and integrated where applicable during the annual and 5-year plan updates.