

**Park County, Montana
City of Livingston, Montana
Town of Clyde Park, Montana**

Critical Facilities and Personal Information
Redacted

Hazard Mitigation Plan

September 2011 Revision



Upper Yellowstone River Flooding in 1997
Photo Courtesy of USGS and Upper Yellowstone River Task Force

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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 Park County Hazard Mitigation Plan addresses eighteen major hazards with respect to risk and vulnerabilities countywide, including in the City of Livingston and the Town of Clyde Park. Through a collaborative planning process, the Park County hazards were identified, researched, and profiled.

The major hazards – avalanche and landslide; aviation accident; communicable disease and bioterrorism; dam failure; drought; earthquake; flooding; ground transportation accident; hazardous materials release; railroad accident; severe thunderstorms and tornadoes; terrorism, civil unrest, and violence; urban fire; utility outage; volcano; wildfire; wind; and winter storms and extended cold – are each profiled in terms of their description, history, probability and magnitude, vulnerabilities, and data limitations. The vulnerabilities to critical facilities, critical infrastructure, existing structures, the population, values, and future development are evaluated for each hazard.

Based on the probability and extent of potential impacts identified in the risk assessment, the prioritizations of hazards within Park County, the City of Livingston, and the Town of Clyde Park are as follows:

Park County Hazard Prioritizations

Level	Hazard
High Hazard	Flooding Wildfire Earthquake Hazardous Materials Release Wind Winter Storms and Extended Cold
Moderate Hazard	Severe Thunderstorms and Tornadoes Communicable Disease and Bioterrorism Drought Ground Transportation Accident Urban Fire Dam Failure
Low Hazard	Utility Outage Volcano Terrorism, Civil Unrest, and Violence Aviation Accident Railroad Accident Avalanche and Landslide

City of Livingston Hazard Prioritizations

Level	Hazard
High Hazard	Flooding Earthquake Hazardous Materials Release Wind Winter Storms and Extended Cold
Moderate Hazard	Communicable Disease and Bioterrorism Severe Thunderstorms and Tornadoes Urban Fire Drought Utility Outage
Low Hazard	Ground Transportation Accident Wildfire Aviation Accident Terrorism, Civil Unrest, and Violence Railroad Accident Volcano

Town of Clyde Park Hazard Prioritizations

Level	Hazard
High Hazard	Severe Thunderstorms and Tornadoes Flooding Urban Fire Wildfire Wind
Moderate Hazard	Winter Storms and Extended Cold Hazardous Materials Release Communicable Disease and Bioterrorism Drought Dam Failure Earthquake
Low Hazard	Ground Transportation Accident Utility Outage Aviation Accident Volcano Terrorism, Civil Unrest, and Violence

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

- *Goal 1: Reduce damages from flooding.*
- *Goal 2: Prevent losses from wildfires.*
- *Goal 3: Reduce potential losses from earthquakes.*
- *Goal 4: Reduce losses from a transportation or hazardous materials accident.*
- *Goal 5: Promote effective multi-hazard mitigation measures.*

Associated with each of the goals are objectives and mitigation projects ranging from updating land use regulations to burying electric infrastructure to public 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 Park County, the City of Livingston, and the Town of Clyde Park. Park County Disaster and Emergency Services and the Park County Local Emergency Planning Committee are 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 Park County.

The Park County Hazard 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 Park County, the City of Livingston, and the Town of Clyde Park and provides a strategy for preventing or reducing some of the impacts.

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1. INTRODUCTION

1.1 Purpose

Park County, the City of Livingston, and the Town of Clyde Park recognize that hazards, both natural and human-caused, 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 Hazard Mitigation Plan is to:

- 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 new facilities or subdivisions will result in cost-effective solutions and greater disaster resistance, thus saving the communities' money in the long-term and contributing to the communities' sustainabilities.

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. Hopefully through the planning process, the communities have become more aware of their hazards and will continue to 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 to be eligible to receive Hazard Mitigation Grant Program (HMGP) and other types of disaster and mitigation funding.

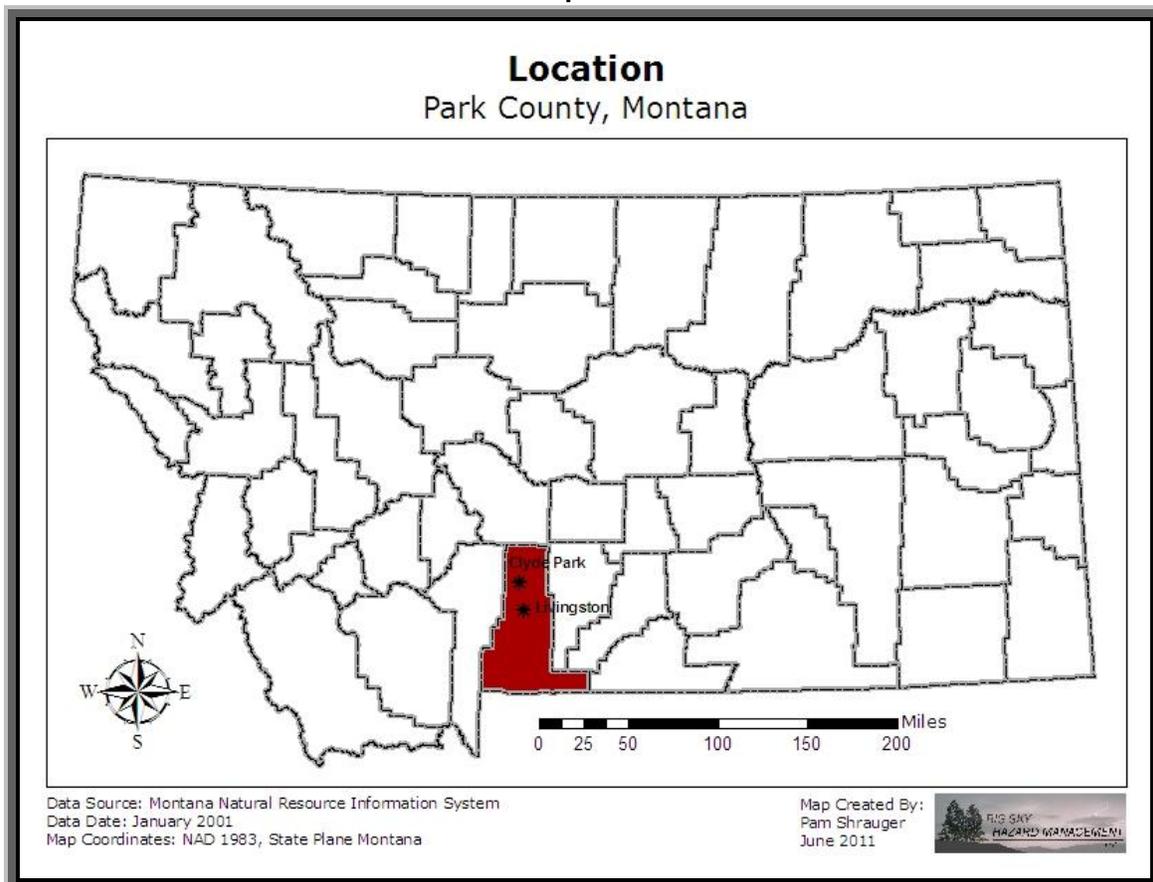
Park County, the City of Livingston, and the Town of Clyde Park have adopted this Hazard Mitigation Plan by resolution (see Appendix P for copies of the resolutions). These governing bodies have the authority to promote mitigation activities in their jurisdictions.

1.3 County and Jurisdictional Profile

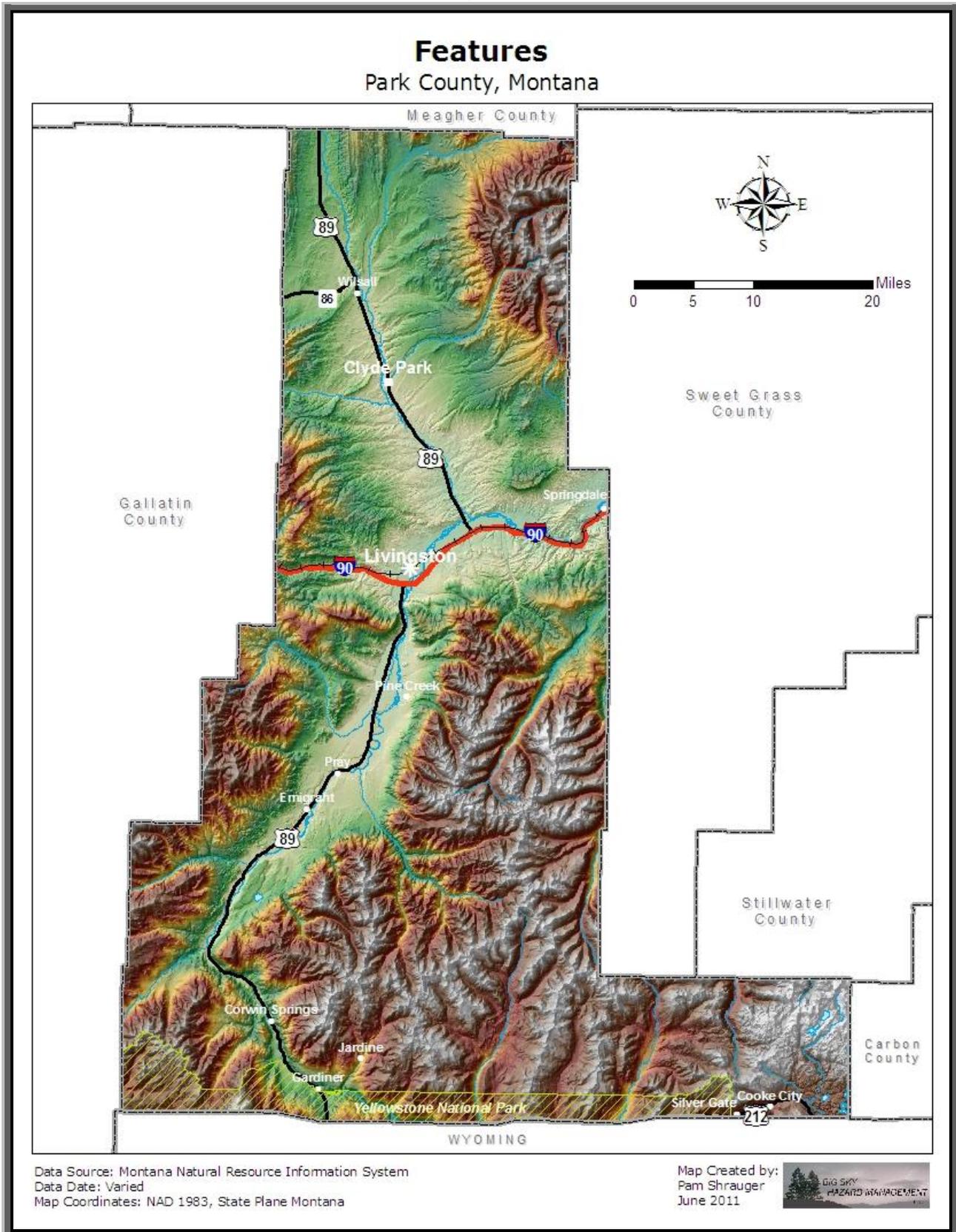
Park County is located in south central Montana, as shown in Map 1.3A, with an area of approximately 2,802 square miles. Park County is bordered on the north by Meagher County, on the east by Sweet Grass County, on the southeast by Carbon and Stillwater Counties, on the west by Gallatin County, and on the south by Yellowstone National Park and Park County, Wyoming. The City of Livingston is the county seat and the only other incorporated community is the Town of Clyde Park.

Map 1.3B shows the general features in the county. The beautiful and agricultural Paradise and Shields Valleys, within Park County, are surrounded by several mountain ranges and are marked by pristine rivers, creeks, and streams. The Shields River flows from the Crazy Mountain Range in northeastern Park County south to the Yellowstone River east of Livingston, forming the Shields Valley. The Bridger Mountain Range lies to the west of the Shields Valley. The Yellowstone River starts to the south in Yellowstone National Park and flows north to Gardiner and between the Gallatin and Absaroka Mountain Ranges, forming the Paradise Valley. At Livingston, the Yellowstone River flows east to Springdale and Sweet Grass County. Elevations range from about 4,000 feet in the river valleys to over 12,000 feet in the mountains. The region offers a wide variety of sights and outdoor activities including hunting, fishing, cross country skiing, swimming in hot springs, horseback riding, camping, and wildlife viewing. Livingston is known as the Gateway to Yellowstone National Park.

Map 1.3A



Map 1.3B



1.4 Climate Overview

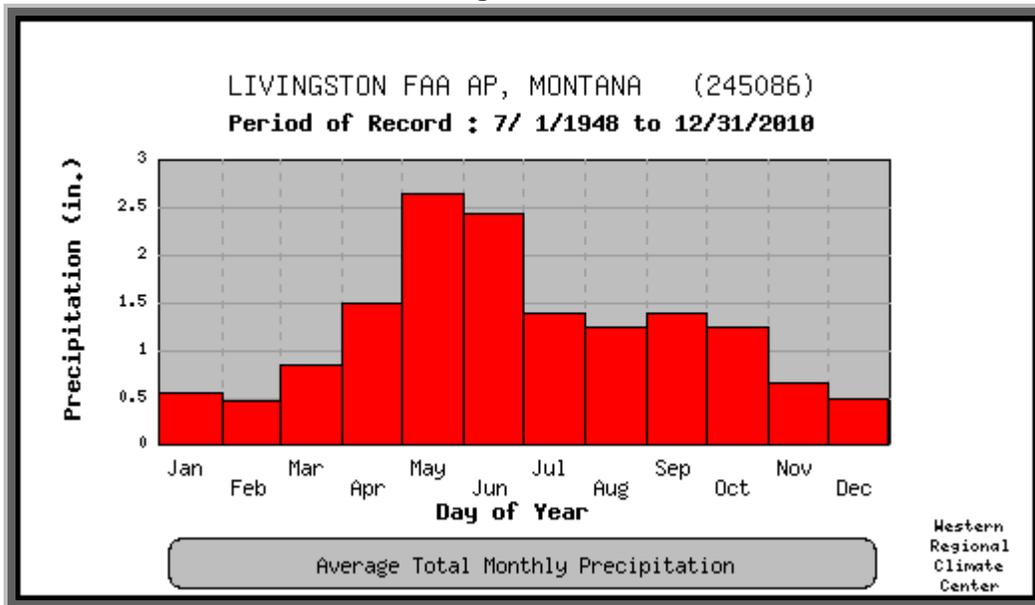
Table 1.4A details the climate statistics recorded by the National Weather Service (NWS) at the primary Livingston weather station, Mission Field. Climate stations also exist twelve miles south of Livingston, at Gardiner, and eight miles east-northeast of Wilsall that capture different elements and show the variations in climate. Figure 1.4B shows the average precipitation by month at Livingston.

Table 1.4A Park County Climate Statistics

	Livingston, Mission Field 1948 - 2011	Livingston, 12 miles south 1981-2011	Gardiner 1956-2011	Wilsall, 8 miles east-northeast 1957-2011
Annual Average Maximum Daily Temperature	57.5°F	57.1°F	58.2°F	54.0°F
Annual Average Minimum Daily Temperature	33.0°F	32.6°F	32.1°F	28.3°F
Annual Average Total Precipitation	14.97 inches	16.21 inches	9.79 inches	20.23 inches
Annual Average Total Snowfall	60.6 inches	64.7 inches	25.2 inches	96.6 inches
Highest Temperature Recorded	105°F August 5, 1961	99°F July 13, 2005	103°F July 21, 1960	99°F July 30, 2000
Lowest Temperature Recorded	-41°F December 24, 1983	-36°F December 24, 1983	-31°F February 3, 1989	-42°F February 3, 1989
Annual Average Number of Days Dropping Below Freezing	162.3 days	165.9 days	173.4 days	207.1 days
Annual Average Number of Days Staying Below Freezing	39.5 days	37.4 days	38.4 days	46.1 days
Annual Average Number of Days Reaching 90°F or Higher	19.8 days	9.4 days	21.7 days	2.7 days
Highest Annual Precipitation	22.87 inches 1975	23.15 inches 1992	15.19 inches 1992	31.31 inches 1993
Lowest Annual Precipitation	9.01 inches 1954	11.91 inches 2003	6.09 inches 2002	13.89 inches 2001
1 Day Maximum Precipitation	2.90 inches June 16, 1992	3.10 inches May 7, 1988	1.87 inches June 16, 1992	2.82 inches June 25, 1969
Highest Annual Snowfall	113.9 inches 1975	123.8 inches 1975	74.5 inches 1967	210.5 inches 1975

Source: Western Regional Climate Center, 2011.

Figure 1.4B



Source: Western Regional Climate Center, 2011.

1.5 Plan Scope and Organization

The Park County Hazard 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 Park County, the City of Livingston, and the Town of Clyde Park. 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, hopefully, this plan will help the communities understand the hazards better and become more disaster resistant.

2. PLANNING PROCESS AND METHODOLOGIES

Mitigation planning is a community effort. It also takes time and expertise. For Park County, the City of Livingston, and the Town of Clyde Park, 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, schools, 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

The planning process used to develop the initial mitigation plan attempted to maximize community input and utilize a wide variety of informational resources. The planning process began in March 2004 with an advertised public meeting that was held in conjunction with the regularly scheduled Local Emergency Planning Committee (LEPC). The LEPC consisted of representatives from emergency management, fire services, medical and health services, law enforcement, media, voluntary organizations, and government administration. This already active committee was determined to be an excellent core group because of its broad representation. The jurisdictions of Park County and Livingston were represented on the LEPC; however, a representative from Clyde Park was not. Therefore, an additional meeting was held in Clyde Park in May 2004. Although not an incorporated community, a meeting was scheduled in Gardiner for May 2004, but little interest was generated. Documentation of the newspaper and newsletter notices can be found in Appendix B. Attendance records can be found in Appendix C.

The initial plan was funded by Montana Disaster and Emergency Services through a Department of Homeland Security, Federal Emergency Management Agency Pre-Disaster Mitigation grant. This grant was used to hire a consultant, Big Sky Hazard Management LLC, based in Bozeman, to assist with the plan's development.

The first public meeting in March 2004 was advertised through public notice in the Livingston Enterprise newspaper and press releases were sent to local radio stations, television stations, print media offices, Chambers of Commerce, and hospitals. Several members attending the first meeting had heard the announcements over the radio. This first public meeting introduced the attendees to the planning process. The group then identified the primary hazards in the county and participants were surveyed on their individual hazard prioritizations.

The second round of public meetings in May 2004 was again advertised through another public notice in the Livingston Enterprise newspaper. Meetings were scheduled in Clyde Park, Livingston, and Gardiner. The Clyde Park meeting was well attended and was held during the regularly scheduled Town Meeting. Attendees identified and prioritized hazards specific to Clyde Park and identified each of the critical facilities. Attendees of the brown bag lunch meeting in Livingston were valuable in identifying critical

facilities and hazard experts. Although Gardiner is not an incorporated community, the meeting was designed to gather input from the public residing in the southern part of the county. The Gardiner meeting was advertised in the Chamber of Commerce newsletter, a well known community publication, but unfortunately, generated no interest.

Additional meetings were held in January 2005, April 2005 (publicly advertised), and July 2005 with the LEPC for the purposes of identifying critical facilities, reviewing draft sections, and developing mitigation strategies. Once draft sections were completed, they were distributed over e-mail for review. The full draft of the plan was posted on a website to solicit public review and comment. Final public meetings soliciting comments on the full draft plan were held in Livingston in August 2005 and in Clyde Park in September 2005. These meetings were advertised in the Livingston Enterprise newspaper.

2.2 Plan Update Process

Approaching the required 5-year plan update, Park County applied for and received a Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation (PDM) grant to update its plan in 2010. With the funding, Big Sky Hazard Management LLC, the same contractor used in 2005, was hired to facilitate the plan update and coordinate the planning process in partnership with the county, city, and town. The contract was managed by the Park County Disaster and Emergency Services Coordinator.

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. New stakeholders were identified.
4. An initial public meeting (advertised through invitations, press releases, and a newspaper ad) was held in Livingston to educate the public on hazard mitigation planning and to solicit comment on the existing plan.
5. An initial planning meeting, open to the public, (also advertised through invitations, press releases, and a newspaper ad) was held in conjunction with the Local Emergency Planning Committee (LEPC) meeting in Livingston to discuss what changes and accomplishments have taken place in the county, city, and town over the past six years and to brainstorm ideas (new hazards, mitigation strategies) for the updated version.
6. Sections related to the Assets and Community Inventory and Risk Assessment were updated.
7. An additional planning meeting was held in conjunction with the Local Emergency Planning Committee (LEPC) meeting to discuss changes to the mitigation strategy. All identified stakeholders were invited.
8. The Mitigation Strategy and remaining sections were updated.
9. Stakeholders were asked to review the draft plan and provide comments.
10. Public meetings (advertised through invitations, press releases, and a newspaper ad) were held in Clyde Park and Livingston to update the communities on the newly revised plan and to solicit comments on the update.
11. Following the public comment period, any comments received were incorporated and the final plan was sent to the state and FEMA for review.

12. The jurisdictions adopted the updated plan, either before or immediately after state and FEMA conditional approval.

Planning Team

The core planning team consisted of the Local Emergency Planning Committee (LEPC) that meets on a regular basis regarding a variety of emergency management related issues. A number of additional key stakeholders from conservation groups, planning departments/boards, and state and federal agencies were invited. A key addition was the Mayor of the Town of Clyde Park that participated in the meetings and discussions. Appendix A lists the invited stakeholders and their level of participation. Major plan issues and discussions were presented to this group and decisions were made through consensus. No significant disagreements or contentious issues were discovered.

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. Perhaps the biggest change in Park County has been significant residential growth. Since Park County does not have building codes or a construction permit system, the exact number of new developments is difficult to determine, however, the county sanitarian issued 609 new septic permits from 2005 through 2010. (Park County Environmental Health, 2011) The recent economic slowdown has reduced this activity, but growth still continues.

A few relatively minor disasters and one Presidentially declared flood disaster have occurred in the county over the past six years, but nothing that has led to big changes in communities or policies. The biggest changes have been updates to flood mapping that have actually reduced the number of people living in the floodplain and improvements to the Park County Subdivision Regulations with respect to development in the wildland urban interface.

Plan Changes

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 the contractor, and changes were made as needed.

The five-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:

- Addition of an executive summary.
- The planning process was updated to include the five-year revision.
- Evaluations of current land use, new development, and future development were added and/or updated.

- More detail was added to each hazard profile, including updated and more detailed descriptions, maps, histories, probabilities, magnitudes, vulnerabilities, and data limitations.
- Ranking of hazards was done for each jurisdiction and was based on the updated risk and probability.
- New mitigation strategies and concepts were added and those completed or no longer relevant were removed.
- The projects were more specifically described including responsible agencies and positions, resources needed, and a goal timeframe.
- A funding sources section was added.
- Details regarding the county and community planning mechanisms and capabilities were added.
- More specificity was added to the plan maintenance section.
- New appendices were added as needed.

More details on plan changes can be found in Appendix H.

Jurisdiction Participation

This plan, both the initial 2005 plan and the 2011 update, included the following jurisdictions:

- Park County
- City of Livingston
- Town of Clyde Park

Note: The jurisdictions listed above are all of the incorporated jurisdictions in Park County. Other communities such as Cooke City, Emigrant, Gardiner, Pray, Silver Gate, Springdale, and Wilsall are not incorporated nor do they have governing bodies and are under the jurisdiction of Park County.

Each jurisdiction participated in a variety of ways depending on the resources available in the community. Park County applied for, received, and managed the funding for the plan's development. Representatives from several county offices were active in all aspects of the plan's update. The City of Livingston and the Town of Clyde Park participated in the plan's update by sending representatives to planning and public meetings, providing data and information, discussing elements of the plan at their regularly scheduled public meetings, and reviewing the draft plan. Each of the jurisdictions adopted the plan through resolution upon completion as shown in Appendix P.

Public Participation

The public was provided with several opportunities to participate in the plan's update. Public meetings were held in July 2011 and September 2011. Each meeting was advertised to the public through press releases and advertisements in the Livingston Enterprise newspaper. Copies of the press releases and advertisements can be found in Appendix B. Announcements were also posted on the Big Sky Hazard Management LLC, Park County, and Livingston HealthCare websites. Each press release encouraged participation through meeting attendance or the review of documents on the consultant's website. Appendix A shows the list of specific stakeholders identified and invited to the meetings. Invitations were sent to active participants and those in communities beyond Park County, thus allowing neighboring communities and regional agencies the opportunity to participate. Appendix C contains the

sign-in sheets from each meeting and identifies those that actively participated in the plan’s update. Notes from each meeting are included in Appendix D.

In addition to the public meetings, the public was given the opportunity to comment on the plan posted on the Big Sky Hazard Management and Park County websites. The completed draft was posted from August 22, 2011 through September 15, 2011. Comments could be made via the mail, phone, or email. The consultant then reviewed the comments and all were integrated where applicable. Comments were readily accepted throughout the planning process.

Since county commission, city commission, and town council meetings are also open, public meetings, the discussions and subsequent adoption of the plan by the governing bodies were additional opportunities for public comment. The jurisdictions advertised these meetings using their usual public notification procedures, typically by posting meeting agendas and newspaper notices.

Incorporation of Existing Information

Information from existing plans, studies, reports, and technical information related to hazards, mitigation, and community planning was gathered by Big Sky Hazard Management LLC by contacting individuals throughout the planning process and reviewing the 2005 plan. Many national and state plans, reports, and studies provided background information. Table 2.2A lists the existing local plans and documents incorporated into this mitigation plan by integrating information into the appropriate sections. Documentation on these sources, plans, studies, reports, and technical information can be found in Appendix E. Mapping for and updating of the plan was done by Big Sky Hazard Management LLC based on information collected from a wide variety of sources. The information was organized into a clear, usable, and maintainable format that also ensured the federal regulations regarding hazard mitigation plans were met.

Table 2.2A Existing Local Plans and Documents Incorporated

Plan/Report/Study Name	Plan/Document Date
City of Livingston Growth Policy	October 2004
City of Livingston Subdivision Regulations	December 2007
City of Livingston Zoning Ordinance	September 2008
Cottonwood Dam Emergency Action Plan	2005
Crazy Mountain Ranch Emergency, Operations, and Maintenance Manual for Crazy Mountain Dam	January 2002
Governor’s Upper Yellowstone River Task Force Final Report	December 2003
Northern Rocky Mountain Resource Conservation and Development Area Plan	March 2007
Park County Community Wildfire Protection Plan	December 2009
Park County Comprehensive Economic Development Strategy	November 2002
Park County Flood Mitigation Plan	March 1999
Park County Growth Policy	August 2006
Park County Rural and Wildland Fire Management Plan	1997

Table 2.2A Existing Local Plans and Documents Incorporated (continued)

Plan/Report/Study Name	Plan/Document Date
Park County Subdivision Regulations	June 2010
Sonoran Institute, Park County’s Future – It’s Our Legacy	
Town of Clyde Park Growth Policy	October 2009
Yellowstone River Channel Migration Zone Report	February 2009

Plan Adoption

This plan has been adopted by Park County, the City of Livingston, and the Town of Clyde Park. Each jurisdiction has a governing body that is authorized to formally adopt plans such as this. The adoption process involved verbal and signatory approval of a resolution accepting the plan by the governing body at a regularly scheduled public meeting/hearing. In order for the resolution to be approved, a majority of the governing body must agree; for Park County, this is two out of three commissioners, in Livingston, this is three out of five commissioners, and in Clyde Park, this is three out of five councilpersons. The resolution is then also signed by a clerk or recording secretary and the jurisdiction’s attorney for form and content. This process occurred shortly after the plan was completed and while the plan was being conditionally approved by the state and FEMA. Copies of the resolutions, including the date signed, are in Appendix P.

The Park County Hazard 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 Park County, the City of Livingston, and the Town of Clyde Park 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.

This all-hazard risk assessment and mitigation strategy serves as an initial source of hazard information for those in Park 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 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, recent development, and future development potential.

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 resources with mapping as applicable and a record of the hazard *history* compiled from a wide variety of databases and sources. Note that the data used was more specific and accurate than the data provided by the SHEL DUS database recommended by FEMA. Where spatial differences exist, mapping was used for hazard analyses by geographic location. Some hazards can have varying levels of risk based on location (i.e. near the rivers versus far away from the rivers). 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.

Using the local historical occurrence, or more specific documentation if available, a *probability and magnitude* was determined for a specific type of event. 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. 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. The hazard frequency and impact ranges show the differentiation between high frequency, low impact events and low frequency, high impact events. Table 2.3A provides the basic criteria used to define the “probability of a high impact event.” Generally, a “high impact event” is defined as one in which the majority of citizens are affected in some way and state and local resources are exceeded.

Table 2.3A Probability of a High Impact Event Criterion

Probability of a High Impact Event	Description
High	Occurs nearly annually
Moderate-High	Occurs roughly once every 50 years
Moderate	Occurs roughly once every 100 years
Low-Moderate	Regional history but no local history
Low	No regional or local history

Vulnerabilities were assessed based on a variety of different resources and methodologies. Additional information on the methodology used to determine the vulnerabilities can be found in each hazard profile. Each type of vulnerability (critical facilities, critical infrastructure, structures, population, values, and future development) was assessed based on a probable impact (100-year) event and an extreme

impact (500-year) event. Generalizations were made to categorize the types and ranges of impacts that could be seen.

Critical facilities and structures were mapped using data developed by the Park County GIS Office. 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 and structure locations were compared to available hazard layers to show the proximity of the buildings 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. Structure losses were calculated using a combination of point structure data and parcel data used for tax assessment purposes. The structures were assigned the building value of the closest parcel with a building value greater than zero. These values were then used to determine the potential losses to structures. 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 MR2, a loss estimation software program developed by the Federal Emergency Management Agency (FEMA), approximated losses from earthquakes and floods. Where GIS mapping was unavailable or not useful, estimations and plausible scenarios were used to quantify potential structure losses.

Critical infrastructure for services such as electricity, heating fuels, telephone, water, sewer, and transportation systems was assessed using history and a general understanding of such systems to determine what infrastructure losses may occur. HAZUS-MH MR2 was also used to determine the potential losses to critical infrastructure from earthquakes and floods.

Population impacts were qualitatively assessed based on the number of structures estimated to be in the hazard area. Depending on the time of year, population concentrations are likely 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.

The assessment on the impact to future development is based on the mechanisms currently in place to limit or regulate development in hazardous areas and the likelihood of development in hazardous areas. Some hazards can be mitigated during development, others cannot.

The impact rating given for each type of vulnerability was generally based on the descriptions shown in Table 2.3B. Some adjustments were made where special circumstances exist.

Table 2.3B Impact Rating Criteria

Impact Rating	Description
High	Causes damages and losses within nearly every aspect of the vulnerability type; community sustainability may be threatened.
Moderate-High	The majority of citizens are affected in some way due to losses in this vulnerability type; state and local resources are likely exceeded.
Moderate	The damages to the vulnerability type are formidable and require a local response.
Low-Moderate	Either a small segment of the vulnerability type is impacted or damages are sporadic. May require a limited local response.
Low	Impacts to the vulnerability type are negligible or are present in only unique situations.

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 project in the mitigation strategy.

The *overall hazard rating* of high, moderate, and low was determined based on the combination of the probability of a high impact event and the vulnerability. These ratings are outlined by jurisdiction in the *risk assessment summary* and take into account the number of hazards that threaten the community.

2.4 Hazard Identification

In 2005, eighteen hazards were identified and analyzed. Hazards were initially identified by participants in the first public meeting. Participants included government, the private sector, and the public. Then, a history of past events was gathered and possible future events were recognized through internet research, available GIS data, archives research, public meetings, subject matter experts, and an examination of existing plans. In 2011, the planning team reconsidered the hazard list; all hazards remained and no new hazards were identified. New data sources, plans, and information for several hazards were identified and incorporated into the appropriate hazard profile.

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 2.4A Identified Hazards

Hazard Profile	Jurisdiction(s)	How Identified	Why Identified
Avalanche and Landslide	Park County	<ul style="list-style-type: none"> ▪ Avalanche.org ▪ Federal Emergency Management Agency ▪ Gallatin National Forest ▪ Montana Department of Transportation ▪ Montana Disaster and Emergency Services 	<ul style="list-style-type: none"> ▪ Mountainous terrain exists that is prone to avalanches and landslides ▪ Avalanche deaths occur regularly ▪ Roadway landslide priorities have been identified
Aviation Accident	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ National Transportation Safety Board 	<ul style="list-style-type: none"> ▪ History of aircraft accidents, some with casualties ▪ Potential for commercial aircraft accident
Communicable Disease and Bioterrorism (including human and animal diseases)	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Centers for Disease Control and Prevention ▪ Montana Department of Livestock ▪ Pandemic studies ▪ US Department of Agriculture ▪ World Health Organization 	<ul style="list-style-type: none"> ▪ Global disease threat ▪ History of pandemics ▪ Dependence on agricultural economy
Dam Failure	Park County Clyde Park	<ul style="list-style-type: none"> ▪ Cottonwood Dam Emergency Action Plan ▪ Crazy Mountain Dam Emergency Action Plan ▪ Federal Emergency Management Agency ▪ Park County GIS data ▪ US Army Corps of Engineers 	<ul style="list-style-type: none"> ▪ Potential for a loss of life and property from a dam failure at the Cottonwood or Crazy Mountain Dams or other significant hazard dams
Drought	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Montana Disaster and Emergency Services ▪ National Drought Mitigation Center ▪ National Oceanic and Atmospheric Administration ▪ US Department of Agriculture 	<ul style="list-style-type: none"> ▪ History of droughts ▪ Importance of agriculture and natural water resources to the local economy ▪ Several USDA disaster declarations
Earthquake	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ HAZUS-MH ▪ Montana Bureau of Mines and Geology ▪ Montana Disaster and Emergency Services ▪ National Earthquake Hazards Reduction Program ▪ University of Utah ▪ US Geological Survey 	<ul style="list-style-type: none"> ▪ History of nearby earthquakes greater than 6.0 magnitude ▪ Proximity to active earthquake areas ▪ Active faults exist within the county

Table 2.4A Identified Hazards (continued)

Hazard Profile	Jurisdiction(s)	How Identified	Why Identified
Flooding (including riverine, flash, and ice jam floods)	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ HAZUS-MH ▪ Federal Emergency Management Agency ▪ Governor’s Upper Yellowstone River Task Force ▪ National Weather Service ▪ Park County GIS data ▪ Yellowstone River Conservation District Council 	<ul style="list-style-type: none"> ▪ History of riverine, flash, and ice jam floods, including Presidential disaster declarations ▪ Frequent flood losses, especially to road infrastructure
Ground Transportation Accident	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Montana Highway Patrol 	<ul style="list-style-type: none"> ▪ Interstate 90 and US Highway 89 traverse the county
Hazardous Materials Release (including fixed, mobile, and pipeline releases)	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ National Response Center ▪ Park County GIS data ▪ US Department of Transportation Emergency Response Guidebook 	<ul style="list-style-type: none"> ▪ Regular interstate and highway traffic and railroad transport hazardous materials through the county ▪ Several facilities house hazardous materials
Railroad Accident	Park County Livingston	<ul style="list-style-type: none"> ▪ Federal Railroad Administration ▪ Montana Rail Link 	<ul style="list-style-type: none"> ▪ Active railroad passes through Livingston and county areas
Severe Thunderstorms and Tornadoes	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Federal Emergency Management Agency ▪ National Climatic Data Center ▪ National Weather Service ▪ Storm Prediction Center 	<ul style="list-style-type: none"> ▪ History of severe thunderstorms and tornadoes, including damages
Terrorism, Civil Unrest, and Violence	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Anti-Defamation League ▪ Memorial for the Prevention of Terrorism ▪ Southern Poverty Law Center 	<ul style="list-style-type: none"> ▪ National indications and foreign threats of future terrorist attacks ▪ Potential for school violence and other domestic attacks ▪ Proximity to national assets such as Yellowstone National Park
Urban Fire	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Park County Rural Fire District ▪ US Fire Administration 	<ul style="list-style-type: none"> ▪ Economic importance of downtown areas
Utility Outage	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Local utility data 	<ul style="list-style-type: none"> ▪ Dependence of population on utility and energy services
Volcano	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Cascades Volcano Observatory ▪ US Geological Survey ▪ Yellowstone Volcano Observatory 	<ul style="list-style-type: none"> ▪ History of volcanic ashfall ▪ Proximity to active geologic areas

Table 2.4A Identified Hazards (continued)

Hazard Profile	Jurisdiction(s)	How Identified	Why Identified
Wildfire	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Interagency Fire Coordination Center ▪ Montana Department of Natural Resources and Conservation ▪ Park County Community Wildfire Protection Plan ▪ Park County GIS data ▪ US Forest Service 	<ul style="list-style-type: none"> ▪ Local history of large wildfires ▪ Large areas of government lands within the county ▪ Numerous areas of wildland urban interface
Wind	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ Montana Disaster and Emergency Services ▪ National Climatic Data Center ▪ National Weather Service 	<ul style="list-style-type: none"> ▪ Frequent occurrence of winds that exceed hurricane force
Winter Storms and Extended Cold (including blizzards, heavy snow, ice storms, and extreme cold)	Park County Livingston Clyde Park	<ul style="list-style-type: none"> ▪ National Climatic Data Center ▪ National Weather Service ▪ Western Regional Climate Center 	<ul style="list-style-type: none"> ▪ History of impacts such as road closures during winter storms ▪ Potential for power outages during an extended cold period

3. 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 first identified. Examples of community assets include the population, critical facilities, businesses, residences, critical infrastructure, 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 Park 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 identified throughout the planning process, initially identified for the 2005 plan through public meetings, plan documents, and additional research and then reviewed by planning committee members and updated in 2011. Replacement values, where shown, are for building and contents based on insurance records provided by the jurisdiction and/or their insurance company. Most of the facilities have been digitally mapped and analyzed with respect to the hazards.

Critical Facilities

Table 3.1A Local Government and Emergency Facilities

Name	Address	Replacement Value (\$)
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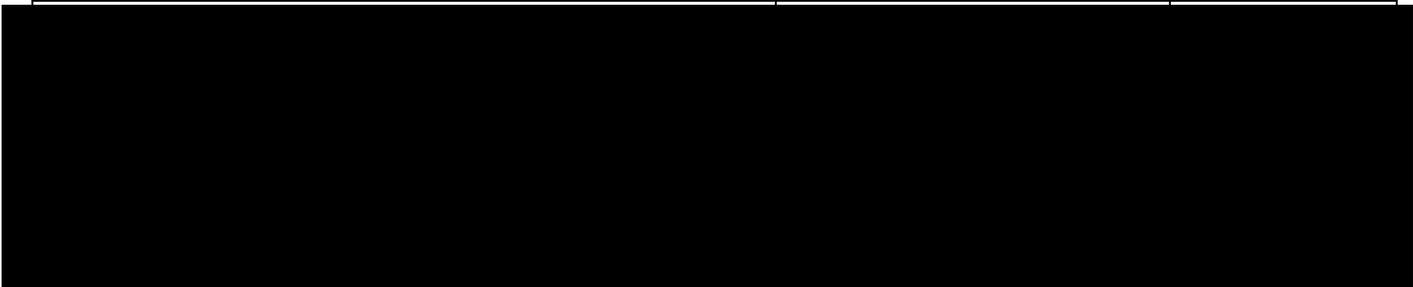


Table 3.1A Local Government and Emergency Facilities (continued)

Name	Address	Replacement Value (\$)
[REDACTED]	[REDACTED] [REDACTED]	
[REDACTED]	[REDACTED] [REDACTED]	[REDACTED]
[REDACTED]	[REDACTED] [REDACTED]	

[REDACTED]

[REDACTED]

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED] [REDACTED]

[REDACTED]

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]

Table 3.1C Hospitals and Clinics (continued)

Name	Address
[REDACTED]	[REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]

Table 3.1F State Government Facilities

Name	Address
[REDACTED]	[REDACTED]

[REDACTED]	[REDACTED]

Table 3.1H Vulnerable Populations – Assisted Living/Skilled Nursing/Senior/Low Income Housing Facilities

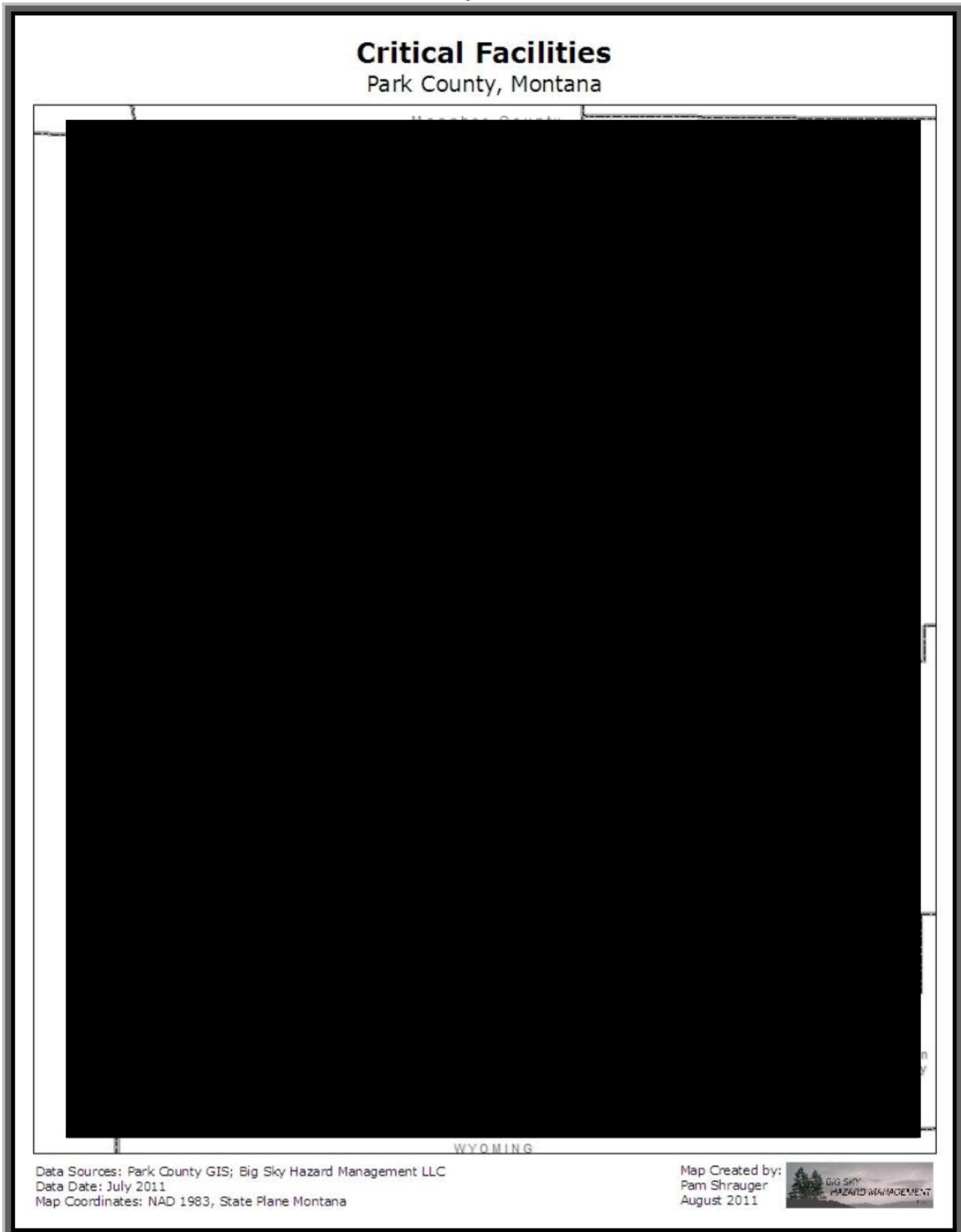
Name	Address
[REDACTED]	[REDACTED]

[REDACTED]	[REDACTED]

Table 3.1K Vulnerable Populations – Child Care/Day Care/Preschools/Youth Camps (continued)

Name	Address
[REDACTED]	[REDACTED]

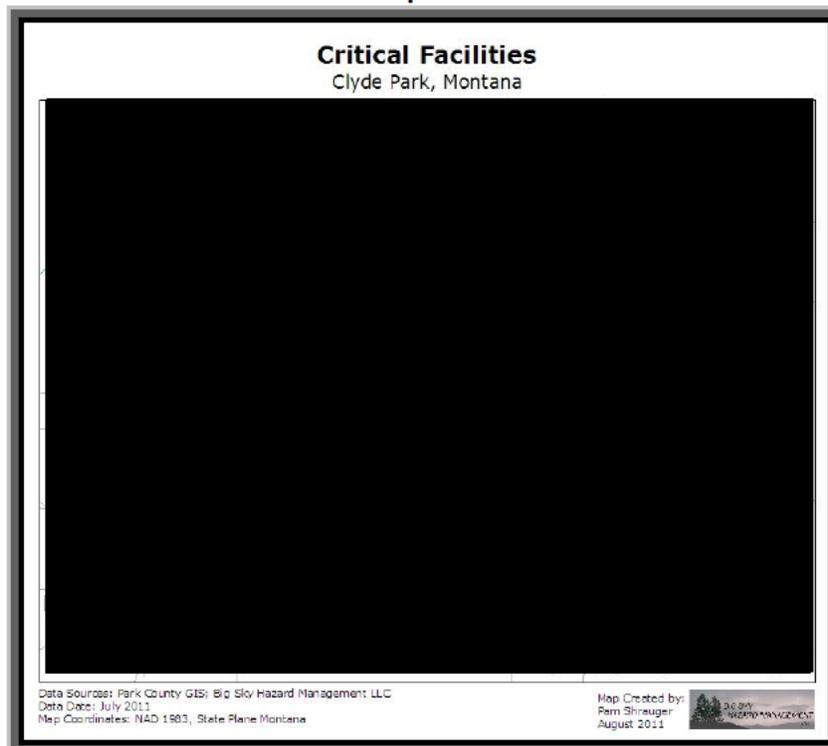
Map 3.1M



Map 3.1N



Map 3.1P



Critical Infrastructure

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
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[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted]

[Redacted]

[Redacted]

Telephone

[Redacted text block]

Water and Wastewater

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[Redacted text block]

Transportation

[Redacted text block]

[Redacted text block]

[Redacted text block]

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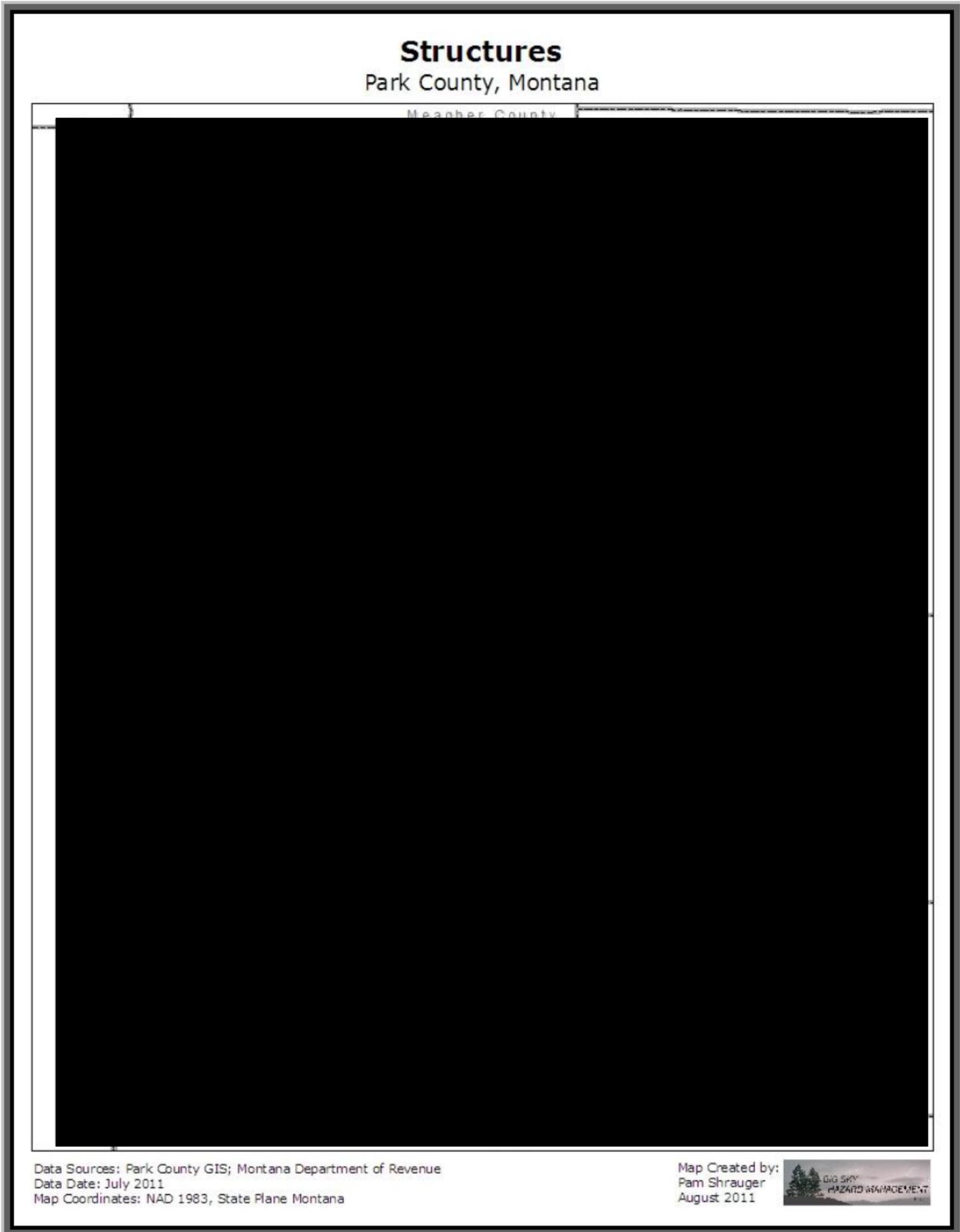
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

* includes non-residential buildings

Sources: Montana Census and Economic Information Center, 2011; Montana Department of Revenue, 2011; Federal Emergency Management Agency HAZUS-MH MR2 database.

[REDACTED]	[REDACTED]

Map 3.2H



3.3 Economic, Ecologic, Historic, and Social Values

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3.4 Current Land Use

Park County has varied land use but is primarily rural with most of the land use devoted to agriculture, forest uses, residential, undeveloped areas, and government ownership. The City of Livingston is the most developed urban area. Small communities and individual homes and farms are interspersed throughout the valleys. Conservation easements have been widely used in Park County as a tool for voluntary land conservation and preservation of natural resources, productive agricultural lands, and wildlife habitat. Map 3.4A shows the federal, state, and local government ownership and conservation easement areas in the county and Map 3.4B shows the land cover throughout the county.

The following are brief descriptions of the community areas in Park County, as derived from the Park County Growth Policy:

Clyde Park Area

The Clyde Park area, north of Livingston, has mostly agricultural and residential land use.

Cooke City Area

The Cooke City / Silver Gate area is in an isolated part of the county in a narrow valley. The area has two access points, both through Wyoming. Two hours from the county seat, the year-round access is through Yellowstone National Park. The scenic Beartooth Highway to Red Lodge is only open during the summer when the population expands by 300-400%.

Joe Brown to Gardiner Area

The Joe Brown to Gardiner Area, including Jardine, is the rural area south of Yankee Jim Canyon and is a mountainous area bisected by the Yellowstone River. Nearly 80% of the land is in public ownership.

Gardiner Area

Gardiner is the gateway community to the very popular North Entrance of Yellowstone National Park and is home to roughly 2,400 seasonal employees. The majority of the land in this area is publicly owned. Private land availability is sparse with conservation easements on many land holdings.

Livingston Area

Livingston is the largest city and serves as the county seat. The city itself is a mix of residential, industrial, and commercial land use. The area outside the city limits is more agricultural in nature but has experienced growth in recent years.

Mission Creek / West Boulder Area

The Mission Creek / West Boulder area to the east and south of Livingston is largely dominated by ranches with very little residential development.

Paradise Valley Area

The Paradise Valley area, located south of Livingston, has transitioned somewhat from mostly agriculture to more residential. Much of the growth is seasonal in nature.

Sheep Mountain to Clyde Park Area

The Sheep Mountain to Clyde Park area north of Livingston, west of Springdale, and south of Clyde Park is 90% privately owned with most of the housing concentrated in the Clyde Park area.

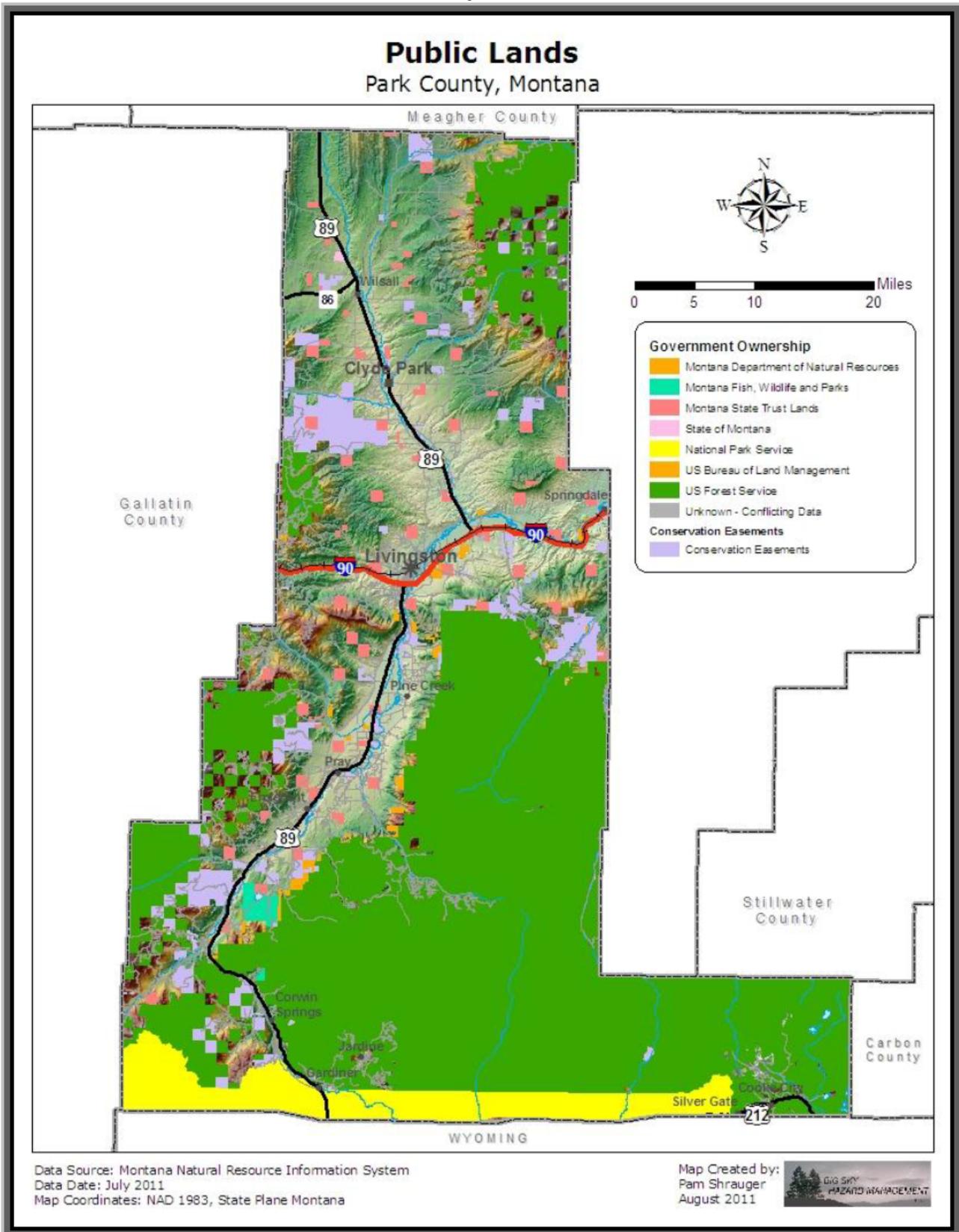
Sheep Mountain to Springdale Area

The Sheep Mountain to Springdale area, east of Livingston, is primarily used for agriculture. Approximately 44% of the land is privately owned and 56% is publically owned. Most of the public land is south of Interstate 90.

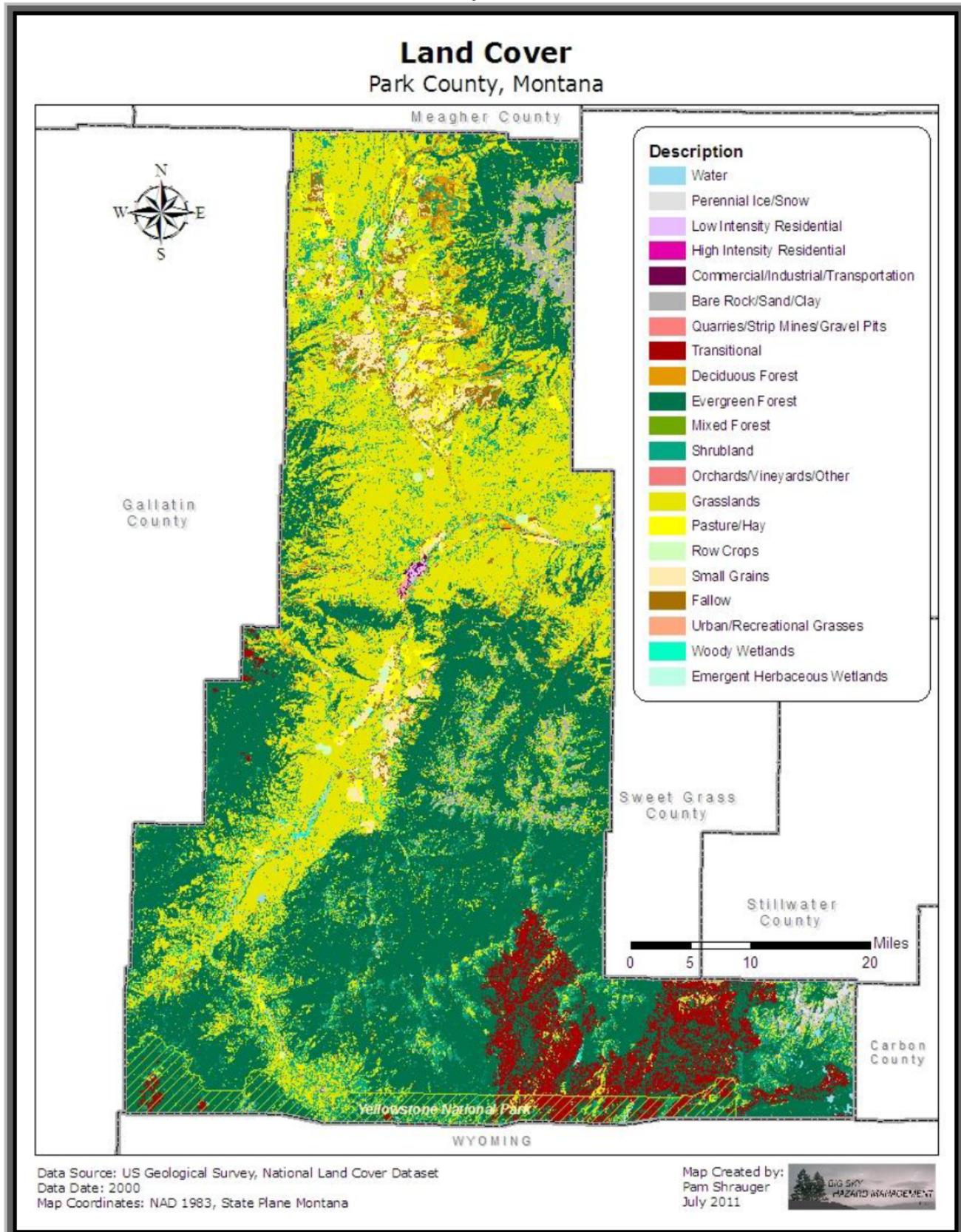
Wilsall Area

Wilsall, north of Clyde Park, is primarily agricultural land use with 75% under private ownership.

Map 3.4A



Map 3.4B



3.5 Recent Development

Population growth has occurred within the City of Livingston and surrounding areas in recent years. Although a population decline was seen in unincorporated parts of Park County and the Town of Clyde Park, development did occur. Rural growth was concentrated along the Yellowstone River Valley south from Gardiner to the northeast of Livingston. A second area of growth has been along the Interstate 90 corridor from Livingston to just east of Bozeman Pass. Scattered pockets of population growth occurred in the Shields River Valley, especially in the Wilsall area. (Park County Planning Department, 2009)

During the January 2006 – June 2008 time period, 1,523 acres were subdivided into 173 lots. Of those, 65% of the total subdivisions and 75% of the total land area occurred in 2006. Subdivision applications submitted prior to October 1, 2006 were reviewed under the 2005 subdivision regulations. A large percentage of county approved subdivisions were either in the Paradise Valley or the Livingston Donut Zoning District. (Park County Planning Department, 2009)

Subdivisions created since 2006 with over 10 lots include:

- Absaroka View, 27 lots, 2007
- Adkins Minor, 20 lots, 2007
- Arrowhead Acres, 18 lots, 2008-2009
- Buena Vista Major, 14 lots, 2006
- Buffalo Ranch Major Phase 1 Cowboy Lake, 30 lots, 2006
- Pivot Point Major, 24 lots, 2006

Sources: Park County Planning Department, 2009; Park County Planning Department, 2010; Park County Community Development Department, 2011b.

Family transfers are divisions made outside of platted subdivisions for the purpose of a single gift or sale to each member of the landowner’s immediate family. This is, by far, the most common exemption requested in the county, as they represented 43% of all the lots created in Park County between 2006 and 2008 and 62% of the acreage. (Park County Planning Department, 2009) Since 2008, family transfer exemptions have surpassed subdivision activity. Because of past abuses of the family transfer exemption, applicants are now required to sign an affidavit guaranteeing that each family member will not sell a transferred lot for at least three years. (Park County Planning Department, 2010)

Development outside of the incorporated communities and larger communities with community sewer systems, a septic system and associated permit are required. Table 3.5A shows the number of septic permits issued by year and location.

Table 3.5A Park County Septic Permits 2005-2010

Location	2005	2006	2007	2008	2009	2010	TOTAL
Clyde Park	9	9	9	14	5	6	52
Cooke City	3	3	2	4	3	1	16
Emigrant	19	33	15	13	9	12	101
Gardiner	4	9	4	10	3	1	31

Table 3.5A Park County Septic Permits 2005-2010 (continued)

Location	2005	2006	2007	2008	2009	2010	TOTAL
Livingston	68	77	65	40	32	29	311
McLeod	0	1	1	0	1	0	3
Pray	13	13	5	7	0	2	40
Silver Gate	1	1	2	2	1	0	7
Springdale	0	0	1	0	0	0	1
Wilsall	10	12	6	9	4	5	46
Yellowstone NP	0	0	0	0	1	0	1
TOTAL	127	158	110	99	59	56	609

Source: Park County Environmental Health, 2011.

Conservation easements provide volunteer landowners the opportunity to work with a land trust organization to preserve and conserve their land. To reduce the negative impacts to conservation values, future development is limited, and in turn, the landowners are able to recognize a tax deduction. Landowners remain responsible for ownership, property management, access, and taxes. Landowners are able to permanently protect wildlife habitat, open space, and agricultural land in a way tailored to the landowners' needs. Many of the easements are along the Yellowstone River and protect floodplain areas from development. The land trust organization works with landowners to see that the easement terms and conditions are respected. (Park County Planning Department, 2010) Table 3.5B shows the number of conservation easements and acres put in place from 2006-2010. Table 3.5C shows the number of Park County floodplain permit applications received by year.

Table 3.5B Recent Conservation Easements

Year	Number	Total Acres
2006	4	6,734 acres
2007	5	2,782 acres
2008 (first half)	1	34 acres
2008-2009 FY	7	3,596 acres
2009-2010 FY	3	1,675 acres

Sources: Park County Planning Department, 2009; Park County Planning Department, 2010; Park County Community Development Department, 2011b.

Table 3.5C Floodplain Permit Applications

Year	Number
2006	16
2007	12
2008-2009 FY	10
2009-2010 FY	17

Sources: Park County Planning Department, 2009; Park County Planning Department, 2010; Park County Community Development Department, 2011b.

3.6 Future Development

Existing land uses and the review processes and regulations for new development play important roles in disaster mitigation. Often, 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.

Growth Policies

Park County, the City of Livingston, and the Town of Clyde Park have growth policies, as required by state law. These policies do not provide regulatory authority but rather outline the future of growth in the jurisdictions. Regulatory authorities such as subdivision regulations and zoning are then guided by the growth policies. These growth policies are essentially the new version of comprehensive plans.

Park County Growth Policy, August 2006

The Park County Growth Policy is “to provide a county wide vision for land use and development,” including a measure for the “protection of public health and safety.” The vision statement of the Park County Growth Policy is, “Park County will grow in ways compatible with the protection of property rights, and its quality of life, quality of place, and unique character.” (Park County, 2006)

Objectives in the Park County Growth Policy complimentary to this mitigation plan include:

- Land Use Objective 3.1: Evaluate and promote public health, safety, and welfare through the decision making process for all land use decisions.
- Natural Resources Objective 3.1: Ensure that development near rivers and water courses follow federal, state, and county regulations.
- Natural Resources Objective 3.2: Follow a public process to revise local subdivision and floodplain regulations to ensure the county’s rivers are protected from development-related impacts.
- Natural Resources Objective 7.1: Encourage the protection of watercourses in Park County.
- County Services Objective 5.2: Encourage new development to be defensible in a wildfire situation.
- Livingston Neighborhood Plan Objective 4.2: Work with local residents and emergency service providers to identify existing inadequate roads.

Source: Park County, 2006.

City of Livingston Growth Policy, October 2004

The primary purpose of the City of Livingston Growth Policy is “to preserve the city’s ability to zone, annex property, and to otherwise allow for the development of its jurisdiction.” According the growth policy, “most of the land use changes in the area will take place on property adjacent to the city. These unincorporated areas are intended to be annexed as development occurs.” The growth policy also outlines the considerations that must be included in subdivision review, as noted in the next section. (City of Livingston, 2004)

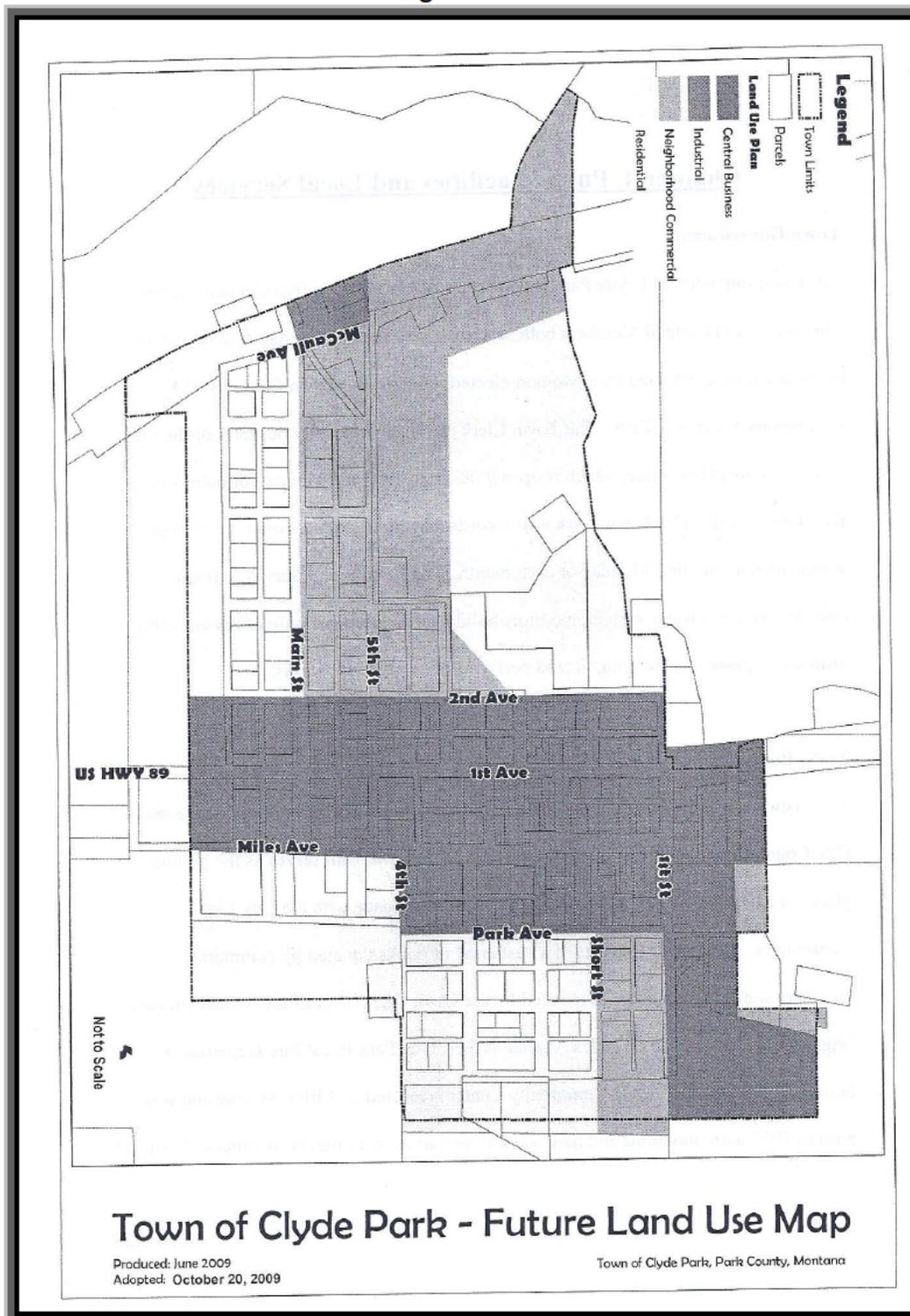
Town of Clyde Park Growth Policy, October 2009

The Clyde Park Growth Policy outlines the process for development in and within one mile of Clyde Park. Subdivisions are to be reviewed based on their material effect on the following, as provided in state law: agriculture, agriculture water users facilities, local services, natural environment, wildlife, wildlife habitat, and public health and safety. Specific to hazard mitigation, the policy states:

- “The Shields River and Cottonwood and Brackett Creeks are the dominant water features in the Clyde Park planning area. Land adjacent to and within these riparian areas can experience high water tables and periodic flooding, and for these reasons, building in these areas should be carefully monitored.” Strategies of the policy related to flooding include:
 - “Establish appropriate setbacks to buffer watercourses and wetlands, so an appropriate amount of buffers are left in natural vegetation.”
 - “Require riparian buffer zones in new subdivisions and encourage them elsewhere for habitat preservation and to prevent property damage from potential flooding.”
 - “Through historic and other existing information, identify areas of potential flooding, wetlands and hydric soils and discourage development in these areas.”
- An example of a consideration for subdivision development in Clyde Park is, “Would the subdivision be subject to natural hazards such as flooding, rock, snow or land slides, high winds, severe wildfires or difficulties such as shallow bedrock, high water table, unstable or expansive soils, or excessive slopes?”
- The future land use categories assigned to areas within town limits include: agricultural residential, central business, gateway commercial, industrial, neighborhood commercial, and residential. These designations can be found in Figure 3.6A.

Source: Town of Clyde Park, 2009.

Figure 3.6A



Source: Town of Clyde Park, 2009.

Subdivision Regulations

Park County and the City of Livingston have subdivision regulations that apply to all divisions of land in which one or more parcels are 160 acres or less, with some exemptions. Proposed subdivisions within two miles of the City of Livingston or one mile of the Town of Clyde Park must also be submitted to the city or town for review and comment.

Purposes of both the Park County and the City of Livingston Subdivision Regulations include, among others:

- Promote the public health, safety, and general welfare by regulating the subdivision of land.
- To require development in harmony with the natural environment.
- The avoidance of danger or injury by reason of natural hazard. (Park County specifically mentions fire and wildland fire.)

Park County Subdivision Regulations, June 2010

The Park County Subdivision Regulations require considerations, such as:

- Floodplain regulations
- Affect on groundwater quality and quantity
- Affect on surface water features
- Affect on wetlands
- Affect of exposure to natural or man-made hazards

The design and improvement standards include provisions, such as:

- Lands that may be considered unsuitable for subdivision because of natural or human caused hazards include areas of potential hazard such as flooding, swelling soils, snow avalanches, rock falls, landslides, steep slopes in excess of 25% grade, subsidence, high water table, polluted or non-potable water supply, high voltage lines, high pressure gas lines, air or vehicular traffic hazards or congestion, because of unreasonable burdens on the general public such as requirements for the excessive expenditure of public funds, environmental degradation, or other features which may be detrimental to the health, safety, or general welfare of existing or future residents.
- Minimum construction setback along the Yellowstone, Shields, and Boulder Rivers is 150 feet from the mean high water mark or outside the 100-year floodplain, whichever is greater. The minimum construction setback from all other perennial rivers and lakes is 100 feet or outside the 100-year floodplain, whichever is greater. These minimums may be increased to protect ecologic or historic values.
- Evaluation of the flood hazard if the subdivision is within 2,000 horizontal feet and 20 vertical feet of a live watercourse draining an area of 25 square miles or more and is lacking an official floodway study.
- Each parcel must have at least one acre of buildable land outside the 100-year floodplain.
- Culverts and other drainage facilities must be large enough to accommodate potential run-off from upstream drainage areas.
- Utilities must be placed underground where practical.

- A Fire Protection Plan that meets minimum fire protection requirements for access, water supply for structure and wildland fires, defensible and/or survivable space, including covenants as required.
- Subdivisions in the wildland-urban interface area, as identified by the US Forest Service, Montana DNRC, a local fire protection authority, a local growth policy, or a Community Wildfire Protection Plan, will be denied unless construction techniques or other mitigation measures acceptable to the fire protection authority and the Board of Commissioners are proposed.

City of Livingston Subdivision Regulations, December 2007

The City of Livingston Subdivision Regulations require considerations regarding the impacts on the natural environment and public health and safety, such as:

- How would the subdivision affect surface and groundwater soils, slopes, vegetation, historical or archaeological features, and visual features within the subdivision or on adjacent lands?
- Would the subdivision be subject to natural hazards such as flooding, rock, snow or land slides, high winds, severe wildfires or difficulties such as shallow bedrock, high water table, unstable or expansive soils, or excessive slopes?
- What public health or safety hazards, such as dangerous traffic or fire conditions, would be created by the subdivision?

The design and improvement standards include provisions such as:

- The governing body may determine that land is unsuitable for subdivision because of natural or human caused hazards, unless the hazards are eliminated or overcome by approved design and construction techniques.
- Land in the floodway of a 100-year flood event as defined in state law, or other land determined by the governing body to be subject to flooding, may not be subdivided for building or residential purposes or other uses that may increase flood hazards.
- Utilities must be placed underground where practical.
- Culverts and other drainage facilities must be large enough to accommodate potential run-off from upstream drainage areas.
- Areas identified as wildfire hazard areas by the US Forest Service, Montana DNRC, a local fire protection authority, or a local growth policy must have a Fire Prevention and Control Plan that includes an analysis of the site wildfire hazards, mapping of proposed fuel reductions, sufficient roads, driveways, and bridges, two entrances/exits, and building sites that are not located on slopes greater than twenty-five percent or at the apex of "fire chimneys." Maintenance of the Fire Prevention and Control Plan is to be included in the covenants, conditions, and restrictions for the development through a property owners' association. Subdivisions in these areas must also have an adequate water supply for fire control, as outlined in the regulations.

Zoning

Zoning regulations generally dictate the type of development that can occur in a particular geographic location and establishes building design standards for some areas. In Park County, several

unincorporated areas have zoning regulations that are enforced through a permit system. Each area has its own set of regulations. These areas include:

- City-County Donut
- Cokedale
- Cokedale West
- Cooke City – Silvergate – Coulter Pass
- East Yellowstone
- O’Rea Creek
- Paradise Valley

Source: Park County, 2011.

Within the City of Livingston, the types of zoning districts include:

- Low Density Residential
- Medium Density Residential (dominant land use in Livingston)
- Medium Density Residential, Mobile Home
- High Density Residential
- Mobile Home Residential
- Public
- Industrial
- Light Industrial
- Highway Commercial
- Neighborhood Commercial
- Central Business District
- Preservation Zoning District

Source: City of Livingston, 2008.

Building Codes

The City of Livingston has adopted and enforces the International Code Council’s International Building Code and International Residential Code. Updated codes are adopted about every three years. A building permit process is used in the city to track new development and enforce the codes. (City of Livingston, 2011)

Development Projections

Future development is so dependent on economic and regulatory conditions that predicting growth, particularly in a quantitative manner, is difficult. The review of studies and information from the Park County Community Development Department allows for a best guess on future development. In 2008, the Sonoran Institute projected more than 2,100 new homes and 5,000 new residents in Park County by 2025. (Sonoran Institute, 2011) This projection was based on development figures during the construction boom of the mid 2000s and may represent a highest case scenario. According to the Park County Community Development Department, undeveloped approved subdivisions include the Arrowhead Acres major subdivision that received approval in 2008 for 18 lots of which only 1 has been built. (Park County Community Development Department, 2011a)

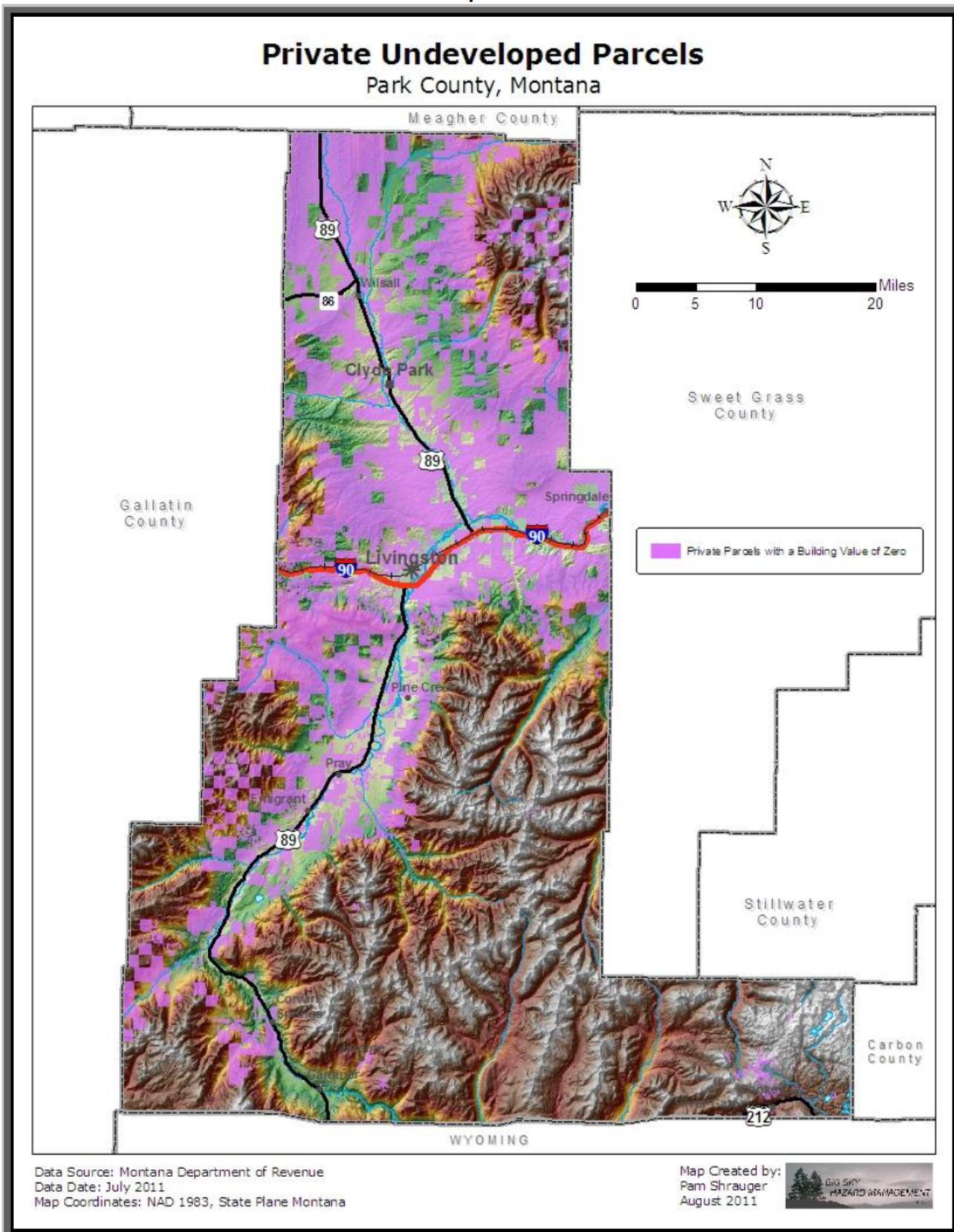
Projected federal and state highway construction projects for 2011-2014 include:

- US Highway 89 Bridge Deck Rehabilitation/Repair near Wilsall (2011)
- Interstate 90 Bozeman Pass Rest Area (2011)
- Interstate 90 Livingston Area Resurfacing (2011)
- Livingston Wye-Park Street Reconstruction (2011)
- Springdale Interchange Safety Improvements (2011)
- Livingston Front Main/Mountain View Resurfacing (2012)
- Livingston Garnier Avenue Resurfacing (2012)
- Yellowstone River Bridge Northeast of Livingston (2012)
- US Highway 89 Mission Interchange North Reconstruction (2013)
- Interstate 90 East of Bozeman Safety Improvements (2014)
- US Highway 89 Cedar Creek Bridge North of Gardiner (2014)

Source: Montana Department of Transportation, 2011.

In general, development has slowed since 2006 and this trend is expected to continue for the foreseeable future. Based on septic permit records in 2009 and 2010, in unincorporated parts of Park County, approximately 50-100 new developments can be expected annually, primarily residential, with about 50% in the Livingston area, 20% in the Emigrant area, 20% in the Clyde Park/Wilsall area, and the remainder in other rural areas. Map 3.6B shows the private undeveloped land parcels in Park County. These parcels were calculated using Montana Department of Revenue parcel data. Those parcels with a building value of zero, excluding government lands and conservation easements, were selected. An estimated 5,195 parcels of private undeveloped lands totaling about 529,996 acres exist in Park County.

Map 3.6B



4. RISK ASSESSMENT / HAZARD PROFILES

4.1 Avalanche and Landslide

Table 4.1A Hazard Summary for Park County

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	History does not indicate a high impact event is probable.
Vulnerability	Low	Most assets are located outside of the hazard areas.

Table 4.1B Hazard Summary for the City of Livingston

Overall Hazard Rating	Not Applicable	
Probability of High Impact Event		
Vulnerability		

Table 4.1C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Not Applicable	
Probability of High Impact Event		
Vulnerability		

Table 4.1D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.1.1 Description

Avalanches and landslides are similar in nature such that both occur when a material on the surface of the earth cannot be supported any longer and gives way to gravity. In the case of an avalanche, the substance is snow, and for a landslide, the substance is mud, rock, or other geologic material. Both can occur rapidly with little warning.

When snow accumulations on a slope cannot be supported any longer, the snow support structure may break and fall creating an avalanche. The subsequent rush of unsupported snow can bury and move things in its path. The majority of avalanches do not cause any damage; occasionally however, people and property may fall in their paths.

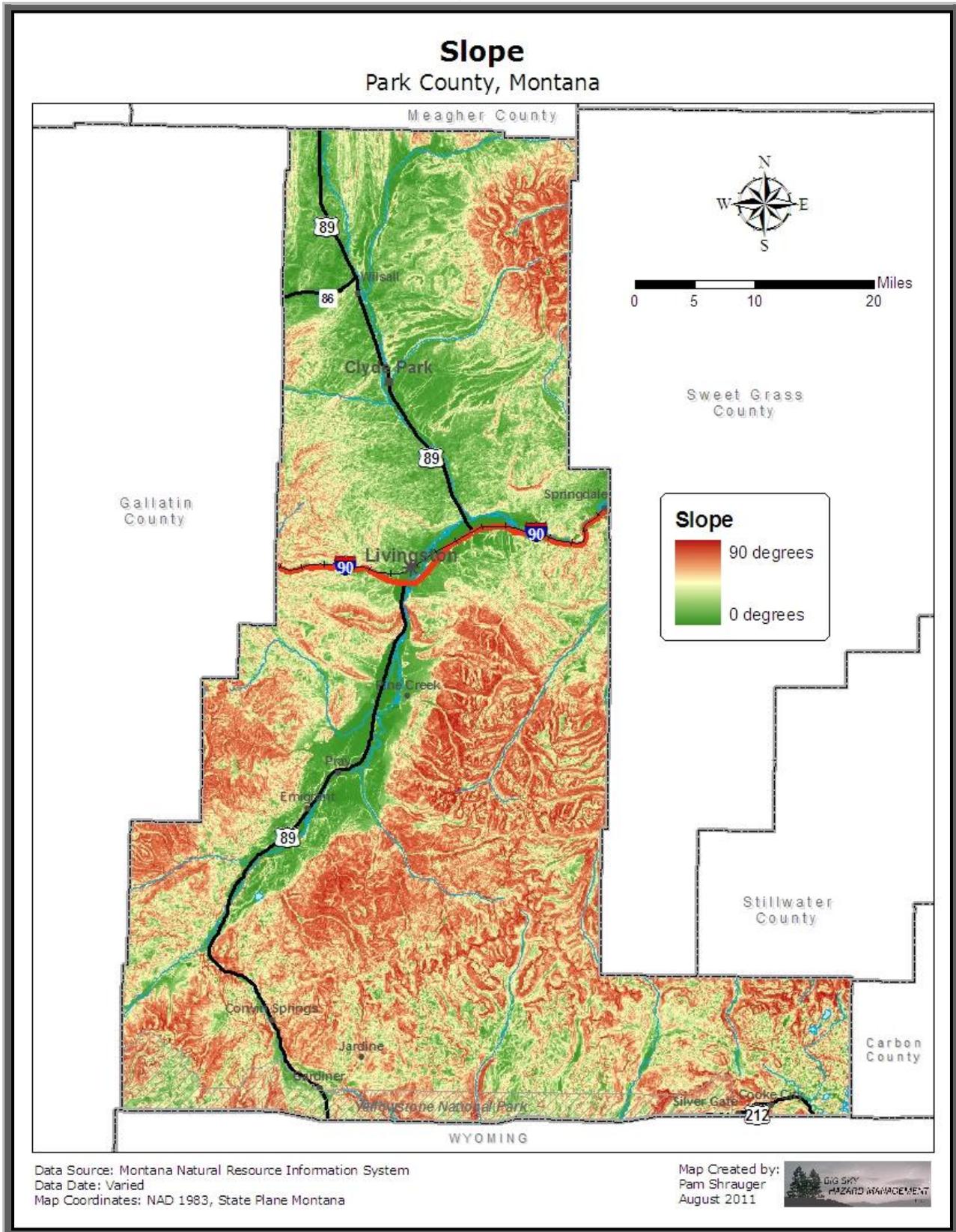
According to the Montana Disaster and Emergency Services website, "If it is assumed that an accumulation of snow is possible anywhere in Montana, then we can evaluate the potential for hazard solely on the basis of terrain characteristics. The most important factor by far is terrain steepness. Wet snow avalanches can start on slopes of 20 degrees or less, but the optimum slope angle for avalanche starting zones is 25-45 degrees. Slopes steeper than 45 degrees will not normally retain enough snow to generate large avalanches, but they may produce small sluffs that trigger major avalanches on the slopes

below. Therefore, all slopes of 20 degrees and greater should be considered as potential avalanche sites.” (Montana Disaster and Emergency Services, 2011a)

In order for an avalanche to occur, factors such as slope, snow cover, a weak layer in the snow, and a trigger must be present. Avalanche danger increases with major snowstorms and periods of thaw. Approximately 90% of avalanches start on slopes of 30-45 degrees, most often on slopes above the timberline facing away from prevailing winds. Most avalanches occur in the backcountry. (Utah Department of Public Safety, 2011) Map 4.1.1A shows the slope in Park County.

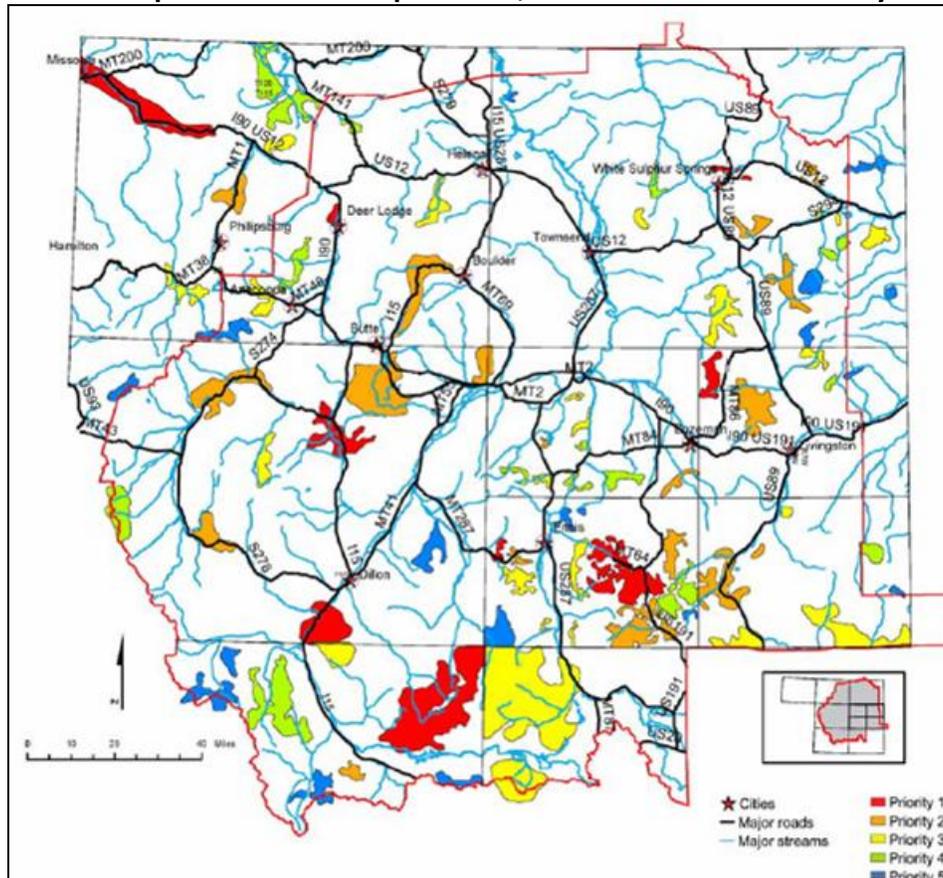
In the case of landslides, some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide movement include: storms, earthquakes, volcanic eruptions, fires, alternate freezing or thawing, and steepening of slopes by erosion or human modification. Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. (Federal Emergency Management Agency, 2011a)

Map 4.1.1A



The Montana Department of Transportation, District 2 has mapped the priority areas for landslide vulnerability. The determination of priorities was based on an inventory of landslides and their proximity to state highways. Park County, the southeastern section of District 2 in Figure 4.1.1B, has several Priority 2 and 3 areas. The Park County Sheriff’s Office has also noted that landslide problems occur on Convict Grade and Interstate 90, mile post 350 and mile post 353.5, during heavy rains.

Figure 4.1.1B
Montana Department of Transportation, District 2 Landslide Priority Areas



Source: Montana Department of Transportation, 2002.

4.1.2 History

The history of avalanches in Park County is much more pronounced than that of landslides. Both, however, have occurred. Table 4.1.2A outlines the impacts of avalanches since 1998. Note that avalanches are a normal occurrence in Park County and typically do not cause any damages. The only concerns here are when people or property lie in the path.

Table 4.1.2A Park County Avalanches Impacting the Population 1998-2010

Date and Location	Result
January 11, 1998 Rock Creek, 35 miles South of Livingston	One snowmobiler completely buried but rescued
January 19, 1998 Scotch Bonnet Mountain near Cooke City	Three snowmobilers killed and one injured
March 26, 1998 Scotch Bonnet Mountain near Cooke City	One snowmobiler completely buried but rescued
December 26, 2000 Daisy Pass near Cooke City	One snowmobiler caught but rescued
December 31, 2000 Emigrant Peak, Absaroka Range	Two hikers killed and one injured
January 27, 2002 Miller Creek, outside of Cooke City	One snowmobiler injured after being completely buried
February 16, 2002 Mount Abundance, north of Cooke City	Two snowmobilers killed
December 28-29, 2002 Cooke City Area	Four separate snowmobile avalanche incidents, one with a serious injury
January 22, 2003 North Side of Wolverine Peak near Cooke City	One snowmobiler killed
February 2, 2003 Elk Creek Drainage of Crazy Mountains near Livingston	One snowmobiler killed
March 9, 2003 Mount Abundance, 10 miles Northwest of Cooke City	One snowmobiler killed
January 5, 2006 Mount Abundance, 10 miles Northwest of Cooke City	One snowmobiler killed and one buried and rescued
January 6, 2006 Miller Mountain, Sheep Creek, near Cooke City	One snowmobiler killed and two partially buried and rescued
December 16, 2006 Scotch Bonnet Mountain near Cooke City	One snowmobiler killed
January 17, 2009 Crown Butte north of Daisy Pass near Cooke City	One snowmobiler killed
January 3, 2010 Scotch Bonnet Mountain near Cooke City	One snowmobiler killed

Sources: Avalanche.org, 2011; Gallatin National Forest Avalanche Center; Bozeman Daily Chronicle; Associated Press.

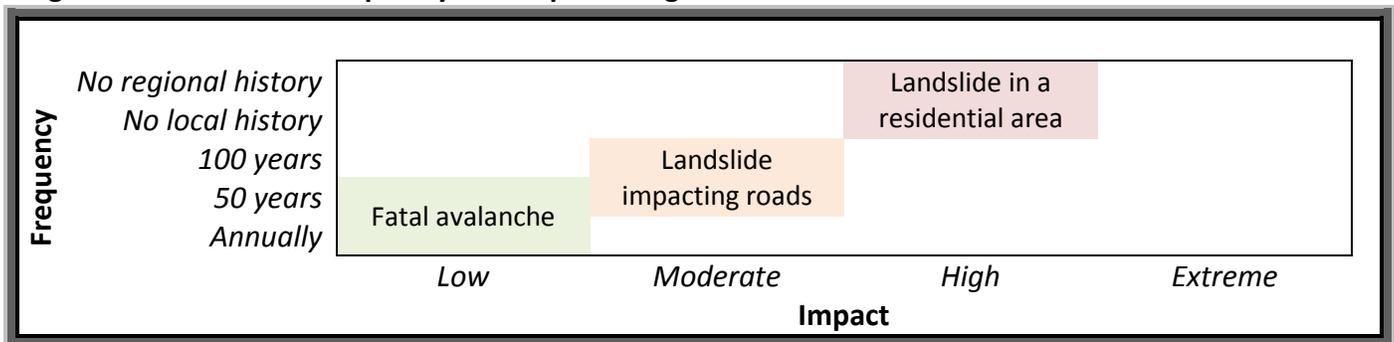
Significant landslides have not been documented in Park County, however, small ones are generally known to have occurred in Yankee Jim Canyon. The 1935 Helena earthquakes triggered a landslide 24 miles south of Livingston on the east side of the Yellowstone River burying the roadway and telephone lines. The road was cleared the following day. (Helena Independent, 1935) The massive Hebgen Lake landslide in nearby Madison County, which resulted in the creation of a new lake and killed 26 people, was triggered by a strong earthquake; this potential also exists in Park County.

4.1.3 Probability and Magnitude

The Colorado Avalanche Information Center has compiled statistics on a statewide basis on avalanche fatalities. Montana ranks second in the nation with 48 fatalities from 1999/2000 to 2009/2010. Looking at the activities the individuals were undertaking at the time of the avalanche, snowmobiling, skiing, and climbing rank as the top three. Ratings have not been compiled for counties within Montana, however, the historical databases show that Park County is one of the more vulnerable counties in the state from avalanche, particularly in the Cooke City area. Based on the statistics from 1998-2010, an average 1.2 people (15 fatalities/13 years) are killed in Park County from avalanches each year. The history of significant incidents noted in Table 4.1.2A demonstrates that the population is most vulnerable to avalanches during the months of December, January, February, and March.

Landslides have an even lower probability of creating a disaster based on a very limited history of events. Should landslides occur in this area, they typically do not affect life or property. The probability of a damaging landslide could greatly increase if development were to occur in landslide prone areas. Wildfire burn areas also greatly increase the probability of a landslide triggered by precipitation.

Figure 4.1.3A Hazard Frequency and Impact Ranges



4.1.4 Vulnerabilities

Methodology

Given a limited history of avalanches or landslides causing losses, with the exception of population losses, loss estimates were generally figured based on a scenario of a landslide or avalanche impacting a rural interface area of three homes. Since the primary avalanche and landslide hazard areas are outside the City of Livingston and the Town of Clyde Park, the analysis applies only to unincorporated area of Park County.

Exposure

Critical Facilities and Infrastructure

Critical facilities in Park County historically have not suffered losses or been threatened by avalanches or landslides. Not that a critical facility could not be impacted, but the probability is very low. Most

facilities are located outside of steep slope areas. The primary exceptions are roadways and communications equipment. Some sections of state highways and county roads are known to have possible landslide hazards. Typically, communications equipment, such as radio towers, are located on mountain peaks and are somewhat protected due to their locations near the peaks but not immune to avalanches and landslides. Potential losses to roadways and communications equipment could easily total into the hundreds of thousands of dollars, but the probability of such an event is considered low.

Existing Structures

Most avalanche and landslide prone areas are located on federal or state lands and do not have significant numbers of structures. An avalanche or landslide impacting three rural homes in the interface areas would result in losses of about \$317,100 (3 homes x \$105,700 median value of homes in unincorporated Park County).

Population

Based on records from the past 13 years, an average of 1.2 people are killed by avalanches in Park County each year. This figure shows that the greatest losses from avalanches are to human life. Fortunately, with advisories being issued by centers, such as the Gallatin National Forest Avalanche Center, some warning does exist as to the potential for avalanches. Training also educates outdoor enthusiasts on the signs of avalanche danger. The potential for population impacts from avalanches, especially when compared to other hazards, is still considered low.

Related to landslides, the National Weather Service issues flash flood warnings during periods of rainfall or snow melt that have a high likelihood of causing flash flooding. Such flooding and rapid runoff may trigger land and mud slides. Without any documentation supporting any deaths or injuries from landslides in Park County, this potential is also considered low.

Values

The potential for economic losses is more likely yet probably not significant. An avalanche or landslide could destroy an area designated for logging, however, such an event may also create fallen timber for harvesting. With tourism being a very large part of the regional economy, severe avalanche seasons could have an impact on the snowmobiling economy.

Future Development

Some undeveloped parcels of land in unincorporated parts of Park County do coincide with the areas at greatest risk for avalanche and landslide losses. Development of these lands could result in more structures in the hazard areas. Fortunately, the subdivision review process prohibits structures on slopes of more than 25% grade. Therefore, the development potential in these areas is limited by these regulations. The most likely type of future development in hazard areas is residential, and given the large tracts of land in the hazard areas and common sense building practices, the number of future structures in the hazard areas is probably less than 10.

Vulnerabilities and Impacts

Table 4.1.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Park County	Critical Facilities		<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses ▪ Clean-up/debris removal costs 	Low
Park County	Critical Infrastructure	<ul style="list-style-type: none"> ▪ \$200,000 losses ▪ Road closures 	<ul style="list-style-type: none"> ▪ Loss of electricity ▪ Loss of telephone service 	Low-Moderate
Park County	Existing Structures		<ul style="list-style-type: none"> ▪ \$317,100 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	Low-Moderate
Park County	Population	<ul style="list-style-type: none"> ▪ Injuries ▪ Fatalities 		Moderate
Park County	Values		<ul style="list-style-type: none"> ▪ Service industry losses ▪ Cancellation of activities ▪ Restrictions on activities ▪ Aesthetic value losses 	Low-Moderate
Park County	Future Structures		<ul style="list-style-type: none"> ▪ Unlikely to occur in hazard areas ▪ Up to 10 residential structures estimated 	Low-Moderate

* in addition to probable (100-year) impacts

4.1.5 Data Limitations

Data limitations include:

- Limited studies of the landslide and avalanche hazards in Park County.
- Difficulties quantifying vulnerabilities due to the site-specific nature of landslides and avalanches.

4.2 Aviation Accident

Table 4.2A Hazard Summary for Park County

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	History indicates that a high impact event is a low probability.
Vulnerability	Low	Aviation accidents are most likely to impact rural, unpopulated areas.

Table 4.2B Hazard Summary for the City of Livingston

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	History indicates that a high impact event is a very low probability.
Vulnerability	Moderate	The more urban nature of Livingston makes it more vulnerable to this type of accident.

Table 4.2C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	History indicates that a high impact event is a very low probability.
Vulnerability	Moderate	The density of structures within Clyde Park make it vulnerable to this type of accident should it occur within town limits.

Table 4.2D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.2.1 Description

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

Park County has four small airports – Mission Field (LVM), 5 miles east of Livingston, Gardiner Airport (29S), 2 miles northwest of Gardiner, Wilsall Airport (9U1), 4 miles northwest of Wilsall, and Paradise Valley Flying Y Ranch Airport (MT48), 12 miles south of Livingston. Chico Hot Springs formerly used the roadway leading to the resort as a runway but is no longer using it in this capacity. These airports serve non-commercial, private commuter, and recreational aircraft. Mission Field, owned by the City of Livingston and Park County, has one paved runway and two turf runways. The airport serves an average of 26 aircraft operations/day. Gardiner Airport has one paved runway and conducts an average of 24 aircraft operations/day. Wilsall Airport has one turf runway and averages about 50 aircraft

operations/month. The Paradise Valley Flying Y Ranch Airport is a private airport with one turf runway. (AirNav.com, 2011)

Commercial service is provided by a number of area airports including Bozeman/Belgrade, West Yellowstone, Billings, and Helena. Large passenger aircraft serving these airports often fly over Park County. Small aircraft accidents may be relatively minor in nature involving none or few casualties, whereas, a large commercial aircraft could create a mass casualty incident requiring outside assistance.

In addition to established airports and fixed wing traffic, helicopters and other aircraft can be found in most other areas of the county. An active wildfire season increases spotting and suppression activities by air, and heliports may be set up in many locations. Other locations, such as Livingston Memorial Hospital, may have helicopter traffic conducting medical transports. Several Park County residents also have their own personal aircraft operating to and from their property.

The hazard of aviation accidents can involve multiple factors. The two most significant include the location of the accident and the cargo on board. The location of an aviation accident will determine the significance of ground casualties and damages. An aircraft accident in a populated downtown area has a much greater potential for additional casualties and property damage than one that occurs in a remote part of the county. The location also affects the ability of responders to get to the crash site. The mountainous terrain in Park County can make rescues and recovery difficult, particularly during inclement weather. The statistics show that incidents occur both on and off airport facilities. Therefore, determining hazard areas based on airport locations would only be minimally beneficial and would not show all hazard areas.

The cargo is an important factor if such cargo would create a hazardous material release or increased fire hazard. Should the contents of the aircraft be hazardous, the situation would need to be treated not only as an aviation accident but also as a contaminated site. The possibility of an aviation accident as an intentional act cannot be ruled out, in which case, the accident site would also become a crime scene and possibly involve mass casualties.

4.2.2 History

Table 4.2.2A briefly summarizes the accident reports filed by the National Transportation Safety Board (NTSB) as occurring in Park County.

Table 4.2.2A NTSB Incident Report Summary for Park County, Montana

Date	Location	Casualties	Additional Information
May 17, 1964	Mission Field	None	Student pilot went nose down during takeoff in windy conditions.
July 25, 1965	Near Livingston	None	Aircraft collided with a rock during an off airport landing.
August 22, 1965	Mission Field	None	A ground loop occurred during landing due to inadequate maintenance of landing gear.
June 30, 1966	Mill Creek	None	Aircraft was destroyed when it crashed during a turbulent final approach.
August 10, 1967	Near Livingston	None	Student pilot stole the aircraft and crashed while attempting to hover.
April 14, 1968	Mission Field	None	Aircraft went nose down during takeoff during windy conditions.
July 1, 1968	Wilsall Airport	None	Plane collided with a fence while trying to take off on a muddy runway.
May 27, 1969	Mission Field	None	A ground loop and landing gear failure occurred during a landing in windy conditions.
August 2, 1969	Mission Field	3 fatal	Aircraft crashed during an emergency landing after complete engine failure while enroute to Rapid City, SD from Butte, MT.
October 31, 1970	Mission Field	None	Student pilot collided with a fence while attempting to land.
August 19, 1971	Mission Field	None	A hard landing with landing gear collapse caused substantial damage to the small aircraft.
September 14, 1972	Near Livingston	None	An aircraft collided with a fence after attempting an emergency landing due to partial power loss in an engine.
March 30, 1974	Mission Field	None	The nose of the small aircraft toppled over after landing in windy conditions.
June 25, 1975	Mission Field	None	An aircraft overturned while taxiing after landing in windy conditions.
March 26, 1977	Near Gardiner	None	Aircraft rolled into a ditch while trying to land on a road after becoming lost.
December 23, 1977	Near Livingston	None	Emergency landing enroute to Big Timber from Bozeman after the inability to clear a ridge due to downdraft weather conditions and the resulting power failure in the engine.
May 29, 1978	Pray	2 fatal	The plane crashed after flying into a thunderstorm.
June 25, 1979	Near Emigrant	None	Aircraft landed in a swamp during an emergency landing after engine failure.
March 8, 1982	6 miles west of Livingston	1 fatal	The accident occurred near a ridge obscured by clouds. The pilot was not instrument rated.
April 16, 1982	Gardiner Airport	None	Landing gear sank in the mud during landing. Another aircraft was also stuck on the other runway.
May 25, 1984	Near Crazy Peak	None	Aircraft was damaged after experiencing extreme turbulence while enroute to Lewistown, MT. The plane landed in Lewistown safely but substantially damaged.
October 18, 1984	Mission Field	None	Left side of aircraft struck the ground during takeoff in gusty winds. The pilot did not take off on the preferred runway.

Table 4.2.2A NTSB Incident Report Summary for Park County, Montana (continued)

Date	Location	Casualties	Additional Information
July 29, 1985	Near Wilsall	1 fatal 1 seriously injured	Plane crashed after flying into poor weather conditions while enroute to Powell, WY from Polson, MT. The pilot was not instrument rated.
June 30, 1987	Near Crazy Mountain	None	During a search and rescue flight, a downdraft caused an engine stall and a collision with trees near the ridge line.
May 6, 1989	South of Livingston	2 seriously injured	Aircraft was “buzzing” the tree line near military units conducting training exercises when it crashed.
July 27, 1993	Flying Y Airport	None	Pilot swerved off of runway into a ditch during takeoff in windy conditions.
September 15, 1995	Pray	None	Equipment malfunction and possible winds caused plane to slide off the runway and collapse landing gear.
June 27, 1996	Chico Hot Springs	2 fatal	Plane crashed while trying to abort a landing in gusty winds.
July 12, 1998	Chico Hot Springs	None	While taking off from the north (non-standard direction), the aircraft struck a fence and crashed into the hilly terrain.
November 27, 1998	Near Jardine	None	During an elk spotting flight, wind conditions and resulting altitude problems resulted in impacting trees, however, the plane was able to return and land in Gardiner.
July 12, 2000	Chico Hot Springs	None	Aircraft collided with a fence while attempting to land in gusty winds.
May 30, 2001	Gardiner Airport	None	Pilot error during takeoff resulted in rotor blades stalling, hitting the ground, and the tail to be cut off.
August 31, 2001	3 miles south of Emigrant	3 fatal	Firefighting helicopter test flight for equipment maintenance in which a bucket line tangled in a rotor causing the aircraft to crash.

Source: National Transportation Safety Board, 2011.

4.2.3 Probability and Magnitude

As the historical record demonstrates, the probability for a private, small aircraft accident is much greater than one involving a large commercial jet in Park County. Although an incident involving a commercial passenger flight and mass casualties cannot be ruled out, the probability is considered low. Statistics compiled based on NTSB incident reports can be found in Table 4.2.3A. Table 4.2.3B shows the number of incidents by 10-year periods.

Table 4.2.3A Summary by Location of NTSB Reported Accidents for Park County

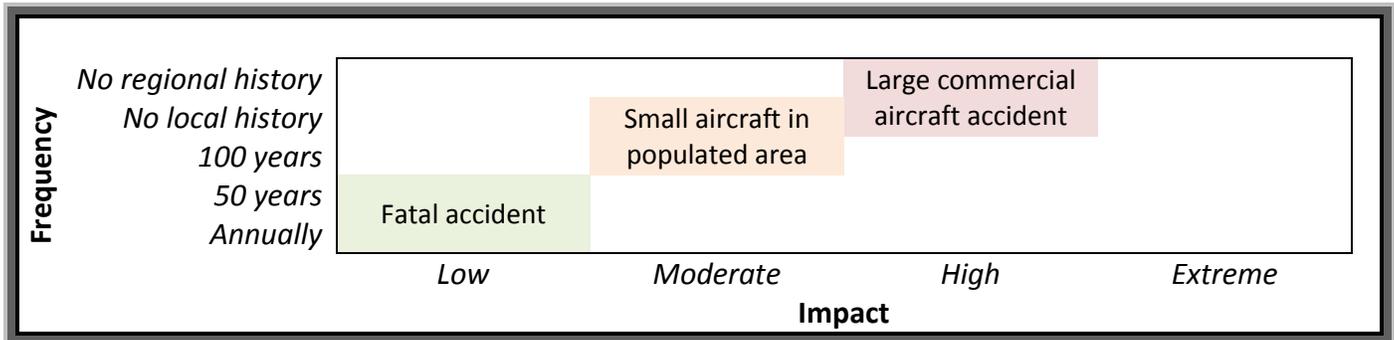
Location	Number of Incidents	Fatalities
Mission Field	10	3
Gardiner Airport	2	0
Chico Hot Springs/Pray	4	2
Wilsall Airport	1	0
Flying Y Airport	1	0
Off Airport	15	7
TOTAL	33	12

Table 4.2.3B Summary by 10-year Periods of NTSB Reported Accidents for Park County

Period	Number of Incidents	Fatalities
1971-1980	8	2
1981-1990	7	2
1991-2000	6	2
2001-2010	2	3
AVERAGE	5.75	2.25

Based on these statistics for Park County over a forty year period (1971-2010), a ten-year average can be derived. In an average ten-year period, 5.75 incidents causing damage can be expected involving 2.25 fatalities. Fortunately, the number of incidents appear to be decreasing somewhat, however, the number of fatalities have not.

Figure 4.2.3C Hazard Frequency and Impact Ranges



4.2.4 Vulnerabilities

Methodology

Since the location and probability of a significant aviation accident is extremely difficult to determine, two scenarios were used to determine potential losses. The first is a small aircraft accident that impacts two homes. The second is a large commercial aircraft impacting an entire city block.

Exposure

Critical Facilities and Infrastructure

All critical facilities in Park County are considered to be at risk from aircraft accidents. Given the nature of historic events and the probability of a specific facility being hit, the overall vulnerability of any given critical facility is considered very low. Livingston Memorial Hospital, however, has been identified as a facility at an increased risk because of the helicopter medical transport operations that may be conducted there. The landing pad for the helicopters is very close to active patient areas of the hospital

and the potential for an accident damaging the hospital is somewhat greater. The only infrastructure that can be considered at a slightly higher risk are the tall communications towers and power lines.

Existing Structures

In most aviation accidents in Park County, the losses are limited to the people on board and the aircraft itself. Should an accident occur in a developed area, structural losses in the neighborhood of \$200,000 (2 homes x \$97,900/average home) plus ground casualties could be found. A large commercial jet in a developed area could potentially destroy an entire city block for a loss of roughly \$1,000,000 (assuming 10 or so structures were destroyed).

Population

The population impacts are going to be directly related to the type of aircraft involved, the number of people on board, the location of the accident, and the number of people in the area of the crash site. Typically, with aircraft accidents, very little warning exists so the population would be unaware until after the event occurred.

Values

In the case of an entire city block being destroyed, several local businesses could experience significant losses related to the destruction of their storefront and business facility. More likely, the emotional impacts of such an event would be significant and impact the community for many years.

Future Development

Due to the somewhat random location of aircraft accidents, the impact of future development is generally the same wherever development occurs, with the possible exception of in the immediate vicinities of the airports.

Vulnerabilities and Impacts

Table 4.2.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities		<ul style="list-style-type: none"> ▪ \$250,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses ▪ Clean-up/debris removal costs 	Low-Moderate
All	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$200,000 losses ▪ Road closures ▪ Loss of electricity ▪ Loss of telephone service 	Low-Moderate

Table 4.2.4A Hazard Vulnerabilities and Impacts (continued)

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Existing Structures		<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	Low-Moderate
All	Population	<ul style="list-style-type: none"> ▪ Injuries ▪ Fatalities 		Moderate
All	Values	<ul style="list-style-type: none"> ▪ Emotional impacts 	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Service industry losses ▪ Agricultural losses ▪ Habitat damages ▪ Reduced air quality ▪ Reduced water quality ▪ Soil contamination ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Aesthetic value losses 	Low-Moderate
All	Future Structures		<ul style="list-style-type: none"> ▪ Increases the total hazard exposure ▪ All types of future structures are at risk 	Low-Moderate

* in addition to probable (100-year) impacts

4.2.5 Data Limitations

Data limitations include:

- Difficulties in predicting the location and magnitude of future accidents. The National Transportation Safety Board keeps very detailed records of damaging aircraft incidents. These records allow for in-depth analysis of individual accidents. The randomness of aircraft accidents, however, limits the usefulness of such information in determining the potential for losses and areas of greatest hazard.
- Lack of data outlining the number of aircraft passing over Park County and the areas they typically traverse to quantify the potential for major accidents.

4.3 Communicable Disease and Bioterrorism

including human and animal diseases

Table 4.3A Hazard Summary for Park County

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	A severe strain of disease occurs approximately once every 100 years.
Vulnerability	Moderate	The entire population of 15,636 and essentially all economic sectors are at risk.

Table 4.3B Hazard Summary for the City of Livingston

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	A severe strain of disease occurs approximately once every 100 years.
Vulnerability	Moderate	The entire population of 7,044 and essentially all economic sectors are at risk.

Table 4.3C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	A severe strain of disease occurs approximately once every 100 years.
Vulnerability	Moderate	The entire population of 310 and essentially all economic sectors are at risk.

Table 4.3D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.3.1 Description

Diseases affect humans and animals 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 mitigation realm are communicable diseases with the potential for high infection rates in humans or those which might necessitate the destruction of livestock. 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.

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
- Smallpox
- Tularemia
- Viral Hemorrhagic Fevers

Source: Centers for Disease Control and Prevention, 2011.

In addition to global disease and bioterrorism concerns, naturally occurring diseases can threaten communities. Natural illnesses of particular concern, among others, include:

- Food-borne illnesses, such as E. coli and Salmonella
- Influenza
- Meningitis
- Pertussis/Whooping Cough
- Measles
- Norwalk Virus
- Severe Acute Respiratory Syndrome (SARS)

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

Medical advances over the past fifty years have prevented 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, frequent air travel by many citizens has made the transfer of disease easier to rural communities. In addition, Park County's gateway location to Yellowstone National Park increases the probability of disease transmission from national and international travelers. The schools and assisted living settings are also prime situations for the rapid spread of disease.

Animal Disease

Park County has a broad agricultural and ranching economic base. Animal diseases, particularly those that infect livestock, can distress the agricultural community. Such diseases could lead to food shortages and negative economic impacts, depending on the types of animals infected and the geographic extent of the disease.

Montana has numerous reportable and quarantineable animal diseases. Some of the more commonly known diseases include bovine spongiform encephalopathy (mad cow disease), brucellosis, foot and

mouth disease, anthrax, plague, rabies, and West Nile virus. (Montana Department of Livestock, 2011) Most global livestock diseases have been confined to specific countries due to strict import regulations.

An ongoing concern is the bison in Yellowstone National Park that are infected with brucellosis. These bison regularly migrate out of the Park onto private lands in Park County. Should livestock become infected, the economic losses could be significant. Humans can also contract brucellosis in the form of undulant fever, causing a public health threat.

The communicable disease and bioterrorism hazard is somewhat uniform across the county. The urban areas may be slightly more vulnerable to the rapid spread of disease in humans, however, the more rural areas are more vulnerable to animal diseases.

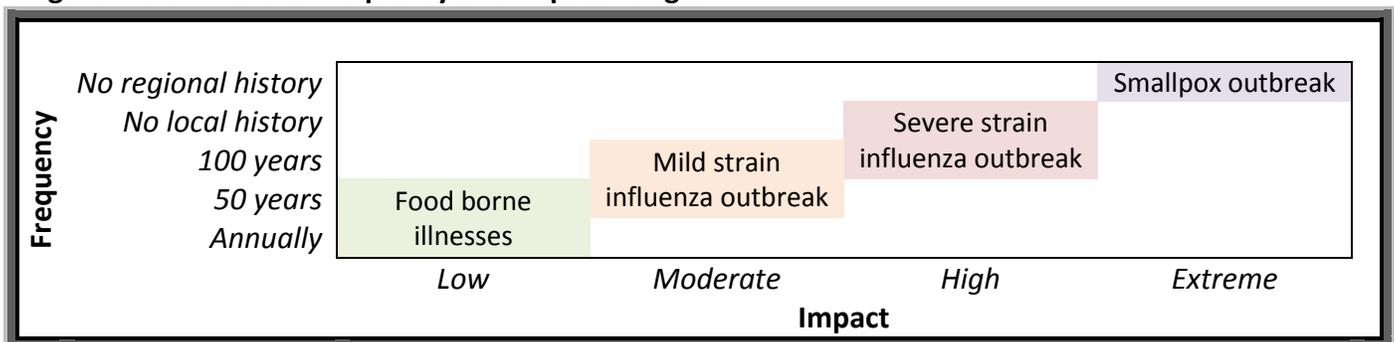
4.3.2 History

Park 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 1918-1919. (Brainerd, 2003) The local impacts of the 2009 H1N1 influenza pandemic were not especially significant. In 1988, a statewide measles outbreak was noted by local health department officials.

4.3.3 Probability and Magnitude

The probability of an epidemic in Park County is rather difficult to assess based on history and current data. Medicine has improved significantly over the past 50 years and continues to do so every day. Given the urban and tourism-based nature of Livingston, the probability of rapid infection is somewhat greater than more rural parts of the county and state. Given relatively rapid worldwide airline travel and the large influx of tourists to Yellowstone National Park through Park County, a disease originating in another part of the world could easily travel unknowingly to Park County, thus increasing the probability of new diseases in this region as compared to other parts of the state.

Figure 4.3.3A Hazard Frequency and Impact Ranges



4.3.4 Vulnerabilities

Methodology

Vulnerabilities were calculated based on estimates derived from a severe strain of influenza impacting the communities. With the exception of population losses, qualitative methodologies were the most logical way to estimate losses.

Exposure

Critical Facilities and Infrastructure

Critical facilities are not structurally threatened by communicable disease and bioterrorism, however, their accessibility and functionality can be lost. Contamination of a critical facility could render the facility non-functional until decontamination or the threat has passed. For this reason, all critical facilities are assumed to be at risk from communicable disease and bioterrorism. As with any human biological event, the hospitals and health service providers would most likely discover a threat and possibly become the first contaminated. Clean up and decontamination 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)

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.

Existing Structures

In most plausible communicable disease scenarios, existing structures would not be impacted.

Population

The entire county population of 15,636 plus non-residents is at risk for contracting a communicable disease. The number of infections and fatalities in the communities would depend on the transmission and mortality rates. Using a general estimate of 30% for the infection rate and a conservative mortality rate (once infected) of 2.5%, as can be the case in an influenza pandemic, approximately 4,691 residents of Park County would be infected with about 117 fatal infections. (World Health Organization, 2010)

As with any disease, age and other health conditions can be a contributing factor. 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-virals, quarantines, and other protective measures may also prevent the spread and impact of the disease. Besides human diseases, animal diseases could negatively affect agriculture and limit food supplies.

Values

In addition to the obvious population impacts, human or animal diseases may have a significant impact on the Park County economy, particularly tourism or agriculture. A human quarantine or highly publicized event may affect sales in the community through tourism and resident services, resulting in long term economic impacts. Animal diseases nationwide could have an overarching effect on the national economy. More directly, however, Park County has 535 farms totaling about 762,753 acres. In 2007, total cash receipts from agriculture were \$27,720,000 with \$20,190,000 from livestock sales. At the start of 2007, Park County had 34,849 head of cattle and calves, 2,242 sheep and lambs, and hundreds of chickens for agriculture purposes. (US Department of Agriculture, 2007) This income and livestock could be lost in a severe animal disease outbreak.

Future Development

In most plausible communicable disease scenarios, future development would not be impacted, but any additional residents would be at risk for disease and increase the overall exposure.

Vulnerabilities and Impacts

Table 4.3.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities		<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Critical functional losses ▪ Clean-up costs 	Low
All	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Loss of electricity ▪ Loss of utility gas ▪ Loss of potable water ▪ Loss of sanitary sewers ▪ Loss of telephone service ▪ Loss of internet service ▪ Fuel/energy shortages 	Low-Moderate
All	Existing Structures		<ul style="list-style-type: none"> ▪ \$0 losses ▪ Clean-up costs 	Low
All	Population	<ul style="list-style-type: none"> ▪ Hundreds of cases ▪ Some fatalities 	<ul style="list-style-type: none"> ▪ 4,691 estimated cases ▪ 117 estimated fatalities 	High
All	Values	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Emotional impacts ▪ Cancellation of activities ▪ Restrictions on activities 	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Service industry losses ▪ Biodiversity losses 	Moderate-High
All	Future Structures		<ul style="list-style-type: none"> ▪ Increases the total hazard exposure ▪ All types of future structures are at risk 	Low

* in addition to probable (100-year) impacts

4.3.5 Data Limitations

Data limitations include:

- Uncertainties related to how and when a disease will spread through a population
- Unknowns with the emergence of new, unstudied diseases

4.4 Dam Failure

Table 4.4A Hazard Summary for Park County

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Low-Moderate	Only one high hazard dam and limited history indicates a low-moderate probability of a high hazard failure.
Vulnerability	Moderate	County roads and some structures are at risk from a dam failure.

Table 4.4B Hazard Summary for the City of Livingston

Overall Hazard Rating	Not applicable	
Probability of High Impact Event		
Vulnerability		

Table 4.4C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Low-Moderate	Only one high hazard dam and limited history indicates a low-moderate probability of a high hazard failure.
Vulnerability	Moderate	The town would not be directly impacted by a dam failure, but its proximity to inundation areas may lead to some impacts.

Table 4.4D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.4.1 Description

Dams, generally defined as barriers created with the purpose of retaining water, have been placed in strategic locations across the county, state, and nation for a wide variety of uses including flood control, hydroelectricity generation, irrigation, public water supplies, and recreation. Dams exist in a wide variety of shapes, sizes, and materials. They are constructed, operated, and maintained by entities such as private individuals, businesses, and government.

The structural integrity of a dam depends on its design, maintenance, and ambient conditions. Should a dam fail, the consequences can be devastating or minimal depending on the dam’s characteristics and regional attributes. 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. Problems arise when a dam fails and people and/or property lie in its inundation area. Dam failure can be compared to riverine or flash flooding in the area downstream from the dam, and sometimes for long distances from the dam,

depending on the amount of water retained and the drainage area. Others may be located in areas that result in little if any damages during a failure.

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, 2004.

Park County has one high hazard dam, four significant hazard dams, and nineteen low hazard dams as shown in Table 4.4.1A. The locations and hazard assignment of dams in Park County can be found on Map 4.4.1B. The high and significant hazard dams can be found in the northern half of the county.

Inundation mapping for the Cottonwood and Crazy Mountain Dams (also known as the Nauharodney Dam) exist in their Emergency Action Plans. These maps can be found in the Park County Disaster and Emergency Services office.

Table 4.4.1A Dams in Park County, Montana

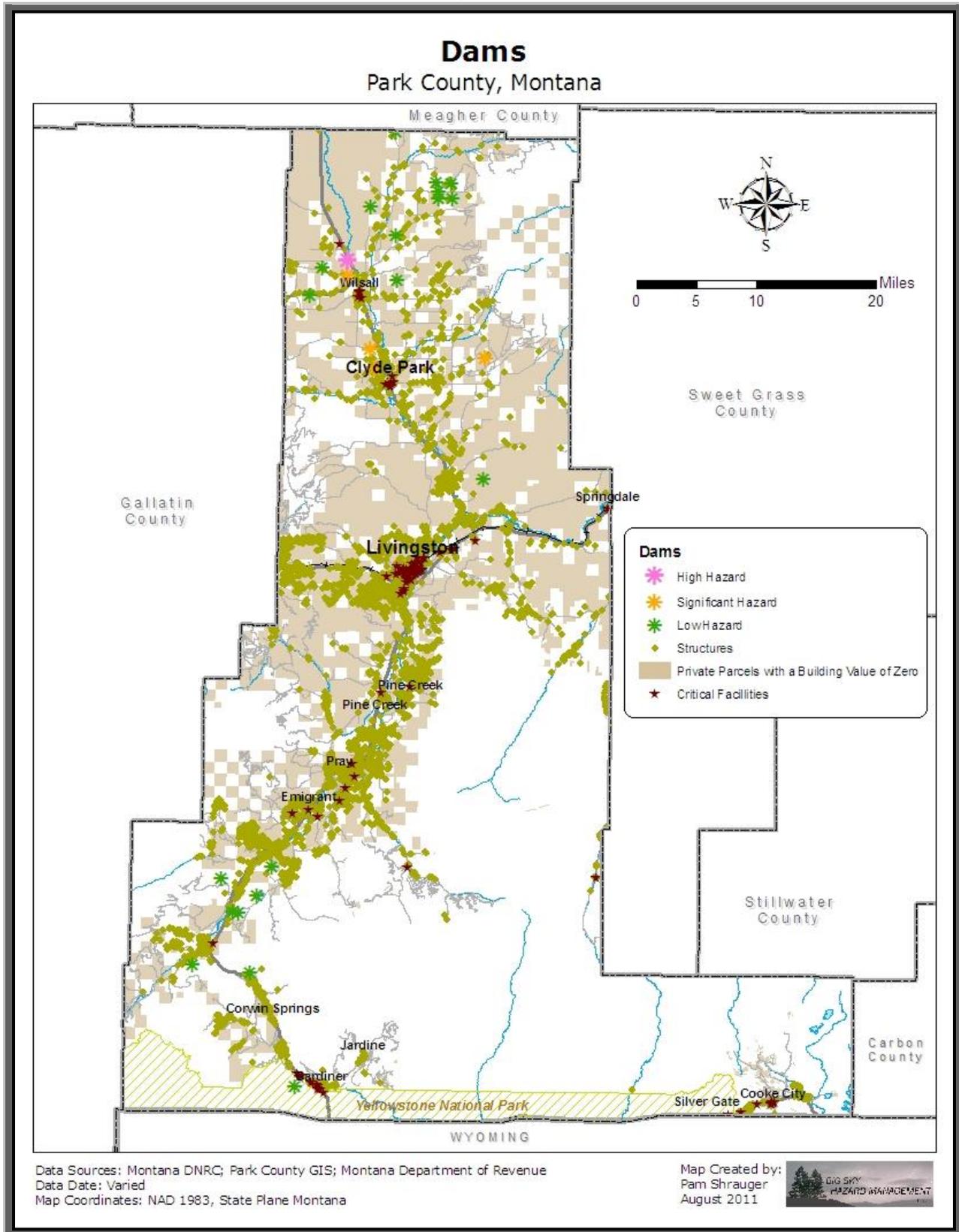
Dam Name	River	NID Height (feet)	NID Storage (acre-ft)	Drainage Area (sq. mi)	Year Finished	Hazard	Owner
Cottonwood	Cottonwood Creek	51	3,670	34.00	1953	High	State of Montana
Arthun	Antelope Creek Tributary	23	186		1956	Significant	Len Arthun
Kaiser	Muddy Creek Tributary	20	201		1964	Significant	Park Swandal
Crazy Mountain / Nauharodney	Hammond Creek	25	175		1960	Significant	Crazy Mountain Ranch
O'Halloran (Lower)	Looking Glass Creek	23	149		1960	Significant	Loyce O'Halloran
Anderson	Kavanaugh Creek	30	70	2.23	1959	Low	State of Montana
Banana Peel	Slip and Slide Creek	8	63		1952	Low	Franklin Rigler
Bonhomme	Bull Run Creek	26	65		1954	Low	Pete Bonhomme
Dailey Lake	Diffused Surface Water	10	959		1945	Low	State of Montana

Table 4.4.1A Dams in Park County, Montana (continued)

Dam Name	River	NID Height (feet)	NID Storage (acre-ft)	Drainage Area (sq. mi)	Year Finished	Hazard	Owner
D'Ewart	Canal from Flathead Creek	10	52		1951	Low	D'Ewart Ranch Inc.
John Ragsdale	Offstream	19	100		1980	Low	John Ragsdale
Jordan	Antelope Creek Tributary	38	1,260	3.30	1961	Low	Arthun Bros.
Kelly	Shields River Tributary	15	60		1955	Low	Duane Nollmeyer
Landers #1	Muddy Creek Tributary	15	93		1949	Low	Landers Hereford
Merrell	Tom Miner Creek Tributary	15	275	0.75	1966	Low	James Hubbard
Nollmeyer #1	Elk Creek Tributary	25	86		1975	Low	Nollmeyer Farms
O'Halloran #1 (Upper)	Looking Glass Creek	23	149		1958	Low	Gene Marelus
Pepper	Porcupine Creek	20	82		1954	Low	Freda Largent
Pepper #1	North Fork Lena Creek	30	139		1953	Low	Westling Ranch
Pepper #2	North Fork Lena Creek	30	52		1954	Low	Westling Ranch
Thelma #1	Yellowstone River Tributary	19	106		1962	Low	Thelma Gray
Walton	Porcupine Creek Tributary	27	40	2.03	1957	Low	Walton Estate
Westling	Porcupine Creek Tributary	30	39		1954	Low	Westling Ranch
Yastremski	Diffused Surface Water	10	77		1950	Low	Alan Glen

Source: US Army Corps of Engineers, 2005.

Map 4.4.1B



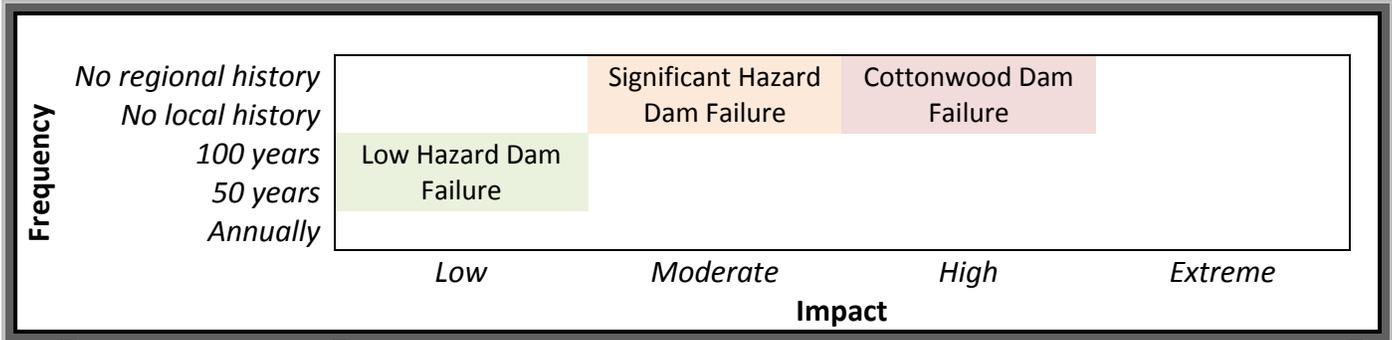
4.4.2 History

The only known dam break in Park County occurred in June 1950 on Soda Butte Creek near Cooke City. Heavy rain and flash flooding caused a dam failure at the McLaren Mine tailings pond spilling contaminated tailings into the creek flowing into Yellowstone National Park. (US Geological Survey, 2011a) This dam failure did not result in casualties or property damage but had significant ecological impacts. Remediation work was done by the Environmental Protection Agency.

4.4.3 Probability and Magnitude

The probability of dam failure in Park County is considered low. Most dams in the county are designated as low hazard. Tailings ponds and high or significant hazard dams are the most probable to cause damages, and none are known to be unstable.

Figure 4.4.3A Hazard Frequency and Impact Ranges



4.4.4 Vulnerabilities

Methodology

Since the dam inundation areas for the dams that threaten Park County are not available digitally, general estimates for losses were based on visual comparisons between the critical facilities and infrastructure and structures and the paper inundation maps contained in the Cottonwood Dam and Crazy Mountain Dam Emergency Action Plans. To estimate the losses from a dam break, the average damage to the structures and critical facilities impacted was estimated to be 30% since many structures may have little damage while other may be a complete loss. A loss ratio specific to dam failure would allow for a more accurate loss estimation.

Exposure

Following a break at the Cottonwood Dam, the flood waters would be in the valley south of Wilsall within a half hour, at the Indian Creek Road Bridge in an hour and a half, at the Highway 89 bridge near Looking Glass Creek in 2.5 hours, near Clyde Park in 3.3 hours, at the Highway 89 bridge over the Shields

River near Gibson Ranch in 4.7 hours, and at the Yellowstone River in 8.3 hours. (Montana Department of Natural Resources and Conservation, 2005)

Critical Facilities and Infrastructure

None of the Park County critical facilities are located within the dam failure inundation areas. During a failure, these facilities could be expected to remain functional barring any other conditions. Some roadways may become impassible and damages to road infrastructure should be expected. Damages to road infrastructure throughout the Shields River basin would be expected downstream of the Cottonwood Dam. Downstream of the dam are 12 road crossings, including three by US Highway 89, before the confluence with the Yellowstone River. At a rough estimate of \$50,000 per bridge, damages could total about \$600,000. Damages to road infrastructure from a failure of the Crazy Mountain Dam would likely include Hammond Creek Road and US Highway 89. (Crazy Mountain Ranch, 2002)

Existing Structures

Given the projected inundation area of the Cottonwood Dam, approximately 25 residences would be affected with a total exposure of roughly \$2,642,500. Using an average damage factor of 30%, the structure losses would total about \$792,750.

Projected structures losses from a failure of the Crazy Mountain Dam include four structures - one structure on the dam owner's property, one house on Cooper Road, one house on Rock Creek Road, and one house on Aspen Lane. Given this scenario, approximately \$850,000 in building stock is exposed. Estimating an average damage factor of 30%, the losses would total about \$255,000. (Crazy Mountain Ranch, 2002)

Population

With any dam failure event, the loss of life is always possible. The warning time for a dam failure can be fairly short, but some warning may exist. The Cottonwood Dam, of all the dams in Park County, poses the greatest risk to lives. With 25 residences in the approximate inundation area, most of those residences could be evacuated if residents were notified in a timely fashion. In the case of the Crazy Mountain Dam, six locations would be evacuated. With some warning time, the potential for the loss of life from dam failure could be reduced.

Values

Since most dam failures would not impact downtown areas, the economic impacts would likely be limited to agriculture and the usual emotional impacts that result from disasters, especially if lives are lost.

Future Development

The areas of Wilsall and Clyde Park near where the high and significant hazard dams are located in northern Park County are rural, agricultural areas. Growth can be expected in these areas, particularly closer to Livingston and Interstate 90. About 50 undeveloped parcels exist in the dam inundation areas between the Cottonwood Dam and the Yellowstone River. Eventually, without consideration of dam failure during the planning process, future development could place residences and business in the hazard areas. Development, in these areas, however, is not expected in the short term.

Vulnerabilities and Impacts

Table 4.4.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Park County Clyde Park	Critical Facilities		• \$0 losses	Low
Park County	Critical Infrastructure		• \$600,000 losses • Road closures	Moderate
Clyde Park	Critical Infrastructure		• Road closures • Loss of potable water	Low-Moderate
Park County	Existing Structures		• \$792,750 losses • Structural losses • Contents losses • Displacement/functional losses • Clean-up/debris removal costs	Moderate
Clyde Park	Existing Structures		• \$0 losses	Low
Park County Clyde Park	Population		• Injuries • Fatalities	Low-Moderate
Park County Clyde Park	Values		• Agricultural losses • Emotional impacts • Aesthetic value losses	Low-Moderate
Park County	Future Structures		• Somewhat likely to occur in hazard areas • 50 undeveloped parcels within the Cottonwood Dam inundation area	Moderate
Clyde Park	Future Structures		• Unlikely to occur in hazard areas, but given the proximity to Clyde Park, future annexation of hazard areas is possible	Low-Moderate

* in addition to probable (100-year) impacts

4.4.5 Data Limitations

Data limitations include:

- Lack of digital dam inundation area mapping.
- Difficulties in quantifying the probability of a dam failure.
- Uncertainties regarding reservoir levels at the time of a break.
- Uncertainties regarding the warning time and capabilities that would be involved with a break.

4.5 Drought

Table 4.5A Hazard Summary for Park County

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	Droughts of high magnitude occur roughly every 100 to 500 years.
Vulnerability	Low-Moderate	Impacts to agriculture could have substantial impact on the regional economy.

Table 4.5B Hazard Summary for the City of Livingston

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	Droughts of high magnitude occur roughly every 100 to 500 years.
Vulnerability	Low-Moderate	Strains on the Livingston water supply could be significant.

Table 4.5C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	Droughts of high magnitude occur roughly every 100 to 500 years.
Vulnerability	Moderate	Strains on the Clyde Park water supply and local agriculture economy could be significant.

Table 4.5D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

Note: The Federal Emergency Management Agency’s ability to utilize the President’s 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.

4.5.1 Description

A drought is an extended period of unusually dry weather. The following is an excerpt from the National Drought Mitigation Center: *“Drought is an insidious hazard of nature. Although it has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as “normal”. It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity.”* (National Drought Mitigation Center, 2011)

Droughts can range from minor to severe, short-term to long-term with a variety of determining factors such as precipitation, soil moisture, river levels, and tree moisture. 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. In Montana, drought conditions have also been associated with grasshopper infestations and blight. Drought is a unique hazard in that it does not strike suddenly, but rather, slowly impacts lives and property without a clear beginning or end, and the impacts tend to persist over long periods of time. Often the question of whether or not an extended dry spell is, in fact, a drought causes considerable debate among meteorologists, farmers, public officials, and other agriculture experts. The amount, duration, and extent of moisture deficiency necessary to establish a drought threshold vary considerably.

For the purposes of this plan, drought is a condition of climatic dryness which is severe enough to reduce soil moisture and water below the minimum necessary for sustaining plant, animal, and human life systems. In addition to severe damage to vegetation, soil in a drought area can become dry and crumble. Often, topsoil is blown away by hot, dry winds. Streams, ponds, and wells can also dry up during a drought, thus wildlife and livestock may suffer and even die. Although agriculture production is the most obvious recipient of drought losses, this hazard can impact communities by reducing domestic water supplies and increasing the fire danger. Water problems caused by drought can range from reduced recreation opportunities to reduction in quantity and quality of municipal water supplies. Losses do not usually include direct structural damage or traumatic loss of human life.

Drought is most commonly associated with wildfire in Park County. Dry conditions contribute to lower moisture content in the trees and plants that provide fuel for wildfires. An initial look at the driest years show that they do not directly coincide with severe wildfire seasons, however, the effects of drought can carry into the long term. One season of severely low precipitation may not be enough for extreme fire behavior, however, followed by several seasons of below normal precipitation, the conditions can contribute to an increased probability for significant wildfires. Drought often kills trees and plants that then become very dry fuels for wildfires years later. Short-term drought conditions can prime grasses on non-irrigated lands for grass fires and long-term drought conditions can additionally impact the heavier timber fuels for forest fires.

Counter intuitively, in mountainous areas, such as those found in Park County, drought can quickly be followed by flash flooding. Dry soils are not as permeable to water, particularly if the vegetation has been killed, and therefore, heavy rains run off faster than on moist soils with green vegetation and can more easily lead to flash flooding.

Blight and grasshopper infestations have a greater probability of occurring in drought conditions. Besides the hydrologic and agricultural impacts, drought can also lead to severe dust storms and soil erosion affecting the population and non-agriculture economies. Additional concerns include the water temperatures for fish populations, wildlife health, changes in plant ecology, hydroelectric power supplies, and public water sources.

Monitoring of drought conditions occurs nationally, and various indices, such as the Palmer Index, indicate the level of drought. Mapping of the current drought status is published by the US Drought Monitor each Thursday at <http://drought.unl.edu/dm>.

4.5.2 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 1200 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.

1930s – The 1930s Dust Bowl remains the most highly publicized of past droughts in Montana. This nationwide drought produced erosion problems in the creation of dust storms throughout Montana. (Montana Disaster and Emergency Services, 2001)

1950s – Montana, especially eastern and central portions, had an extended period of reduced rainfall that impacted agricultural and local economies. (Montana Disaster and Emergency Services, 2001)

1960s - Montana saw another significant drought period beginning in 1961. By the end of June 1961, 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 1930s. In 1966, the entire state experienced another episode of drought. (Montana Disaster and Emergency Services, 2001)

1970s – Over 250,000 acres of Montana farmland was damaged by winds in the western and southern parts of the 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% electric use reduction in state and county governments. (Montana Disaster and Emergency Services, 2001)

1980s - 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 agricultural 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. (Montana Disaster and Emergency Services, 2001) On July 24, 1988, Park County Resolution #270 declared a disaster from

drought. Within the county, 526 farmers sustained crop losses, with 350 of those farms sustaining losses 50% or greater and 126 sustaining losses of 20-49%.

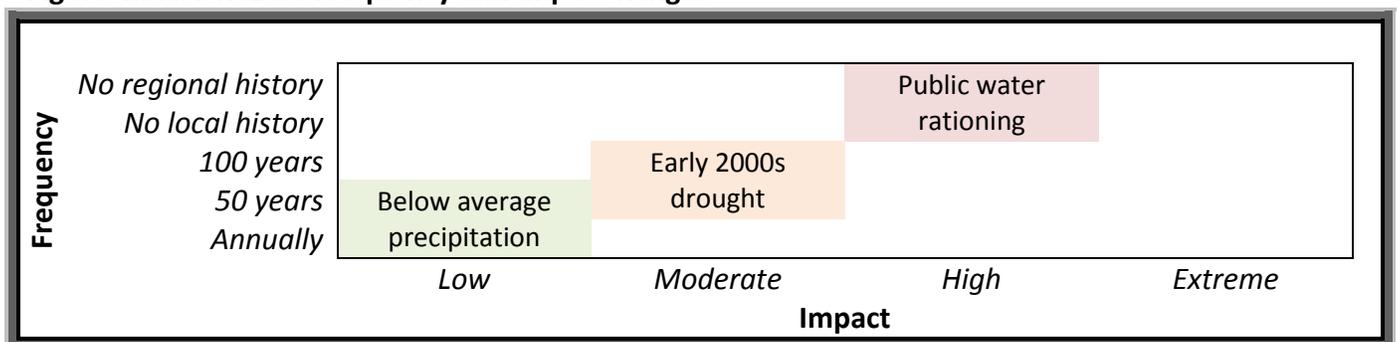
1990s – Drought emergencies were declared in a number of Montana counties with 83% of the state reported under drought conditions by mid-August 1994. Impacts included stress to stream fisheries (low water levels, high temperatures), reduced crop yields, and wildfires. (Montana Disaster and Emergency Services, 2001)

2000s – Severe drought and persistent heat caused significant losses to agriculture and related industries. The US Department of Agriculture (USDA) 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. In 2004, Park County was given a USDA Secretarial Disaster Designation. Most protective measures were conducted at the county level. February 2005 was a particularly dry month; it was the driest February on record across the State of Montana. (Montana Disaster and Emergency Services, 2001)

4.5.3 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 1950s 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 1950s drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930s "Dust Bowl," has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade. (National Oceanic and Atmospheric Administration, 2003)

Figure 4.5.3A Hazard Frequency and Impact Ranges



4.5.4 Vulnerabilities

Methodology

Vulnerabilities were calculated based on estimates derived from a severe drought that impacts public water supplies. Qualitative methodologies are the most logical way to estimate losses given the uncertainties related to and wide variety of drought impacts.

Exposure

Critical Facilities and Infrastructure

Generally, critical facilities are not affected directly by drought. Infrastructure relying on the water supply is the primary exception. If the water supply for public drinking water and sewer systems was threatened, those losses could total millions of dollars should equipment be damaged or outside water need to be shipped into the county.

Existing Structures

In most plausible drought scenarios, existing structures would not be impacted.

Population

Since drought evolves slowly over time, the population has ample time to prepare for its effects and is warned accordingly. The greatest direct threat to the population from drought is through the drinking water supply. 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.

Values

The most probable losses from drought are to the economy. The agriculture industry can be severely threatened by drought due to a loss of forage, feed, and water supplies. Crops may not even reach maturity or provide minimal yields in significant droughts. Given the dependence of the local economy on agriculture, the impacts can extend to other industries. In 2007, Park County had 535 farms covering 762,753 acres. The total market value of agricultural products sold in 2007 was \$20,190,000 for livestock, poultry, and their products and \$7,530,000 for crops. (US Department of Agriculture, 2007)

Natural resources, and therefore recreation and tourism, are influenced by drought. As river and stream levels drop, fish populations and other natural resources are impacted. With fishing and river recreational activities a very important part of the tourism industry in Park County, those aspects of the economy can be threatened during extended periods of drought.

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.

Vulnerabilities and Impacts

Table 4.5.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities		<ul style="list-style-type: none"> ▪ \$0 losses ▪ Critical functional losses 	Low
All	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Loss of potable water 	Low-Moderate
All	Existing Structures		<ul style="list-style-type: none"> ▪ \$0 losses 	Low
All	Population		<ul style="list-style-type: none"> ▪ Increased illness 	Low
All	Values	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Biodiversity losses ▪ Habitat damages ▪ Reduced water quality ▪ Restrictions on activities ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Service industry losses ▪ Emotional impacts ▪ Cancellation of activities 	High
All	Future Structures		<ul style="list-style-type: none"> ▪ Increases the total hazard exposure ▪ May increase the strain on public water systems and individual wells. 	Low-Moderate

* in addition to probable (100-year) impacts

4.5.5 Data Limitations

Data limitations 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/archived US Department of Agriculture (USDA) Secretarial disaster declarations and the associated losses.

4.6 Earthquake

Table 4.6A Hazard Summary for Park County

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	Earthquakes as frequent as the 100 year event could result in significant losses.
Vulnerability	High	Losses to structures and infrastructure during the 100 year event are in the millions.

Table 4.6B Hazard Summary for the City of Livingston

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	Earthquakes as frequent as the 100 year event could result in significant losses.
Vulnerability	High	Losses to structures and infrastructure during the 100 year event are in the millions.

Table 4.6C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Low-Moderate	Earthquakes as frequent as the 500 year event could result in significant losses.
Vulnerability	Moderate	Structure and infrastructure losses could be widespread through the town.

Table 4.6D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

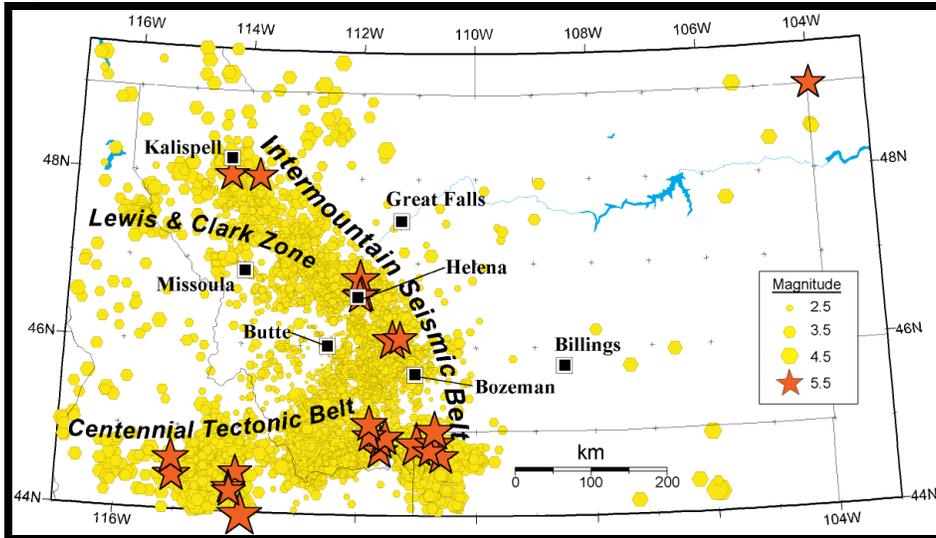
4.6.1 Description

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)

Montana is the fourth ranked state in the United States for seismicity and has many faults, primarily in the mountainous parts of the state. Yellowstone National Park, within and to the south of Park County, is an active geothermal area with approximately earthquakes 2,000 each year. The Intermountain Seismic Belt, shown in Figure 4.6.1A, demonstrates the active seismic areas of the state. Park County lies just to the east and north of the most active areas and has been in close proximity to many significant earthquakes. Earthquakes can damage property and infrastructure very rapidly and

significantly with little warning, severely impacting those close to the epicenter and being felt for hundreds of miles.

Figure 4.6.1A Intermountain Seismic Belt in Montana



Source: Montana Bureau of Mines and Geology, 2011.

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, 2011)

Table 4.6.1B and Map 4.6.1C show potentially active faults within Park County as published by the Montana Bureau of Mines and Geology.

Table 4.6.1B Known Faults within Park County, Montana

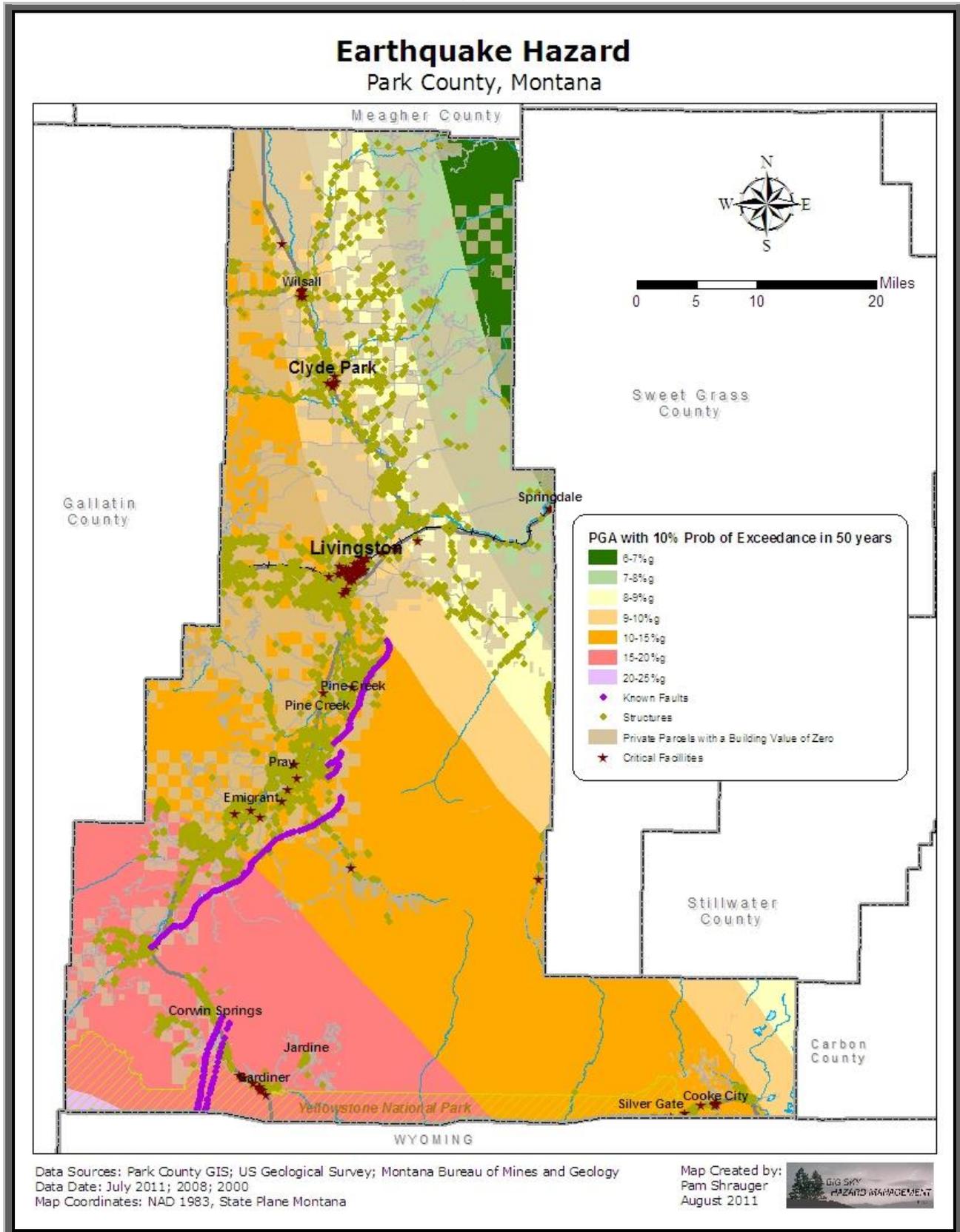
Fault Name	Recurrence Interval	Slip Rate	Length
Emigrant Fault			
Unnamed (north) section	15 ± 10 k.y.	Probably 0.2-1.0 mm/year	8.0 miles (12.9 km)
Unnamed (south) section	15 ± 10 k.y.	0.2-1.0 mm/year	24.9 miles (40.0 km)
East Gallatin Reese Creek Fault			
Reese Creek section	Unknown	Probably <0.2 mm/year	8.4 miles (13.5 km)
Gardiner Fault	N/A	N/A	N/A
Mammoth Fault	N/A	N/A	N/A
Mol Heron Creek Fault	N/A	N/A	N/A

Source: Haller et al, 2000.

History has shown that significant earthquakes (up to magnitude 6.5) may occur anywhere throughout the Intermountain Seismic Belt, even in areas where young faults are not recognized. Examples of damaging earthquakes for which no known surface fault was recognized include the 1925 Clarkston earthquake (magnitude 6.6) and the 1935 Helena earthquakes (magnitude 6.3-5.9).

Research through the US Geological Survey's National Seismic Hazard Mapping Project has resulted in peak ground acceleration (PGA) maps related to the probability of seismic shaking. The map for Park County, Map 4.6.1C, shows the strength of seismic shaking that has a 10% probability of being exceeded in a 50 year period. The strength of the shaking is measured as a percentage of the acceleration of gravity (%g). Generally, a PGA of 20%g would result in major damage and a PGA of 10%g would result in slight damage. As Map 4.6.1C shows, the earthquake hazard in Park County is greater to the south and west and less to the north and east. The unincorporated communities of Gardiner and Corwin Springs are at greatest risk.

Map 4.6.1C



4.6.2 History

Since 1900, sixteen earthquakes of magnitude 5.5 or greater have occurred within 100 miles of Park County. Table 4.6.2A shows the list of these earthquakes. The closest of these earthquakes to southern Park County were the Hebgen Lake and Yellowstone Park earthquakes, and to northern Park County, the Clarkston and Lombard earthquakes.

Table 4.6.2A Earthquakes Magnitude 5.5 or greater within 100 miles of Park County, Montana

Date	Name/Location	Location	Magnitude
June 27, 1925	Clarkston Valley Earthquake	8 miles north of Three Forks	Richter magnitude 6.6
February 15, 1929	Lombard Earthquake	20 miles north of Manhattan	Richter magnitude 5.6
October 12-31, 1935	Helena Earthquakes	15 miles north of Helena	Richter magnitude 6.3
November 23, 1947	Virginia City Earthquake	25 miles west-northwest of West Yellowstone	Richter magnitude 6.3
August 17-18, 1959	Hebgen Lake Earthquake and aftershocks	15 miles north of West Yellowstone	Richter magnitude 7.5
October 21, 1964	Hebgen Lake Earthquake	30 miles west-northwest of West Yellowstone	Richter magnitude 5.8
June 30, 1975	Yellowstone Earthquake	5 miles east-northeast of Norris Junction, WY	Richter magnitude 6.1
December 8, 1976	Yellowstone Earthquake	5 miles west of Norris Junction, WY	Richter magnitude 5.5
July 25, 2005	Dillon Earthquake	10 miles north of Dillon	Richter magnitude 5.6

Sources: Stickney et al, 2000; US Geological Survey, 2011b; University of Utah, 2011.

The Clarkston earthquake, in neighboring Gallatin County, caused relatively light damages due to the rural nature of the area at that time. Most of the damages were confined to Manhattan, Logan, Three Forks, and Lombard in Gallatin and Broadwater Counties. The earthquake was felt from the North Dakota line to Washington and from the Canadian border to central Wyoming, including Park County. Unreinforced brick structures suffered the greatest damages. Livingston felt five distinct shocks. Pavement and buildings sustained cracks up to an inch wide. Mines in Jardine were feared to have been damaged. Livingston police reported the tower of a high building swaying with many people fainting and rushing to the streets. A train from Livingston was sent to rescue passengers from trains trapped by landslides near Lombard. In Clyde Park, the stock of tinware at Jack O’Leary’s store fell off the shelves. (University of Utah, 2011)

The 1935 earthquakes in Helena triggered a landslide 24 miles south of Livingston on the east side of the Yellowstone River. Telephone wires and the roadway were buried. The roadway was cleared by the next day. (Helena Independent, 1935) The Wilsall School also sustained considerable damages from this series of earthquakes. The 1947 Virginia City earthquake caused “very light” shaking in Livingston. (Daily

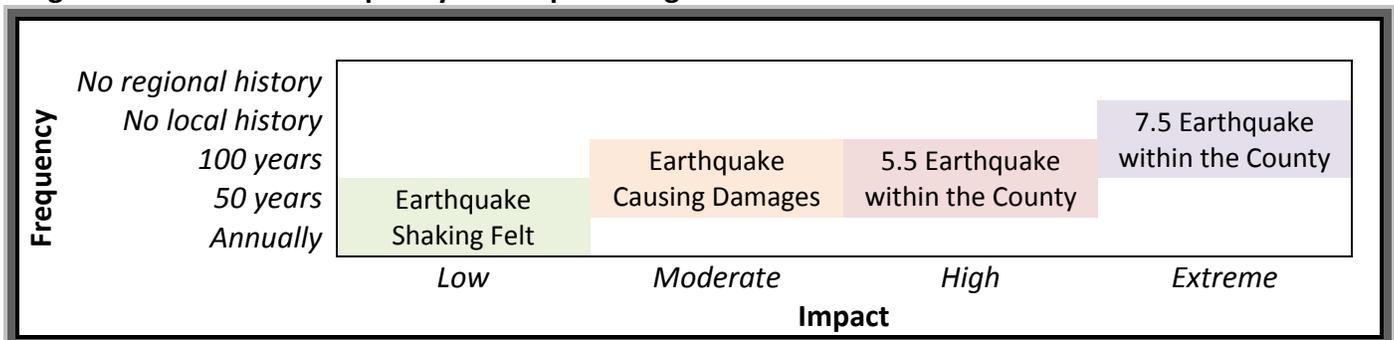
Missoulian, 1947) The 2005 Dillon earthquake was felt throughout Park County, but no damages were reported. (US Geological Survey, 2011b)

The initial Hebgen Lake earthquake on August 18, 1959 is the most significant earthquake to have occurred in the region over the past 100 years. This magnitude 7.5 earthquake occurred about 30 miles from Gardiner and about 70 miles from Livingston. This surface rupturing earthquake changed the geology of the Hebgen Lake area and triggered a major landslide (80 million tons of rock) in nearby Madison County. The result was the creation of a new lake, Earthquake Lake, on the Madison River and State Highway 287 was buried. Twenty-eight people were killed and roadway and timber damages totaled over \$11 million. The quake was felt in 8 states and 3 Canadian provinces. (US Geological Survey, 2011b) The North Entrance to Yellowstone National Park did have some landslides blocking roadways, but all were cleared within 2 days. Also damaged was the Golden Gate just above Mammoth Hot Springs near Park County. Damages in Yellowstone National Park were estimated at about \$2 million. Despite the close proximity of this major earthquake, the damages were not significant in Park County.

4.6.3 Probability and Magnitude

Earthquakes when large and damaging are infrequent events. Park County experiences many small earthquakes every month, but they are undetectable except by instrumentation. The geography of Park County is such that it lies within several categories of seismic source zones. The most active of which is the Northern Intermountain Seismic Belt to the north and west. This region is estimated to recurrence rate of 3.84 years for a magnitude 5 or greater earthquake, 22.6 years for a magnitude 6 or greater earthquake, and 133 years for a magnitude 7 or greater earthquake. (Montana Disaster and Emergency Services, 2004)

Figure 4.6.3A Hazard Frequency and Impact Ranges



4.6.4 Vulnerabilities

Methodology

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 HAZUS-MH MR2 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. Two simulations were run through the model, the 100-year probabilistic hazard with a 5.5 moment magnitude and the 500-year probabilistic hazard with a 7.5 moment magnitude.

The HAZUS-MH loss estimates from 2005 to 2011 appear to have improved, likely due to data improvements in the model.

Exposure

Critical Facilities and Infrastructure

Since the probability and likely strength of an earthquake varies across the county, the threat to critical facilities can be assessed based on their geographic locations. Structural assessments of the individual facilities would further determine the seismic stability of that structure. Based on geography, however, the critical facilities and vulnerable populations in and around Gardiner can be considered the most vulnerable. The critical facilities north on Highway 89 to Emigrant are the next most vulnerable, followed by those north of Emigrant on Highway 89, and then those in the Livingston, Cooke City, Clyde Park and Wilsall areas. All critical facilities are at risk from earthquakes in Park County, but those to the southwest can be considered the most vulnerable. In addition, unreinforced masonry construction is particularly vulnerable to seismic shaking. Therefore, any critical facilities with, or within close proximity to, unreinforced masonry can be considered at greatest risk. Based on the results of the HAZUS-MH runs, Table 4.6.4A shows the functionality of critical facilities included in the inventory.

Table 4.6.4A Critical Facility Functionality Following an Earthquake

Critical Facility Type	100-Year Event Functionality	500-Year Event Functionality
Hospital	93% on Day 1	67% on Day 1 91% on Day 7
Fire Stations	93% on Day 1	73% on Day 1
Law Enforcement Stations	93% on Day 1	71% on Day 1
Schools	91% on Day 1 Range: 80-96%	69% on Day 1 Range: 51-80%

Source: HAZUS-MH MR2.

The State Hazard Assessment values the state-owned building stock in Park County at \$2,063,368 with contents valued at \$847,125. Using the Annualized Loss Ratio of 0.0106 from FEMA’s HAZUS-MH model, the total annualized losses to state buildings in Park County are estimated at \$30,851 annually or \$1,542,561 every 50 years. (Montana Disaster and Emergency Services, 2004)

The HAZUS-MH MR2 database contains over 183 miles of highway, 103 bridges, and 4,475 miles of pipeline valued at over \$1.9 billion. Infrastructure, as quantified in the default HAZUS-MH database, suffers damages during the 100-year and 500-year earthquakes as shown in Table 4.6.4B.

Table 4.6.4B HAZUS-MH Estimated Infrastructure Losses

Infrastructure System	100-Year Economic Losses	100-Year Damages	500-Year Economic Losses	500-Year Damages
Highway	\$90,000		\$1,530,000	
Bus	\$60,000		\$150,000	
Airport	\$1,950,000		\$4,980,000	
Potable Water	\$290,000	65 leaks 16 breaks	\$1,850,000	410 leaks 103 breaks 243 households without service
Waste Water	\$4,260,000	51 leaks 13 breaks	\$16,100,000	325 leaks 81 breaks
Natural Gas	\$260,000	55 leaks 14 breaks	\$1,650,000	347 leaks 87 breaks
TOTAL	\$6,910,000		\$26,260,000	

Source: HAZUS-MH MR2.

Existing Structures

100-year Earthquake in Park County (Moment Magnitude 5.5) HAZUS-MH MR2 Results

Table 4.6.4C Expected Building Damage by Occupancy for 100-Year Earthquake

Type	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Agriculture	0	0	0	0
Commercial	7	3	1	0
Industrial	0	0	0	0
Other Residential	211	135	17	1
Religion	0	0	0	0
Single Family	422	36	1	0
TOTAL	640	175	18	1

Source: HAZUS-MH MR2.

Losses from capital stock (structural, non-structural, contents, and inventory) and income (relocation, capital related, wages, and rental income): \$8,130,000

500-year Earthquake in Park County (Moment Magnitude 7.5) HAZUS-MH MR2 Results

Table 4.6.4D Expected Building Damage by Occupancy for 500-Year Earthquake

Type	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Agriculture	0	0	0	0
Commercial	15	13	5	1
Industrial	0	0	0	0
Other Residential	359	413	147	15
Religion	1	1	0	0
Single Family	1,472	277	12	3
TOTAL	1,847	703	165	19

Source: HAZUS-MH MR2.

Losses from capital stock (structural, non-structural, contents, and inventory) and income (relocation, capital related, wages, and rental income): \$43,780,000

Population

The population would have little or mostly likely no warning prior to an earthquake. Most casualties in a large earthquake in Park County would be anticipated with building collapse, roadway failures, falling objects, and landslides. The HAZUS runs estimate 2 people with minor injuries in the 100-year event and 19 casualties (14 minor, 4 hospitalized, and 1 killed) in a 500-year event. The number of actual casualties will be dependent on a variety of factors including proximity to the epicenter, time of day, and magnitude, among others.

Values

The impacts of a strong earthquake in Park County could be far reaching. Economically, physical and functional damages to businesses, particularly downtown businesses in unreinforced masonry structures, could be substantial. Industries such as construction, however, may see a recovery related boom following an earthquake. Since many historic structures were not built to earthquake resistant standards, the losses to those historical values could be significant. Social losses could include fear of aftershocks, emotional impacts from casualties, and cancellation of activities.

Future Development

Any future development in Park County is at risk for earthquake damages. Fortunately, construction standards for seismic stability have improved over the past 100 years. Livingston is the only jurisdiction within Park County that has a building code and inspection program. Other areas of the county are under the state building code that for most single family homes is only subject to electrical, plumbing, and septic inspections. Much of the new Paradise Valley construction is taking place in the areas near the identified and active Emigrant Fault. Should an earthquake occur on that fault, the future development that occurs will be in the highest hazard area.

Vulnerabilities and Impacts

Table 4.6.4E Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Park County Livingston Clyde Park	Critical Facilities	<ul style="list-style-type: none"> ▪ \$4,000,000 losses ▪ Critical functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ Structural losses ▪ Contents losses ▪ Critical data losses 	High
Park County Livingston Clyde Park	Critical Infrastructure	<ul style="list-style-type: none"> ▪ \$6,910,000 losses ▪ Physical losses ▪ Road closures ▪ Loss of utility gas 	<ul style="list-style-type: none"> ▪ \$26,260,000 losses ▪ Loss of electricity ▪ Loss of potable water ▪ Loss of sanitary sewers ▪ Loss of telephone service ▪ Loss of internet service ▪ Fuel/energy shortages 	High
Park County Livingston Clyde Park	Existing Structures	<ul style="list-style-type: none"> ▪ \$8,130,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$43,780,000 losses 	High
Park County Livingston Clyde Park	Population	<ul style="list-style-type: none"> ▪ 2 Injuries 	<ul style="list-style-type: none"> ▪ 18 Injuries ▪ 1 Fatality 	Moderate
Park County Livingston Clyde Park	Values	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Historic structure losses ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Service industry losses ▪ Historic item losses ▪ Emotional impacts ▪ Cancellation of activities ▪ Restrictions on activities 	Moderate
Park County Clyde Park	Future Structures	<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas 	<ul style="list-style-type: none"> ▪ Future structures may not be constructed to seismic standards 	Moderate
Livingston	Future Structures	<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas 	<ul style="list-style-type: none"> ▪ Future structures are constructed to current building code standards 	Low

* in addition to probable (100-year) impacts

4.6.5 Data Limitations

Data limitations include:

- Estimating the probability and possible damages associated with this low frequency, high impact hazard.
- Lack of improved digital data for use in the HAZUS module.
- Lack of individual facility assessments by a structural engineer.

4.7 **Flooding**

including riverine, flash, and ice jam floods

Table 4.7A Hazard Summary for Park County

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate-High	History of frequent, damaging flood events.
Vulnerability	High	Hundreds of structures at risk and potential for future development near high risk areas.

Table 4.7B Hazard Summary for the City of Livingston

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate-High	History of frequent, damaging flood events.
Vulnerability	Moderate-High	Structures at risk, mostly during a 500-year flood event, and possible development near hazard areas.

Table 4.7C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	History of damaging flood events.
Vulnerability	Moderate	Structures and critical facilities at risk. Future development of hazard areas possible.

Table 4.7D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
FEMA-DR-1105	1996	Public Assistance	None	\$146,379 state/local share (Park County) \$36,287 state/local share (Livingston) Total damages estimated over \$1,275,000
FEMA-DR-1183	1997	Public Assistance	None	Total damages estimated over \$616,000
FEMA-DR-1996	2011	Public Assistance Individual Assistance	None	Still being determined

4.7.1 **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 streams, which 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.

Riverine Flood

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Flooding on the rivers generally occurs during the spring and early summer when snow rapidly melts in the higher elevations. Smaller streams are more susceptible to flooding in the summer with peak flows resulting from thunderstorms.

Flooding in Park County normally occurs during periods of rapid snowmelt almost exclusively during the months of May and June. The mountainous areas in the upper reaches of the Yellowstone River keep the snowpack into the early summer months, and as temperatures warm, the mountain snowpack melts rapidly. Fleshman Creek through west portions of the City of Livingston floods primarily from intense rainfall in the hills south and west of the city. (Federal Emergency Management Agency, 2011c)

The Yellowstone River in Park County is approximately 84 miles long, running from the Yellowstone Park boundary through the Paradise Valley and Livingston to Springdale. The Yellowstone has two river gauges in Park County at Corwin Springs and near Livingston at Carter's Bridge. The flood stage for the Yellowstone River is 11 feet at Corwin Springs. At 11 feet, brushland and adjacent prairie are in flood. At 12 feet, waters reach trailers along the river. In 1918, this location crested at 11.5 feet. In 1996, this location crested at 10.92 feet. The flood stage for the Yellowstone River is 9 feet at Carter's Bridge. At 9 feet, some minor overflow occurs along the lowest areas throughout the reach of the river and across the road to Ninth Street Island. At 9.21 feet, the roads to Mill Creek, Cinnabar Basin, and Trail Creek are covered with water with water reaching some homes on Ninth Street Island and a few farms. In 1997, this location crested at 10.72 feet. (National Weather Service, 2011a)

A unique developed floodplain feature is a river island called Ninth Street Island just outside of Livingston. This inhabited island is entirely within the 100-year floodplain and presents unique access challenges due to its island properties within the Yellowstone River.

The Shields River in Park County is approximately 44 miles long, running from the north end of the county by Wilsall to the Yellowstone River. Flood stage is 5.5 feet at the gauge 7 miles northeast of Livingston. In 1948, this location crested at 7.39 feet. (National Weather Service, 2011a)

Identification and Mapping

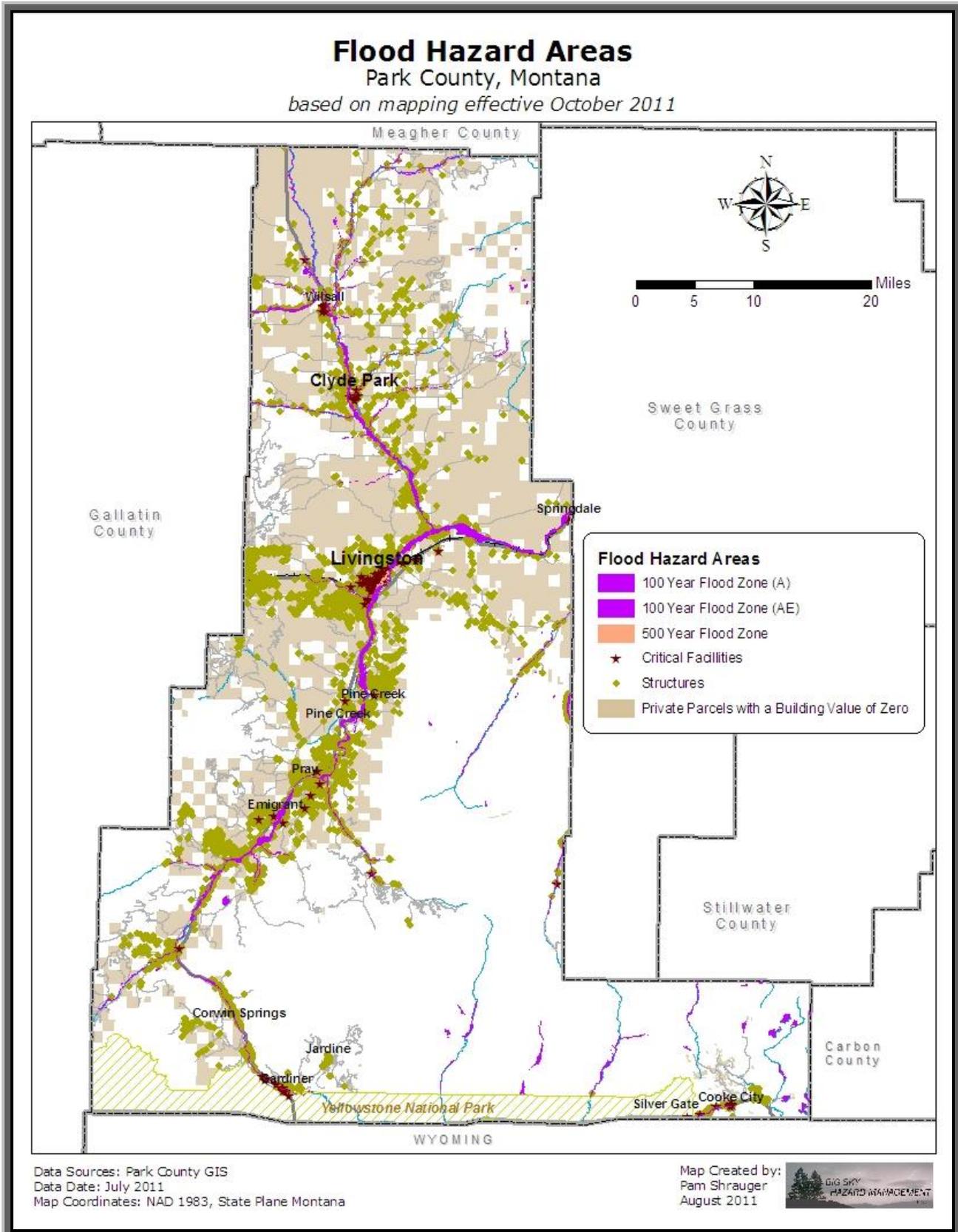
The riverine hazard areas may be mapped as part of the National Flood Insurance Program (NFIP). Under this program, an area is broken into zones to depict the level of flood hazard. Most commonly, the areas within the 100-year floodplain are considered the greatest risk. The 100-year floodplain has a

1% chance of exceedance in any given year. Over a 30-year period, a flood of this magnitude or greater has a 26% chance of occurring, compared to a 9% chance of fire for buildings in high-risk flood areas. (Federal Emergency Management Agency, 2009) Locations outside the 100-year floodplain may also experience flood conditions during greater magnitude floods, localized events, or along unmapped creeks, streams, and ditches.

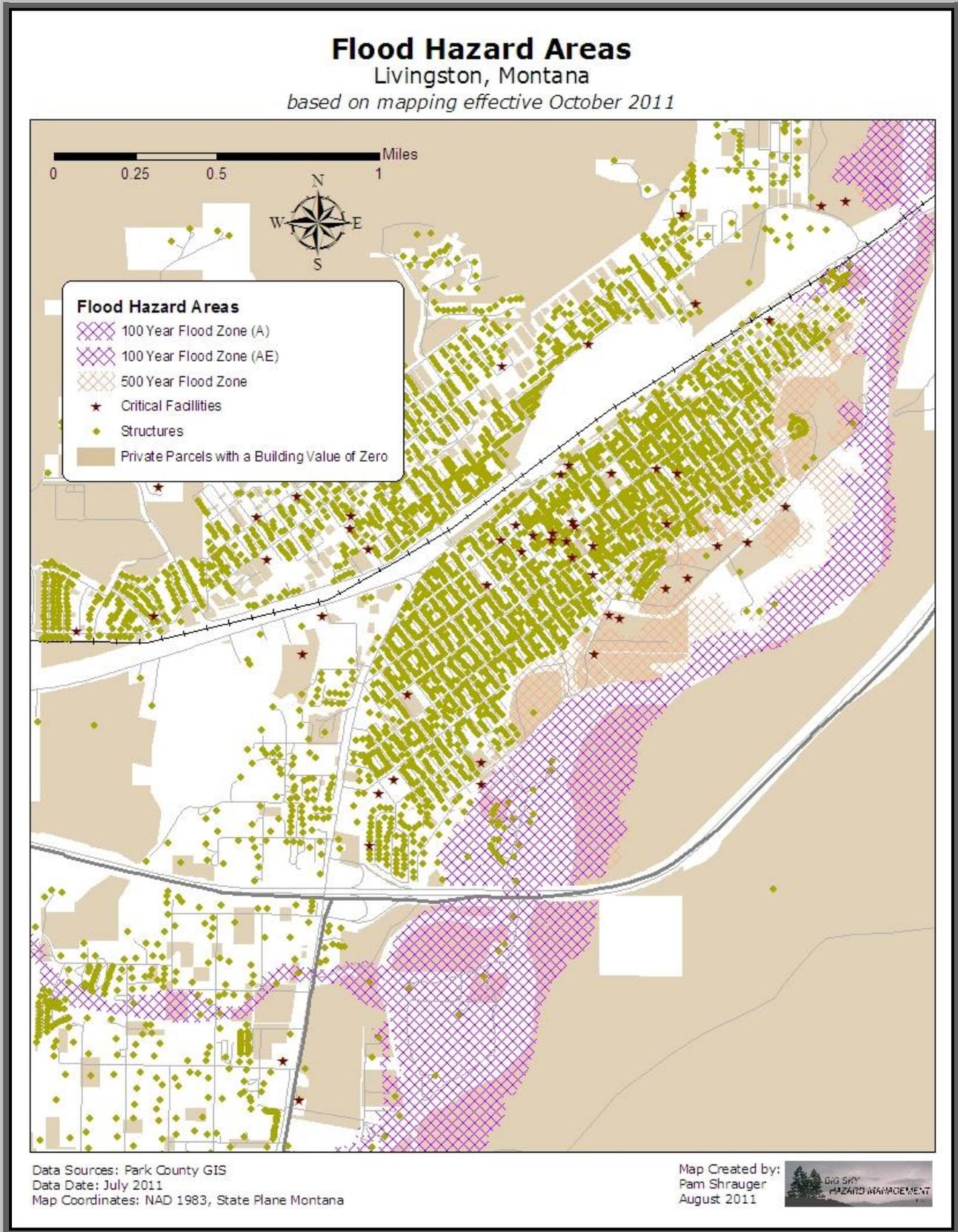
The Flood Insurance Rate Maps (FIRMs) depicting flood-prone areas and Flood Insurance Studies for Park County and the City of Livingston were recently updated and are scheduled for an effective date of October 18, 2011. The previous maps and studies were dated 1987. The Town of Clyde Park did not have an identified flood hazard area through the National Flood Insurance Program but has since been mapped and is planning on entering the program.

The primary waterways in Park County are the Yellowstone and Shields Rivers and short stretches of the West Boulder and Boulder Rivers. Stretches of the 100-year floodplain have been mapped for the rivers and several additional creeks. Map 4.5.1A shows the designated 100-year floodplain areas of Park County. Two 100-year floodplain areas are depicted on the maps. Zone A indicates 100-year floodplain areas without elevation data and Zone AE indicates 100-year floodplain areas with elevation data. Zone X areas lie outside the 100-year floodplain. Development in the 100-year floodplain must meet floodplain construction requirements adopted by Park County, the City of Livingston, and soon, the Town of Clyde Park, and most borrowers must purchase flood insurance.

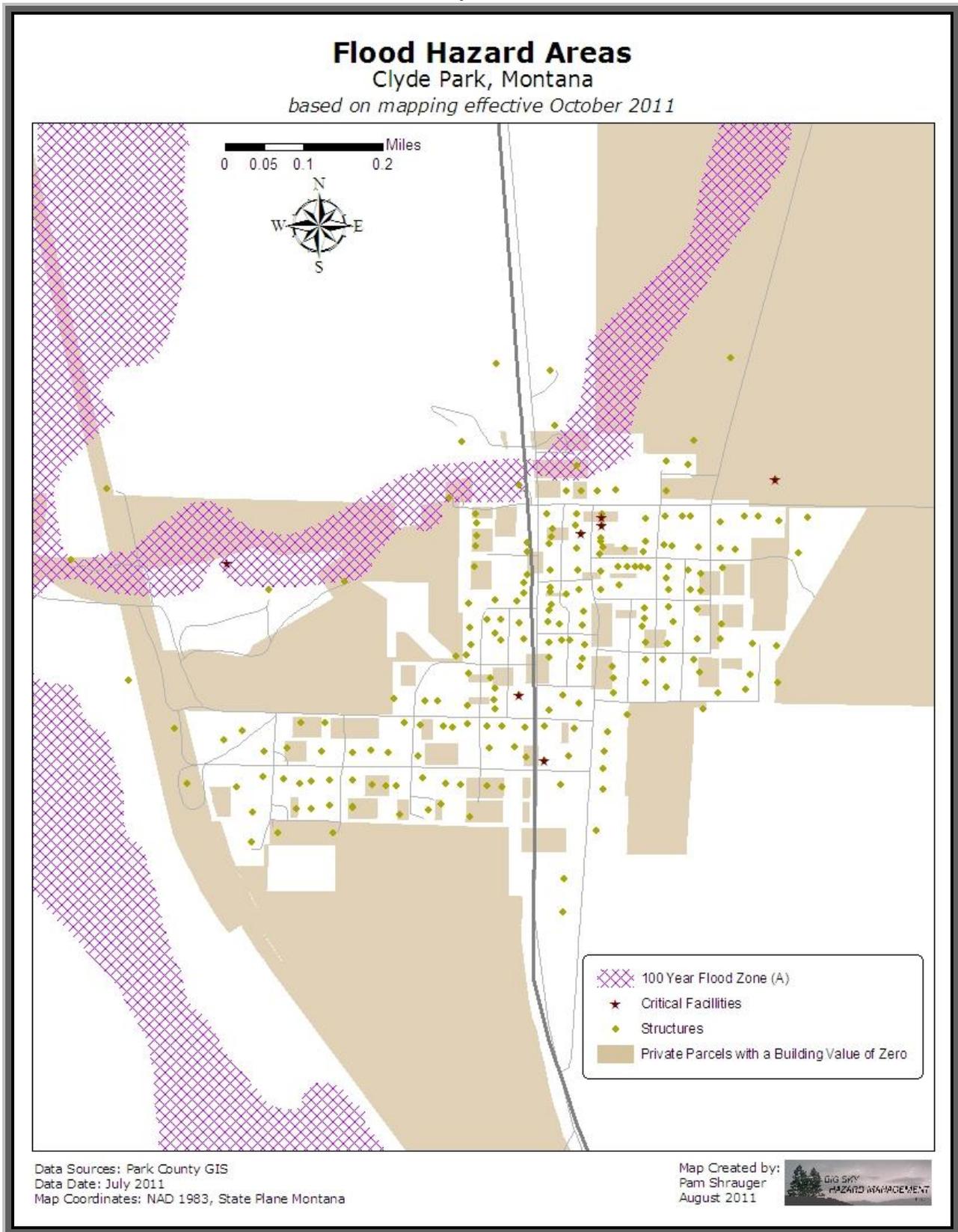
Map 4.7.1A



Map 4.7.1B



Map 4.7.1C



Flooding and mitigation on the Yellowstone River in Park County has been such an important community issue that based on a request from the citizens of Park County, Governor Marc Racicot established an Upper Yellowstone River Task Force in November 1997. The purpose of the task force was “to provide a forum for the discussion of issues that effect the Upper Yellowstone River Basin, particularly, to bring together landowners, sportsmen and sportswomen, and community leaders to develop a shared understanding of the issues and competing values and uses that impact the upper Yellowstone River.” (Governor’s Upper Yellowstone River Task Force, 2003) This task force developed 43 consensus-based river management recommendations and presented them to Governor Judy Martz on October 20, 2003. Many of their recommendations have been implemented and others can be found in the mitigation strategy of this plan.

In 2009, a Channel Migration study was completed on the Yellowstone River by the Yellowstone River Conservation District Council. The Channel Migration Zone maps depict the current and historic river channel locations and the potential for migration into other areas. The maps are intended to be a basic screening tool for guiding management decisions and are not regulatory. (Yellowstone River Conservation District Council, 2009)

Floodplain Management

The floodplain in Park County, the City of Livingston, and soon, the Town of Clyde Park is managed through floodplain ordinances in compliance with the National Flood Insurance Program (NFIP). A designated floodplain administrator for each of the jurisdictions issues and reviews permits for development in the floodplain.

A factor making a difference in flood prevention is the community. Park County has applied various mitigation techniques over the years to try to prevent impacts from flooding. The US Army Corps of Engineers constructed an emergency bank protection on the left bank of the Yellowstone River between 11th and 12th Streets in 1955. A temporary levee constructed around the City of Livingston in 1996 still exists. Rip rap and other streambank stabilization projects have been conducted on private and public property along the Yellowstone River, particularly after the 1996 and 1997 events. The non-construction projects mitigating flood impacts include the establishment of floodplain development regulations in Park County and the City of Livingston including the restriction of septic and drain fields within 100 horizontal feet or 4 vertical feet of the 100-year floodplain. Real estate disclosures are also required for properties in the 100-year floodplain.

Flood Insurance

Residents of Park County, the City of Livingston, and the Town of Clyde Park have or will have the opportunity to purchase flood insurance through the National Flood Insurance Program (NFIP). As of May 31, 2011, 125 policies covering over \$25 million in property were in force in unincorporated parts of Park County and 158 policies covering nearly \$22 million were in force in the City of Livingston. (Federal Emergency Management Agency, 2011b) The Town of Clyde Park is expected to enter the NFIP in the spring of 2012. As of May 31, 2011, Park County has seven repetitive loss properties through the National Flood Insurance Program with a total of fifteen claims. Additional data on these structures,

such as type and location, was requested but not provided. (Montana Disaster and Emergency Services, 2011b) 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.” (Federal Emergency Management Agency, 2007)

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 Park County contain mountainous and hilly terrain, and therefore, are more prone to flash flooding. Recent wildfire burn areas and downstream areas are also more prone to flash floods.

Ice Jam Flood

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 freezeup 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.

4.7.2 History

Park County has an extensive history of riverine flooding. The first major documented flood occurred in June 1894 with the most recent one in June 2011. The historical record has been compiled from the 1987 Livingston Flood Insurance Study, notes in a Park County Disaster and Emergency Services notebook, and the Park County Flood Mitigation Plan. The damages listed are assumed to be losses paid out by the government due to infrastructure damages, not including private losses. The data sources did not specify how the losses were calculated.

Yellowstone River, June 4-8, 1894 - Rapidly melting snows supplemented by rainfall caused the Yellowstone River to flow from its banks. The flood crest reached Livingston on June 4 and floodwaters did not begin to recede until June 8. Ninth Street Island, which was uninhabited at the time, was inundated. Livingston Island was flooded to a depth of 3 feet. Thirty-two homes in Riverside Addition were flooded on the first floor, and many city streets were damaged. Damages were estimated at \$11,300 in 1894 dollars (\$295,000 in 2010 dollars).

Yellowstone River, June 16-17, 1918 - Rapidly melting snows caused flooding at Livingston on June 16 and 17. Ninth Street Island and Livingston Island were covered to a depth of 2 feet, and the bridge between Livingston and Ninth Street Island collapsed. Twelve homes and three sheds in the Riverside Addition were flooded with 1 to 3 feet of water, and many streets were damaged. Damages were estimated at \$8,000 in 1918 dollars (\$116,000 in 2010 dollars).

Yellowstone River, June 10, 1921 - The flood crest reached Livingston on June 10 and receded the same night. A major portion of Ninth Street Island was inundated, damaging gardens and roads. The upstream end of Livingston Island, including a tourist camp, was flooded. The dam at the upstream end of Sacajawea Lagoon prevented major damage. Damages were estimated at \$1,200 in 1921 dollars (\$14,600 in 2010 dollars).

Yellowstone River, May 27-29, 1928 - Rapidly melting snows in the upstream basin caused flooding at Livingston on May 27, and floodwaters began to recede on May 29. Six homes on Ninth Street Island had first-floor flooding and four homes had their grounds flooded. The upstream end of Livingston Island was flooded. Floodwaters filled Sacajawea Lagoon. One section of the bridge spanning the old channel at Sacajawea Park was destroyed by floodwaters. Damages were estimated at \$6,900 in 1928 dollars (\$87,800 in 2010 dollars).

Fleshman Creek, June 1937 - The June 1937 flood, the most damaging on record for Fleshman Creek, resulted from heavy rains in the upstream drainage area. The creek overtopped its banks upstream from the Northern Pacific Railway tracks, and floodwaters followed the railroad northeastward, overtopping the tracks and flooding several blocks in the business district of Livingston. Damages were estimated at \$80,000 in 1937 dollars (\$1,210,000 in 2010 dollars).

Yellowstone River, June 14-20, 1943 - The Yellowstone River began to rise at Livingston on June 14, and the flood reached its peak on June 20. Ninth Street Island was covered with 2 to 3 feet of water with damage to eight homes, a gravel plant, and roads. The golf course and a barn were flooded on Livingston Island. Water came within 2 inches of overtopping the levee. The maximum discharge at Livingston was 30,600 cfs and the stage was 9.34 feet. Damages were estimated at \$2,600 in 1943 dollars (\$32,800 in 2010 dollars).

Yellowstone River, June 4, 1948 - Rapidly melting snows caused flooding at Livingston on June 4 with a stage of 9.10 feet. On Ninth Street Island, several residences were surrounded by water, and on Livingston Island the golf course had minor damage. The maximum discharge was 26,800 cfs. Damages were estimated at \$200 in 1948 dollars (\$1,810 in 2010 dollars).

Fleshman Creek, June 1950 - The June 1950 Fleshman Creek flood, which covered nine city blocks, resulted from heavy rains. House foundations, city streets, sewage facilities, and lawns were damaged. Damages were estimated at \$60,000 (\$543,000 in 2010 dollars).

Fleshman Creek, May 1951 - The May 1951 flood, which covered about the same area as the June 1950 flood, was caused by rapid melting of late snowfall. Damages were estimated at \$60,000 (\$504,000 in 2010 dollars).

Yellowstone River, June 22, 1971 - Unseasonably warm weather caused melting of heavy snow cover upstream from Livingston. Heavy runoff caused the Yellowstone River to rise to a peak flow and stage of 29,200 cfs and 8.45 feet, respectively. Ninth Street Island was flooded to a depth of approximately 1 foot.

Yellowstone River, June 17-21, 1974 - Warm temperatures, coupled with an exceptionally heavy mountain snowpack, caused flooding in the Livingston vicinity that reached a peak stage of 9.21 feet on June 17 at the US Geological Survey (USGS) gauge near Livingston. The National Weather Service called it the worst flooding in Livingston since 1943. The Ninth Street Island bridge and Vista View Road from the Main Street bridge to the golf course were closed. The school football and track fields were inundated. Much of Ninth Street Island was flooded, even though valiant attempts were made to keep out the floodwaters by dike construction and sandbagging. The Burlington-Northern Railroad bridge near Riverside Addition was damaged by the floodwaters.

Yellowstone River, June 6-18, 1996 - The Yellowstone River rose to 9.97 feet on June 10 and peaked at approximately 33,000 cfs at Livingston. The flood was the result of rapid snow melt and heavy rains. Approximately 150 homes from Cooke City to Fleshman Creek were evacuated. One house on Ninth Street Island was partially destroyed and another sustained flood damage. Many residences on Highway 89 South also sustained significant flood damage. Approximately 200 homes in all were reported have sustained some sort of damage with additional agricultural losses. Erosion along the river was significant, and there were numerous bridge, road, and culvert washouts. Sacajawea Park was flooded for nearly four days with damages to the Livingston Civic Center. Phone service was lost for a time, and dikes were reported to be failing. County Resolution # 562 designated an emergency mil levy of 2 mils be used for the repair of bridges, roads and homes damaged from June 6-18, 1996. Montana Disaster Declaration (Executive Order 12-96), dated June 10, 1996, claimed \$175,870 in personnel costs. Montana Executive Order 13-96 then closed the Yellowstone River to recreation. County records showed the emergency response cost Livingston \$24,000 and Park County \$40,000. Damages to public infrastructure were estimated at \$849,456 and \$425,728 for private property, and therefore, totaled over \$1,275,000.

Yellowstone River, June 1997 - A record snowpack with record water content melted resulting in a stage of 10.72 feet on June 6 and peak flow of approximately 36,000 cfs recorded at the river gauge station near Livingston. The flood event caused serious erosion to many stream banks and major gravel deposits in some sections of the Yellowstone River channel. Flood waters also damaged many county roads and washed out culverts. The majority of residential damage was south of the city of Livingston. Damage included flooded basements, first floors, and the total loss of one house due to bank erosion. County Resolution # 591 declared a flood emergency on the Yellowstone River. Recreational use from Point of Rocks to Springdale was prohibited. Damages to public infrastructure were estimated at \$411,421 and \$205,210 for private property, therefore, totaling over \$616,000.

The following creeks and rivers caused various forms of damage in the 1996 and 1997 floods: Yellowstone River, Shields River, Six Mile Creek, Tom Minor Creek, Soda Butte Creek, Cottonwood Creek, Fleshman Creek, Mill Creek, Big Creek, Eight Mile Creek, Cinnabar Creek, Rock Creek, Billman Creek, and Bear Creek.

Yellowstone River Ice Jam, January 17, 2007 – An ice jam on the Yellowstone River, 13 miles south of Livingston, caused water to back up and flood one house. (Yellowstone River Conservation District Council, 2008)

Yellowstone River, June 25, 2008 – High water on the Yellowstone River crested at 9.52 feet on June 25 and led to the collapse of the Ninth Street Island bridge. The cost to construct a permanent replacement bridge in 2010 was about \$1.1 million.

Shields, Yellowstone, and Boulder Rivers, May 25 – July 9, 2011 – Extraordinary snowpack and a wet spring contributed to flooding along the Shields, Boulder, and Yellowstone Rivers in Park County. The Shields River crested first at 6.6 feet in late May. The Yellowstone River at Livingston crested at 9.99 feet on June 30. Many roads and bridges were damaged by floodwaters throughout Park County. Several campgrounds and fishing access points were flooded and closed. A power line providing electricity to Ninth Street Island residents was damaged and power was lost for a time. The City of Livingston and Park County constructed an emergency flood berm at a cost of approximately \$108,000 and Park County sustained approximately \$63,000 in damages, mostly to roads and bridges. Damages to private property are still being evaluated.

Historically, the two primary sources of damaging floods for Park County are the Yellowstone River and Fleshman Creek. All floods have been associated with rapidly melting mountain snowpack or heavy rains over key drainages. Flooding by Fleshman Creek is usually in the west portion of the City of Livingston. This tributary to the Yellowstone River floods primarily from intense rainfall in the hills north and west of Livingston. Some of the heaviest damage to Livingston has been due to the floods from Fleshman Creek. Table 4.7.2A gives a summary of flood events and the associated damages.

Table 4.7.2A Park County Flood Events and Damages

Date	Location	Damages	Damages in 2010 dollars
June 4, 1894	Yellowstone River	\$11,300	\$295,000
June 16, 1918	Yellowstone River	\$8,000	\$116,000
June 10, 1921	Yellowstone River	\$1,200	\$14,600
May 27, 1928	Yellowstone River	\$6,900	\$87,800
June 1937	Fleshman Creek	\$80,000	\$1,210,000
June 20, 1943	Yellowstone River	\$2,600	\$32,800
June 4, 1948	Yellowstone River	\$200	\$1,810
June 1950	Fleshman Creek	\$60,000	\$543,000
May 1951	Fleshman Creek	\$60,000	\$504,000
June 22, 1971	Yellowstone River	Unknown	Unknown
June 21, 1974	Yellowstone River	Unknown	Unknown
June 1996	Yellowstone River	\$1,275,000	\$1,770,000
June 1997	Yellowstone River	\$616,000	\$837,000
January 17, 2009	Yellowstone River	Unknown	Unknown
June 25, 2008	Yellowstone River	\$1,100,000	\$1,100,000
May 25 – July 9, 2011	Shields River, Yellowstone River, and Boulder River	\$171,000*	\$171,000*
TOTAL			\$6,683,010

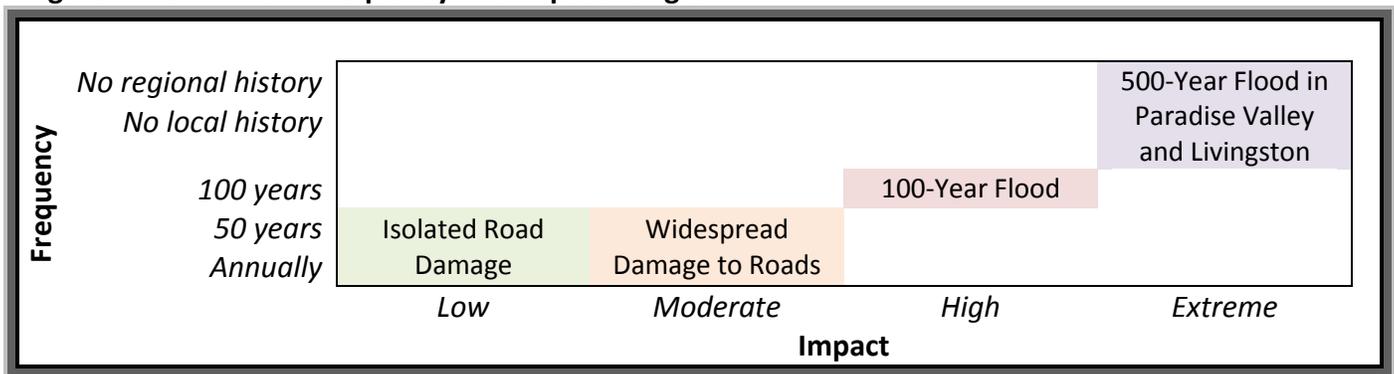
* damages still being calculated

Riverine flooding has historically caused the most damages, however, some urban flash flooding has also occurred. On August 5, 1993, heavy rains caused street flooding throughout the City of Livingston. On July 12, 2001, a similar event occurred and four feet of water was reported in the B Street underpass with several inches of water running through the area roadways.

4.7.3 Probability and Magnitude

Flooding probabilities are shown through the mapping of the floodplain. The 100-year floodplain has a 1% probability of being exceeded in any given year. Flooding has been noted 15 times since 1894 in Park County with approximately \$6,683,010 in damages (2010 dollars). Based on the historical record over the past 118 years, a damaging flood occurs on average once every 7-8 years (118 years / 15 events) at a cost of approximately \$445,534 (\$6,683,010 / 15 events) or \$56,636 per year (\$6,683,010 / 118 years).

Figure 4.7.3A Hazard Frequency and Impact Ranges



4.7.4 Vulnerabilities

Methodology

Two methods were used to identify vulnerabilities to flood. First, digital floodplain mapping, effective October 2011, was compared to mapped critical facilities and structures. In most cases, this mapping depicts the 100-year flood hazard area; the City of Livingston also has 500-year flood areas mapped.

HAZUS-MH MR2, FEMA’s loss estimation software was also used to estimate 500-year flood losses on the larger rivers in Park County. Note that the Yellowstone River, south of the confluence with Mill Creek, was considered a “problem reach”, so 500-year discharges derived from the Flood Insurance Study were used to generate a 500-year flood hazard area.

For population estimates, the 2010 county population of 15,636 was divided by the total number of structures in the Park County GIS database of 9,507 for an estimate of 1.64 people per structure.

Exposure

Since the 2005 plan, new floodplain studies have likely reduced the overall assessed flood vulnerability. Improved mapping removed several residential areas from the flood hazard areas. In addition, improved structure data was also used in the analysis. Also note that since 2005, floodplain areas have been annexed into the City of Livingston, but building locations are outside the floodplain per local regulations.

Critical Facilities and Infrastructure

Comparing the locations of critical facilities and infrastructure to the 100-year and 500-year flood hazard areas, the following facilities are estimated to have the greatest risk:

100-year event, digital flood map comparison:

- Clyde Park Pumphouse
- Cooke City Compactor
- Yellowstone Bible Camp
- Approximately 280 miles of roadways

500-year event (in addition to those at risk during the 100-year event), digital flood map comparison:

- Livingston Civic Center
- Safe Haven Childcare
- Wiggles N Giggles Daycare
- Approximately 30 miles of roadways, 11 miles within the City of Livingston

Note: these results should only be used for planning purposes and are not actual flood zone determinations.

500-year event, HAZUS-MH flood boundary comparison, excluding Livingston:

- US Post Office - Emigrant

Note: the HAZUS-MH generated flood hazard boundary is considered less accurate in and around the City of Livingston than the actual digital flood hazard maps. Other areas of the county do not have 500-year flood hazard areas identified otherwise.

Park County has six critical scour potential bridge structures at the following locations:

- Yellowstone River, 6 miles northeast of Livingston (state-owned)
- Ferry Creek, 1 mile north of Livingston (county-owned)
- Shields River, 4 miles northeast of Livingston (county-owned)
- Shields River, 3 miles northeast of Wilsall (county-owned)
- Shields River, 8 miles northeast of Wilsall (county-owned)
- Shields River, 12 miles northeast of Wilsall (county-owned)

Source: Montana Disaster and Emergency Services, 2010.

The vulnerabilities to flash flooding are harder to quantify without specific hazard data. In Montana, however, flash flooding has been known to be most problematic to public infrastructure such as roads. As history has shown, flood events frequently wash out roadways in Park County. Specific critical facilities have not been identified as more susceptible to flash flooding.

Existing Structures

The type of property damage caused by flood events depends on the depth and velocity of the floodwaters. Flooding can wash away supporting fill, infiltrate basements, damage contents, and in worst cases, wash structures off their foundations. Most flood damage is caused by water saturating materials susceptible to loss such as wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances.

FEMA’s Benefit-Cost Analysis Module determines damage percentages for various building types. Table 4.7.4A shows the estimated percentages of building and contents losses from flooding at depths of one foot, three feet, and six feet.

Table 4.7.4A Flood Building and Contents Loss Estimation Percentages

Structure Type	Flood Depth		
	1 foot	3 feet	6 feet
One Story No Basement	14% Building Damage 21% Contents Damage	27% Building Damage 40.5% Contents Damage	40% Building Damage 60% Contents Damage
Two Story No Basement	9% Building Damage 13.5% Contents Damage	18% Building Damage 27% Contents Damage	24% Building Damage 36% Contents Damage
One or Two Story with Basement	15% Building Damage 22.5% Contents Damage	23% Building Damage 34.5% Contents Damage	38% Building Damage 57% Contents Damage
Manufactured Unit	44% Building Damage 66% Contents Damage	73% Building Damage 90% Contents Damage	81% Building Damage 90% Contents Damage

Source: Federal Emergency Management Agency, 2001.

The structure database provided by the Park County GIS Office was compared to the digital flood hazard areas. Tables 4.7.4B, 4.7.4C, and 4.7.4D show the estimated number of structures within the hazard areas and their associated building values. Potential losses were estimated by using a damage factor of 30%. Total 500-year estimated losses for the City of Livingston are \$9,845,214; 500-year data does not fully exist for the other jurisdictions.

Table 4.7.4B Estimated 100-Year Flood Exposure Using Digital Flood Hazard Maps

Jurisdiction	Estimated Number of Structures in the Flood Hazard Area	Estimated Total Building Value	Estimated Losses
Park County, unincorporated	361 structures	\$81,735,922	\$24,520,777
City of Livingston	2 structures	\$224,860	\$67,458
Town of Clyde Park	3 structures	\$345,622	\$103,687
TOTAL	366 structures	\$82,306,404	\$24,691,921

Table 4.7.4C Estimated 500-Year Flood Exposure (in and around Livingston only and in addition to 100-year flood exposure) Using Digital Flood Hazard Maps

Jurisdiction	Estimated Number of Structures in the Flood Hazard Area	Estimated Total Building Value	Estimated Losses
Park County, unincorporated	81 structures	\$25,557,005	\$7,667,102
City of Livingston	304 structures	\$32,592,521	\$9,777,756
TOTAL	385 structures	\$58,149,526	\$17,444,858

Table 4.7.4D Estimated 500-Year Flood Exposure Using HAZUS-MH Generated Flood Hazard Areas

Study Area	Estimated Number of Structures in the Flood Hazard Area	Estimated Total Building Value	Estimated Losses
Yellowstone River	583 structures	\$150,689,469	\$45,206,841
Shields River	31 structures	\$7,199,539	\$2,159,862
Boulder and West Boulder Rivers	37 structures	\$9,225,723	\$2,767,717
TOTAL	651 structures	\$167,114,731	\$50,134,420

Table 4.7.4E shows the results generated by HAZUS-MH. HAZUS-MH used census block data to estimate damages to structures for the 500-year floods on the reaches indicated.

Table 4.7.4E HAZUS-MH Flood Module Estimated 500-Year Building-Related Economic Losses

Study Area	Estimated Building Damage	Building-Related Economic Loss
Yellowstone River, north of confluence with Mill Creek	3 substantially damaged residences 73 moderately damaged residences 67 slightly damaged residences	\$10,950,000
Shields River	3 slightly damaged residences	\$3,530,000
Boulder and West Boulder Rivers	2 slightly damaged residences	\$280,000

Table 4.7.4F provides National Flood Insurance Program data, as of May 31, 2011. Park County has seven repetitive loss properties through the National Flood Insurance Program with a total of fifteen claims. Additional data on these structures, such as type and location, was requested but not provided. (Montana Disaster and Emergency Services, 2011b)

Table 4.7.4F National Flood Insurance Program Statistics

Location	Policies	Insurance In-Force	Total Loss Payments 1978 – May 2011
Park County, unincorporated areas	125	\$25,347,300	\$659,965
City of Livingston	158	\$21,949,500	\$47,612
TOTAL	283	\$47,296,800	\$707,577

Source: Federal Emergency Management Agency, 2011b.

Population

Due to the terrain and hazard areas in Park County, the population is considered to be at moderate risk for riverine and flash flooding. Some warning does exist, particularly with riverine flooding, but rapidly occurring events may leave the population unprepared and in a dangerous situation. The impacts from flash flooding could be even greater in areas downstream of wildfire burn areas. Flash flooding often occurs without warning. The population estimated in the 100-year floodplain is 600 people (366 structures x 1.64 people/structure). The population in flash flood areas is unknown as flash flood can occur almost anywhere.

Values

Economic values can be negatively affected by floods. Agriculture losses may occur due to reduced profits, damaged crops, livestock drownings, and delays in planting. Physical losses to businesses and historic properties may also occur. Damages to the road transportation network may slow commerce. Flooding often benefits ecologic values in the riparian areas, but socially, emotional impacts related to losses can be significant.

Future Development

Project for the spring of 2012, all jurisdictions within Park County will adhere to National Flood Insurance Program (NFIP) requirements for new and improved developments in the mapped floodplain. These requirements do not prohibit development in the floodplain; rather, they require the development to meet certain standards. Future development of lands within the floodplain is possible. About 638 private, undeveloped parcels of land coincide with the 100-year floodplain; however, these parcels may also contain possible building sites outside the 100-year floodplain boundaries. Similarly, 132 private, undeveloped parcels of land coincide with the mapped 500-year floodplain in and around Livingston.

Vulnerabilities and Impacts

Table 4.7.4G Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Park County	Critical Facilities	<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$500,000 losses 	Moderate
Livingston	Critical Facilities		<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses ▪ Clean-up/debris removal costs 	Low-Moderate
Clyde Park	Critical Facilities	<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses ▪ Clean-up/debris removal costs 		Moderate
Park County	Critical Infrastructure	<ul style="list-style-type: none"> ▪ \$2,000,000 losses ▪ Road closures 	<ul style="list-style-type: none"> ▪ \$5,000,000 losses ▪ Loss of electricity ▪ Loss of potable water ▪ Loss of sanitary sewers 	Moderate-High
Livingston	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$2,000,000 losses ▪ Road closures ▪ Loss of electricity ▪ Loss of potable water ▪ Loss of sanitary sewers 	Moderate
Clyde Park	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Road closures ▪ Loss of electricity ▪ Loss of potable water ▪ Loss of sanitary sewers 	Moderate
Park County	Existing Structures	<ul style="list-style-type: none"> ▪ \$24,500,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$40,000,000 losses 	High

Table 4.7.4G Hazard Vulnerabilities and Impacts (continued)

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Livingston	Existing Structures	<ul style="list-style-type: none"> ▪ \$67,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$10,000,000 losses 	Moderate
Clyde Park	Existing Structures	<ul style="list-style-type: none"> ▪ \$104,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$1,000,000 losses 	Moderate
All	Population		<ul style="list-style-type: none"> ▪ Injuries ▪ Fatalities 	Moderate
All	Values	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Service industry losses ▪ Reduced water quality ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Emotional impacts ▪ Cancellation of activities ▪ Restrictions on activities 	Moderate
All	Future Structures	<ul style="list-style-type: none"> ▪ Somewhat likely to occur in hazard areas ▪ 638 undeveloped parcels in the 100-year floodplain 	<ul style="list-style-type: none"> ▪ 132 additional undeveloped parcels in the 500-year floodplain in and around Livingston 	Moderate

* in addition to probable (100-year) impacts

4.7.5 Data Limitations

Data limitations include:

- Quantifying all of the losses that occur during major floods, especially when some are covered by insurance and government assistance and others are not.

4.8 Ground Transportation Accident

Table 4.8A Hazard Summary for Park County

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	The interstate and highways can experience relatively high volumes of tourist traffic.
Vulnerability	Low-Moderate	The greatest vulnerability is to the population.

Table 4.8B Hazard Summary for the City of Livingston

Overall Hazard Rating	Low	
Probability of High Impact Event	Low-Moderate	Interstate 90 and Highway 89 pass through Livingston.
Vulnerability	Low-Moderate	The greatest vulnerability is to the population.

Table 4.8C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Low	
Probability of High Impact Event	Low-Moderate	Highway 89 passes through Clyde Park with regular truck traffic.
Vulnerability	Low-Moderate	The greatest vulnerability is to the population.

Table 4.8D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

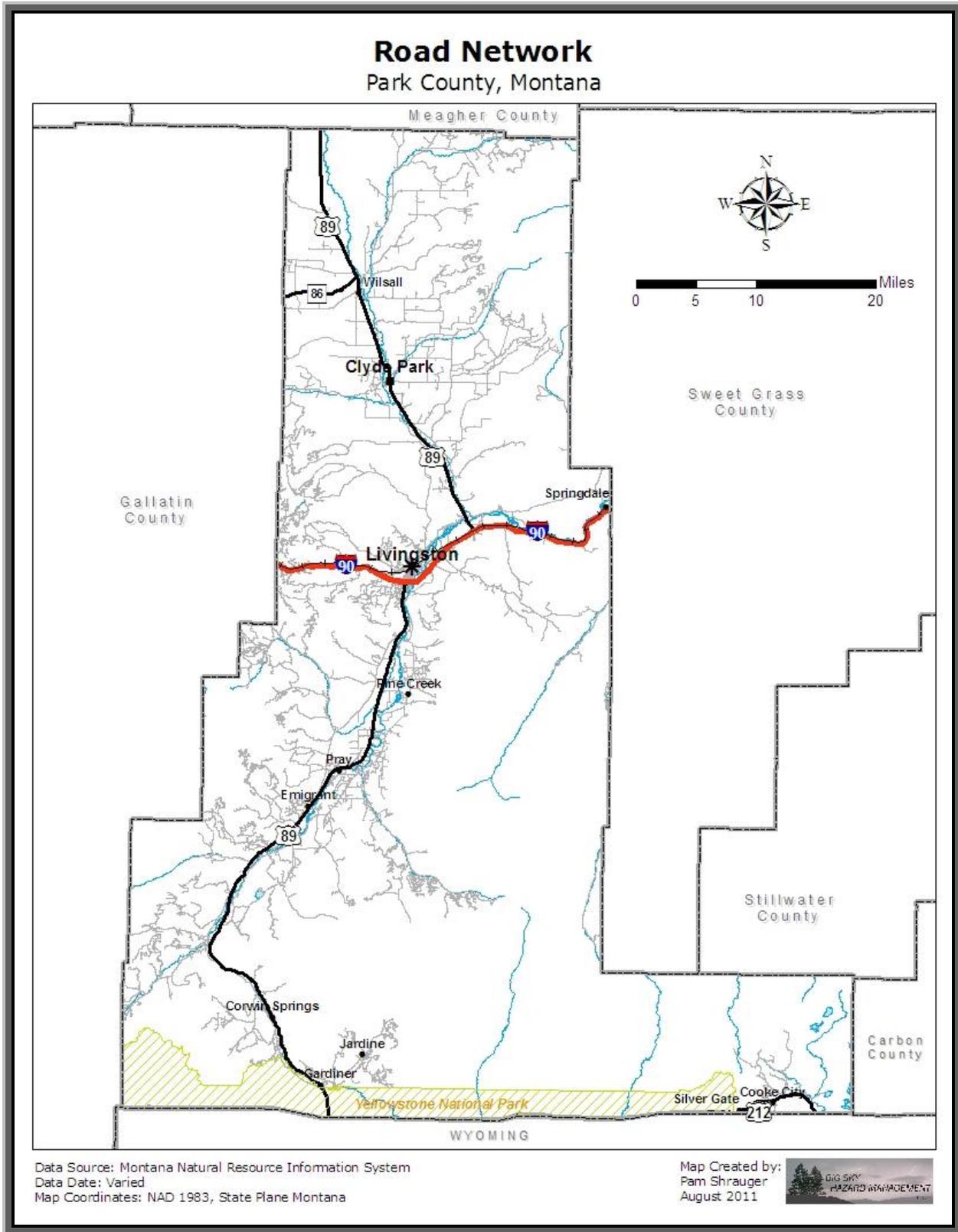
4.8.1 Description

A ground transportation accident, for the purposes of this plan, is any large scale vehicular accident involving mass casualties. The most likely locations for an incident of this magnitude would be on Interstate 90 or on Highway 89. Interstate 90 crosses central Park County in an east-west direction. This Interstate is widely used by large trucks, area residents, and distance travelers. Highway 89, south of the Interstate, connects Interstate 90 to Yellowstone National Park and is used by tourists visiting the Park, local residents, and as a shipping route to the Park and points south into Wyoming. Highway 89, north of the Interstate, serves as the primary route for many rural communities in northern Park County and beyond. Map 4.8.1A shows the roadways in Park County.

A significant concern in ground transportation accidents is the release of hazardous materials. This hazard is addressed in the hazardous materials release profile.

A unique problem linked to ground transportation accidents is that of wildlife. Wildlife collisions, particularly deer and elk, are another common cause of transportation accidents in the county. Deceased animals left on the roadside often attract other animals, such as grizzly bears, into the populated areas. This has been a specific problem in the Cooke City area as these animals can then threaten humans.

Map 4.8.1A



4.8.2 History

The history of ground transportation accidents in Park 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 4.8.2A shows the traffic fatalities in Park County from 1980-2009.

Table 4.8.2A Traffic Fatalities

Year	Number of Fatalities	Year	Number of Fatalities	Year	Number of Fatalities
1980	6	1990	1	2000	5
1981	3	1991	3	2001	7
1982	7	1992	6	2002	6
1983	6	1993	1	2003	9
1984	3	1994	4	2004	5
1985	3	1995	1	2005	5
1986	3	1996	8	2006	5
1987	3	1997	7	2007	6
1988	4	1998	5	2008	1
1989	3	1999	5	2009	3
Annual Average	4.1	Annual Average	4.1	Annual Average	5.2

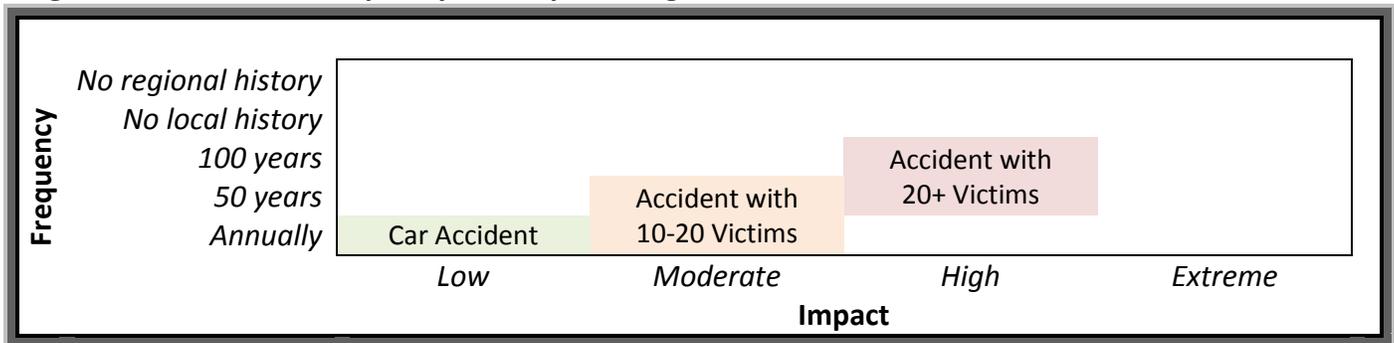
Source: Montana Highway Patrol, 2010.

In the early 1980s, local firefighters recall a four-car accident on Highway 89 south of Livingston, in which 14 people were treated, many of whom were deaf. Then, on June 17, 1999, 12 miles south of Livingston on Highway 89, a truck and tourist bus accident killed one person and injured 26 others. That accident involved many foreign, non-English speaking tourists.

4.8.3 Probability and Magnitude

Despite a relatively low history of major ground transportation accidents, the increase in fatal motor vehicle accidents leads to the assumption that the probability of a major ground transportation accident may be increasing. The probability of a large wreck with mass casualties is further increased during the frequent snow storms, periods of poor visibility with blowing snow or smoke, and during times of heavy tourist traffic.

Figure 4.8.3A Hazard Frequency and Impact Ranges



4.8.4 Vulnerabilities

Methodology

Since the location and probability of a significant ground transportation accident is extremely difficult to determine, two scenarios were used to determine potential losses. The first is an accident involving a bus and resulting in 10-15 casualties. The second is a multi-vehicle accident resulting in 20-25 casualties, damage to electric infrastructure, and damage to two structures.

Exposure

Critical Facilities and Infrastructure

The critical facilities are not anticipated to be impacted by a ground transportation accident. A critical facility could be damaged in or made inaccessible from the impact of an accident, but the likelihood is considered low and uniform throughout the county. Should the incident be large enough, the largest expenditures would probably be in responding agency costs.

Existing Structures

Typically, most losses from a ground transportation accident are covered by insurance. Losses of two structures would be about \$200,000 (2 homes x \$97,900/average home).

Population

Population losses are highly likely in ground transportation accidents. A ground transportation accident has the potential to kill and injure large numbers of people. Any accident involving a bus or many vehicles has the potential for casualties numbering from 10 to 100.

Values

Should vehicle fluids or hazardous materials seep into a water supply, the quality of that water body could be threatened.

Future Development

Future development, except for the associated increase in vehicles in the area, will not impact or will just slightly increase the probability of a large ground transportation accident. Otherwise, the specific locations of where development occurs should not significantly affect the vulnerabilities from this hazard, especially since appropriate road improvements are usually required with new development per subdivision regulations

Vulnerabilities and Impacts

Table 4.8.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities		• \$0 losses	Low
All	Critical Infrastructure	• Road closures	• \$100,000 losses • Loss of electricity • Loss of telephone service • Loss of internet service	Low-Moderate
All	Existing Structures		• \$200,000 losses • Structural losses • Contents losses • Displacement/functional losses • Clean-up/debris removal costs	Low-Moderate
All	Population	• Injuries • Fatalities		Moderate-High
All	Values	• Emotional impacts	• Business disruption losses • Service industry losses • Agricultural losses • Habitat damages • Reduced water quality • Soil contamination • Historic structure losses • Historic site losses • Historic item losses • Aesthetic value losses	Low-Moderate
All	Future Structures		• Unlikely to occur in hazard areas • Increases the total hazard exposure	Low-Moderate

* in addition to probable (100-year) impacts

4.8.5 Data Limitations

Data limitations include:

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

4.9 Hazardous Materials Release

including fixed, mobile, and pipeline releases

Table 4.9A Hazard Summary for Park County

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	Significant potential exists due to interstate, railroad, and pipeline, but only a limited history of releases.
Vulnerability	Moderate-High	Significant damages possible to the population and values. Some damages to structures possible.

Table 4.9B Hazard Summary for the City of Livingston

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	Significant potential exists due to interstate and railroad, but only a limited history of releases.
Vulnerability	Moderate-High	Significant damages possible to the population and values. Some damages to structures possible.

Table 4.9C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Low-Moderate	Releases possible due to the proximity to US Highway 89.
Vulnerability	Moderate-High	Significant damages possible to the population and values. Some damages to structures possible.

Table 4.9D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.9.1 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. 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 Park County include the usual facilities within communities such as water and sewer treatment plants, swimming pools, hospitals, gas stations, bulk plants, and supply stores containing substances such as fuel, farm and weed chemicals, propane, fuel oil, paint, and small amounts of chlorine and low level nuclear wastes.

A major fuel pipeline, the Yellowstone Pipeline, runs through central Park County, just north of Livingston and Interstate 90. This pipeline transports refined petroleum products between Billings, MT and Spokane, WA. Should an explosion or leak occur on this pipeline, a large hazardous material release of the fuel and/or fumes could result and threaten the population, property, and/or the environment.

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. Interstate 90 crosses central Park County in an east-west direction. This Interstate is widely used by vehicles transporting hazardous materials. Highway 89, south of the Interstate, connects Interstate 90 to Yellowstone National Park and is used as a shipping route to the Park and points south into Wyoming. Highway 89, north of the Interstate, serves as the primary route for many rural communities in northern Park County and beyond. For the most part, the railroad parallels Interstate 90, except for where it goes through the City of Livingston. Only the east-west railroad sections are currently active with an additional short section used south through Livingston. The railroad is owned and operated by Montana Rail Link. Hazardous materials and wastes are continually present on these corridors.

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 4.9.1A 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. Over 18,000 materials are covered under the US Department of Transportation regulations.

Table 4.9.1A Evacuation Radii for Hazardous Material Releases

Material	Potential Hazard	Initial Isolation	Evacuation
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
Anhydrous Ammonia	Toxic by Inhalation	500 feet	Up to 1.4 miles
Chlorine	Toxic by Inhalation	2,000 feet	Up to 5 miles

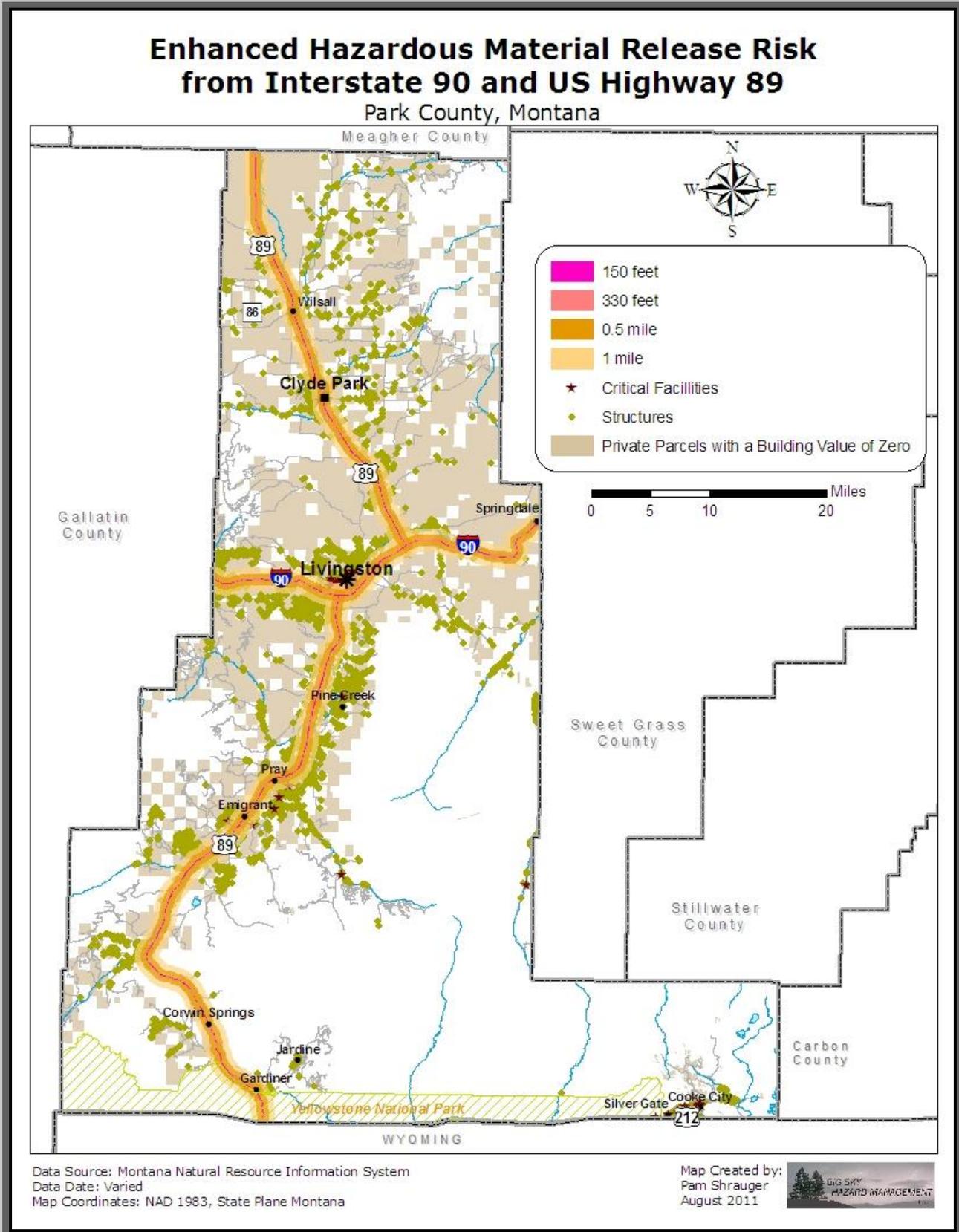
Source: US Department of Transportation, 2008.

The buffers around the interstate, railroad, and pipelines shown in Maps 4.9.1B, 4.9.1C, 4.9.1D, respectively, 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 interstate and Highway 89, 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 4.9.1A. For the railroad, the buffers were 500 feet and 1.4 miles for anhydrous ammonia and 2,000 feet and 5 miles for chlorine. 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. Along the pipelines, buffers of 500 feet and ½ mile were used for petroleum products such as fuels.

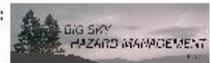
Map 4.9.1B

Enhanced Hazardous Material Release Risk from Interstate 90 and US Highway 89 Park County, Montana

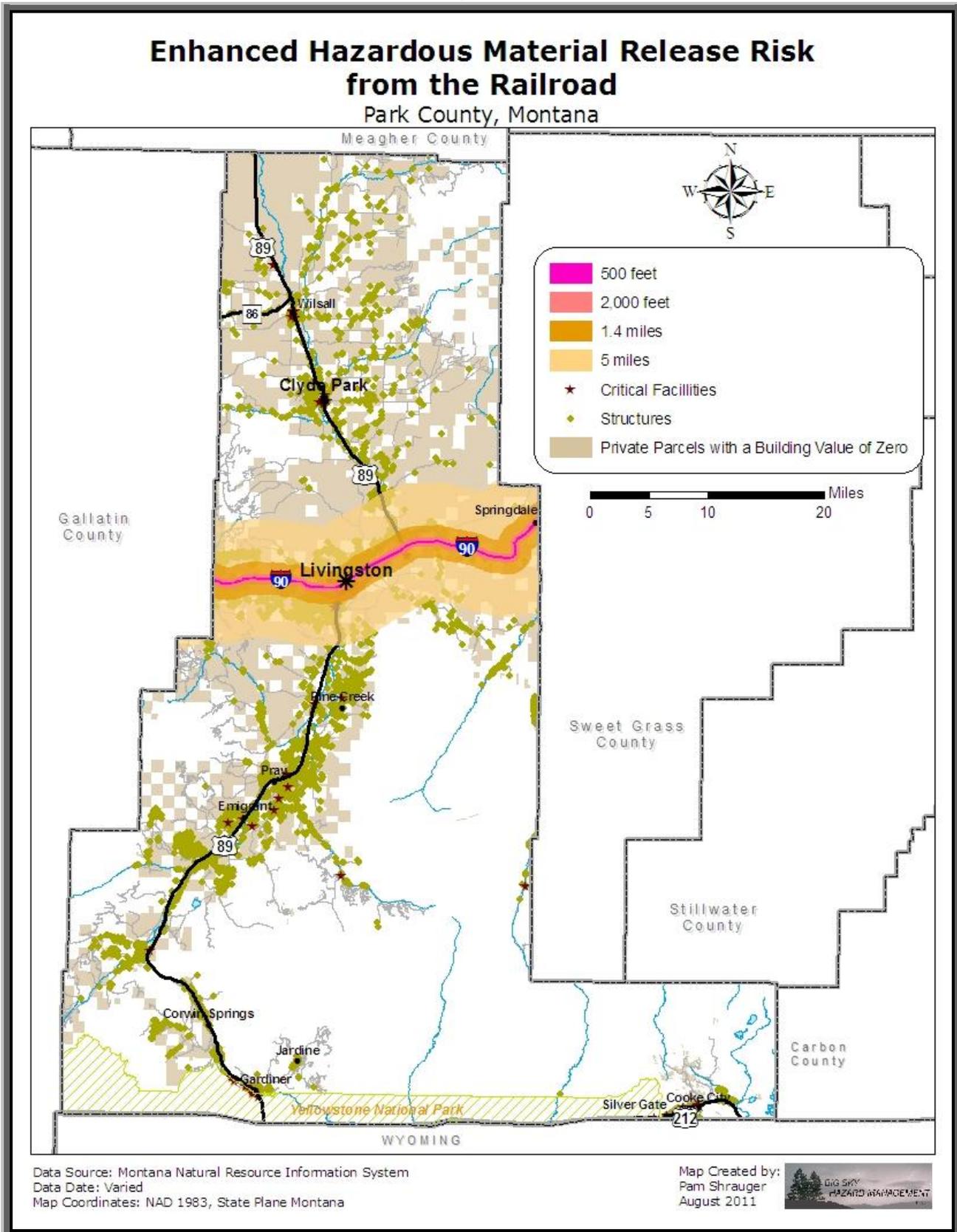


Data Source: Montana Natural Resource Information System
Data Date: Varied
Map Coordinates: NAD 1983, State Plane Montana

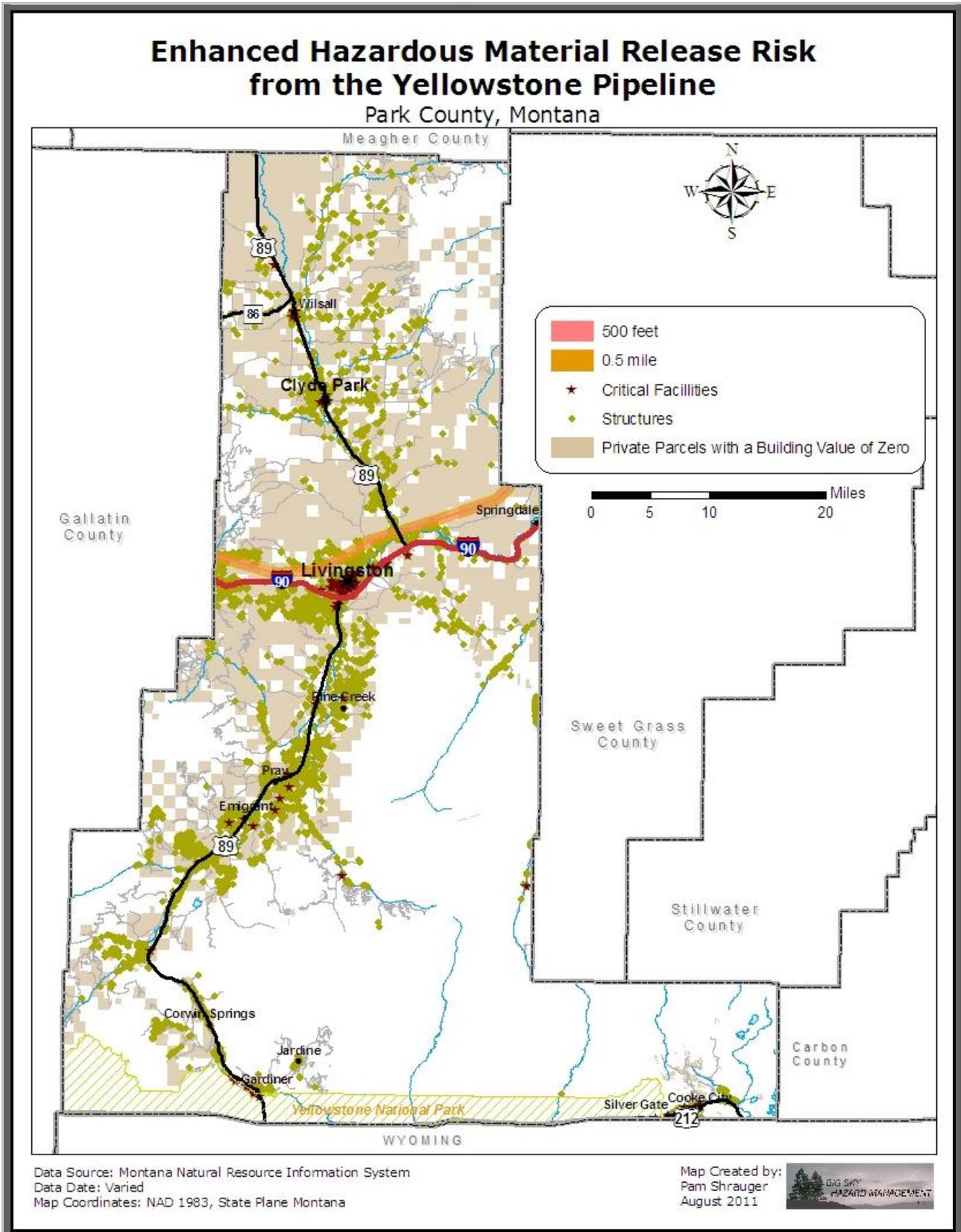
Map Created by:
Pam Shrauger
August 2011



Map 4.9.1C



Map 4.9.1D



4.9.2 History

Historically, incidents have been small enough to prevent a large evacuation and long-term impacts however, hazardous materials incidents do occur in Park County. The incidents logged with the National Response Center are shown in Table 4.9.2A. Note this database likely does not contain all incidents.

Table 4.9.2A Hazardous Material Releases from 1990-2010

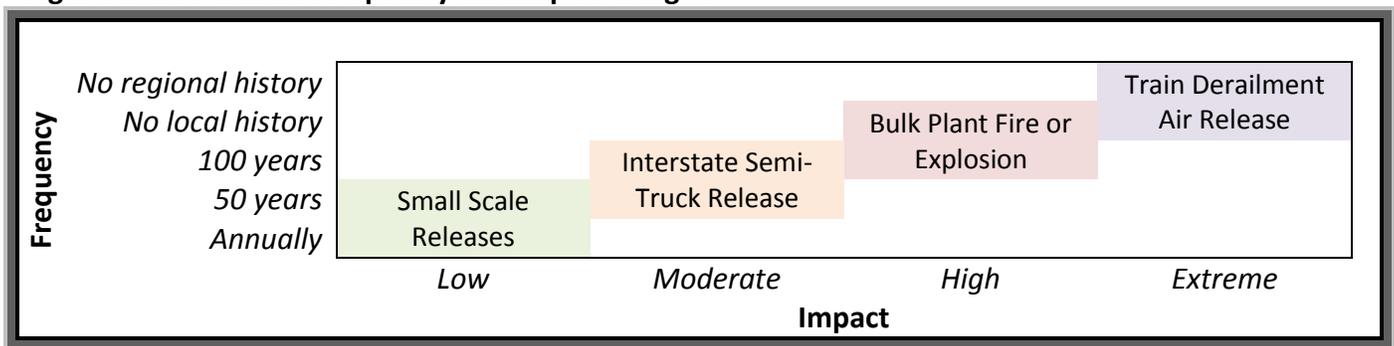
Date	Location	Material	Cause/Impacts
09/08/1990	East End of Wilsall	Transformer Oil, 30 gallons	Pole was knocked over by the wind.
04/10-14/1990	Corwin Springs	Fuel Oil, 4,000 gallons Gasoline, 12,000 gallons	Underground storage tank leak. Approximately 300 gallons entered the Mol Huron Creek drainage.
02/22/1994	Springdale	Unleaded Gasoline, 1,500 barrels	Failed cooling line.
06/21/1996	Near Cooke City	Diesel Oil, 350 gallons	Portable diesel fuel tank leaked and then ruptured.
01/19/1997	TVX Mineral Hill Mine, Jardine	Ferric Chloride, 100 gallons	Storage tank leaked.
11/20/1998	Livingston Rebuild Center	Oil, 1,500 gallons	Open storage tank valve.
04/07/2000	North C Street, Livingston	Raw Sewage	Backed up into a trailer.
07/01/2001	High Ground Avenue, Livingston	Transformer Oil, 40 gallons	Transformer was struck by a vehicle.
02/18/2002	Interstate 90, between Mission Creek and Springdale	Diesel, 125 gallons	Tractor trailer truck overturned on icy road conditions and spilled fuel from a saddle tank.
07/14/2003	Near Corwin Springs	Fuel Oil	Spilled onto the ground by a tanker truck.
09/15/2005	Callender Street, Livingston	Natural Gas	Pipeline leak led to an explosion that destroyed two houses and injured four.
08/23/2007	Fleshman Creek between B and N Streets, Livingston	Chlorinated Pool Water	White sheen reported in the creek to be killing species in the water. Municipal pool water was approved to be released.
12/24/2007	5284 US Highway 89 South, Livingston	Transformer Oil, PCBs, 45 gallons	Wind knocked down a transformer.

Source: National Response Center, 2011.

4.9.3 Probability and Magnitude

The probability of a hazardous materials release can only be realistically assessed qualitatively. The history of events in Park County is 13 events over the past 21 years, none of which have resulted in a disaster declaration. The exposure, however, is high with Interstate 90, a petroleum pipeline, and an active railroad passing within close proximity to critical facilities and Livingston. The probability of a significant release is considered greater along the railroad since the US Department of Transportation regulates hazardous materials on commercial vehicles, has specific regulations regarding mixed loads and amounts, and provides enforcement, whereas, the railroad system does not have as extensive control measures.

Figure 4.9.3A Hazard Frequency and Impact Ranges



4.9.4 Vulnerabilities

Methodology

To assess the vulnerabilities to hazardous material releases, GIS data for critical facilities, structures, and undeveloped parcels were compared to the enhanced risk areas depicted by the buffer zones around the interstate, US Highway 89, the railroad, and the Yellowstone Pipeline. For population estimates, the 2010 county population of 15,636 was divided by the total number of structures in the Park County GIS database of 9,507 for an estimate of 1.64 people per structure.

Exposure

Critical Facilities and Infrastructure

Based on the estimated 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. Structural and contents losses may only be seen if an explosion and/or fire are present. Table 4.9.4A shows the critical facility exposure to the various hazardous material risk areas.

Table 4.9.4A Hazardous Material Incident Exposure to Critical Facilities

Within Buffer Zone	Exposure	Specific Facilities
150 feet of Interstate 90	None	
330 feet of Interstate 90	None	
½ mile of Interstate 90	11 critical facilities	
1 mile of Interstate 90	41 critical facilities	
150 feet of US Highway 89	10 critical facilities	County Road Shop, Clyde Park County Road Shop, Wilsall Gateway Hose Company North Entrance of YNP Shields Valley Health Center US Dept. of Agriculture, Gardiner US Dept. of Agriculture, Livingston US Post Office, Clyde Park US Post Office, Wilsall Wilsall Fire Station
330 feet of US Highway 89	16 critical facilities	
½ mile of US Highway 89	36 critical facilities	
1 mile of US Highway 89	45 critical facilities	
500 feet of the Railroad	7 critical facilities	Blessings Abound Daycare Counterpoint, Milky Way Group Home Montana DPHHS, Livingston MDT, Livingston Park County Rural Fire Station #1 US Post Office, Springdale Washington School
2,000 feet of the Railroad	40 critical facilities	
1.4 miles of the Railroad	60 critical facilities	
5 miles of the Railroad	62 critical facilities	
150 feet of the Yellowstone Pipeline	None	
½ mile of the Yellowstone Pipeline	None	

Existing Structures

Comparing the structure database provided by Park County GIS to the buffer zones, Tables 4.9.4B shows the estimated number of structures within the enhanced hazard areas. Fortunately, unless an explosion is present with the release, structures are typically not damaged in a hazardous materials release. Structure losses in an explosion would likely total in the millions of dollars.

Table 4.9.4B Structure Vulnerabilities to Hazardous Material Releases

Within Buffer Zone	Estimated Number of Structures
150 feet of Interstate 90	4 structures
330 feet of Interstate 90	23 structures
½ mile of Interstate 90	739 structures
1 mile of Interstate 90	2,882 structures
150 feet of US Highway 89	260 structures
330 feet of US Highway 89	602 structures
½ mile of US Highway 89	2,337 structures
1 mile of US Highway 89	3,626 structures
500 feet of the Railroad	446 structures
2,000 feet of the Railroad	2,730 structures
1.4 miles of the Railroad	4,577 structures
5 miles of the Railroad	5,303 structures
150 feet of the Yellowstone Pipeline	25 structures
½ mile of the Yellowstone Pipeline	165 structures

Population

Table 4.9.4C shows the estimated population within each of the buffer zones. These estimates are based on 1.64 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. 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.

Table 4.9.4C Population Vulnerabilities to Hazardous Material Releases

Within Buffer Zone	Estimated Number of Structures	Estimated Population
150 feet of Interstate 90	4 structures	7 people
330 feet of Interstate 90	23 structures	38 people
½ mile of Interstate 90	739 structures	1,212 people
1 mile of Interstate 90	2,882 structures	4,726 people
150 feet of US Highway 89	260 structures	426 people
330 feet of US Highway 89	602 structures	987 people
½ mile of US Highway 89	2,337 structures	3,833 people
1 mile of US Highway 89	3,626 structures	5,947 people
500 feet of the Railroad	446 structures	731 people
2,000 feet of the Railroad	2,730 structures	4,477 people
1.4 miles of the Railroad	4,577 structures	7,506 people
5 miles of the Railroad	5,303 structures	8,697 people
150 feet of the Yellowstone Pipeline	25 structures	41 people
½ mile of the Yellowstone Pipeline	165 structures	271 people

Many factors will determine the true hazard area in a transportation related hazardous material release. The worst case scenario would be a release along the railroad near downtown Livingston. Given this scenario, a conservative estimate of 1,000 structures could be directly affected and/or evacuated. With an estimated 1.64 people per structures (and possibly higher for downtown Livingston), approximately 1,640 people would be at greatest risk in such an event.

Values

Temporary business closures and associated business disruption losses may occur with a hazardous material release and losses may be more extensive to include physical losses when explosions are present. Often, the most significant losses occur to ecologic values when such releases occur. Releases that impact a body of water can be especially difficult to manage. Social values such as cancelled activities and emotional impacts related to significant population losses or associated illness are also possible.

Future Development

Much of the future development currently occurring is off of the major road and rail networks in the county. The potential, however, does exist for development of agricultural lands bordering the highways and railroad, particularly in the unincorporated parts of Park County. Very few restrictions are in place to prevent development in these areas. Table 4.9.4D provides the number of private, undeveloped parcels within each of the enhanced risk areas.

Table 4.9.4D Undeveloped Parcel Vulnerabilities to Hazardous Material Releases

Within Buffer Zone	Estimated Number of Parcels
150 feet of Interstate 90	52 parcels
330 feet of Interstate 90	78 parcels
½ mile of Interstate 90	276 parcels
1 mile of Interstate 90	680 parcels
150 feet of US Highway 89	238 parcels
330 feet of US Highway 89	339 parcels
½ mile of US Highway 89	973 parcels
1 mile of US Highway 89	1,400 parcels
500 feet of the Railroad	219 parcels
2,000 feet of the Railroad	591 parcels
1.4 miles of the Railroad	1,155 parcels
5 miles of the Railroad	1,964 parcels
150 feet of the Yellowstone Pipeline	80 parcels
½ mile of the Yellowstone Pipeline	187 parcels

Vulnerabilities and Impacts

Table 4.9.4E Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities	<ul style="list-style-type: none"> ▪ Critical functional losses 	<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical data losses ▪ Clean-up/debris removal costs 	Low-Moderate
All	Critical Infrastructure	<ul style="list-style-type: none"> ▪ Road closures 	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Loss of electricity ▪ Loss of utility gas ▪ Loss of potable water 	Low-Moderate
All	Existing Structures	<ul style="list-style-type: none"> ▪ Displacement/functional losses 	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Structural losses ▪ Contents losses ▪ Clean-up/debris removal costs 	Low-Moderate
All	Population	<ul style="list-style-type: none"> ▪ Illness ▪ Injuries ▪ Fatalities 		High
All	Values	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Agricultural losses ▪ Habitat damages ▪ Reduced air quality ▪ Reduced water quality ▪ Soil contamination ▪ Cancellation of activities ▪ Restrictions on activities 	<ul style="list-style-type: none"> ▪ Service industry losses ▪ Biodiversity losses ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Emotional impacts ▪ Aesthetic value losses 	Moderate-High
All	Future Structures	<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Nearly 2,000 parcels available for development ▪ Increases the total hazard exposure 		Moderate

* in addition to probable (100-year) impacts

4.9.5 Data Limitations

Data limitations include:

- Estimating what substances and the quantity that may be released in any given location.
- Lack of a study with the numbers and types of hazardous materials being hauled on the interstate, railroad, and highways in the county.
- Digital mapping of fixed facilities housing significant amounts of hazardous materials would allow for more detailed analysis of impacts related to releases at those facilities.

4.10 Railroad Accident

Table 4.10A Hazard Summary for Park County

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	Very limited history of significant railroad incidents.
Vulnerability	Low	Most structures are located outside the immediate railroad vicinity.

Table 4.10B Hazard Summary for the City of Livingston

Overall Hazard Rating	Low	
Probability of High Impact Event	Low-Moderate	Limited history of significant railroad incidents.
Vulnerability	Low-Moderate	A few structures are located within close proximity to the railroad.

Table 4.10C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Not Applicable	
Probability of High Impact Event		
Vulnerability		

Table 4.10D Federal Major Disaster and Emergency Declarations

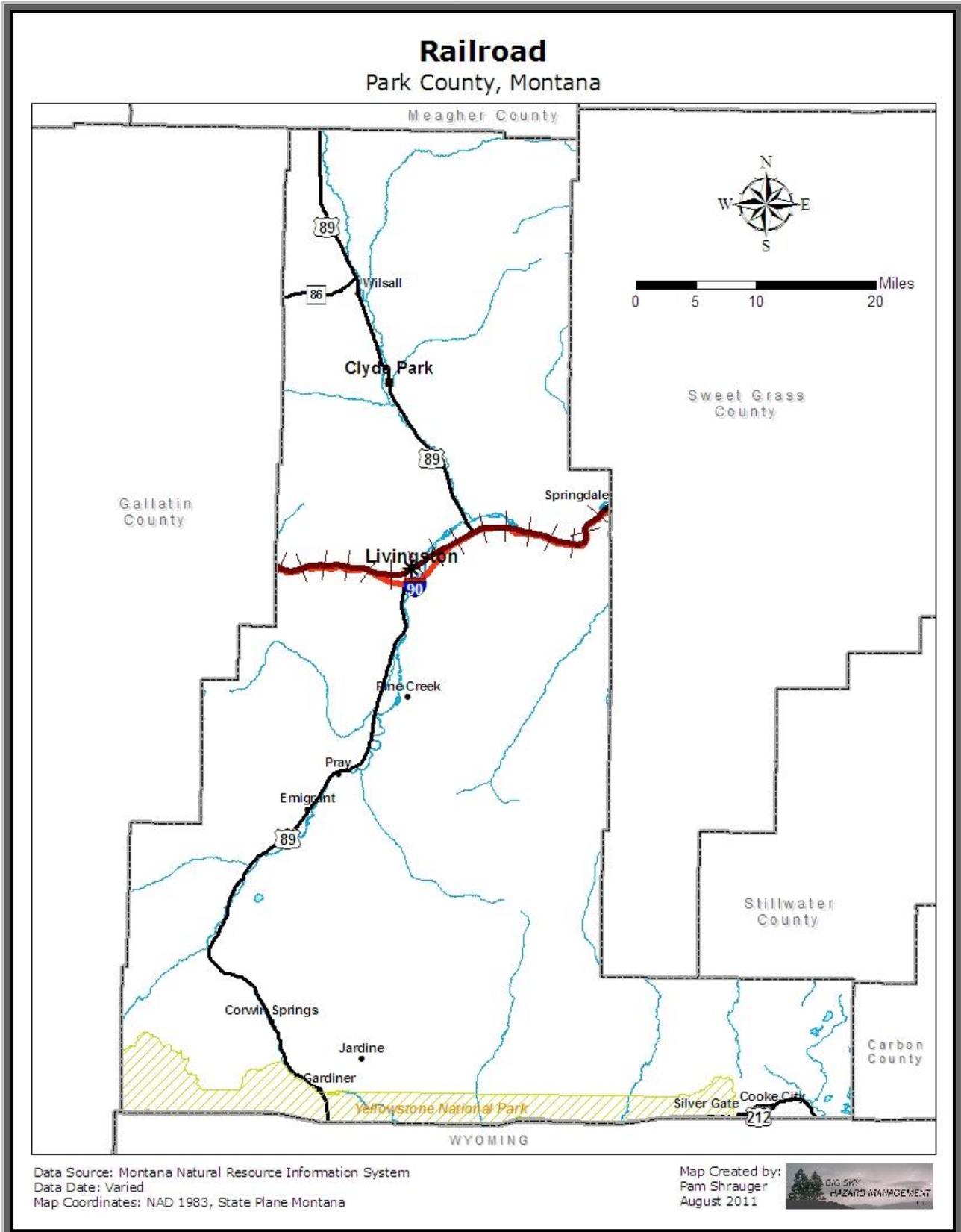
Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.10.1 Description

Goods, including hazardous materials, are transported by Montana Rail Link (MRL) via the rail network across Park County in an east-west direction, roughly parallel to Interstate 90 and passing through the City of Livingston. A very short segment runs from RY Timber to this main line. MRL is a Federal Railroad Administration Class II regional railroad with more than 900 miles of track serving 100 stations in the states of Montana, Idaho and Washington, and employs approximately 900 people. MRL connects with Spokane, Washington, the Burlington Northern & Santa Fe Railway (BNSF) at Laurel and Garrison, and the Union Pacific Railroad at Sandpoint, Idaho. (Montana Rail Link, 2011) Map 4.10.1A shows the active railroad sections in Park County.

A railroad accident is hazardous to those in close proximity to and inside the train due to physical impacts, but others may be threatened by associated hazards. A hazardous material release is the most probable associated hazard. Those effects are described in detail in the hazardous materials release profile.

Map 4.10.1A



4.10.2 History

The railroads in Park County were operated by Burlington Northern Railroad from 1970 to 1987 until Montana Rail Link assumed control of the route through Southern Montana. Table 4.10.2A outlines the accidents in Park County documented by the Federal Railroad Administration since 1975.

Table 4.10.2A Railroad Accidents in Park County, Montana

Date	Reportable Damage	Casualties	Cause/Effect
07/05/1975	\$5,500	None	Human cause, 1 car derailed
10/24/1976	\$5,235	None	Human caused switch problem, 3 cars derailed
02/16/1977	\$3,900	None	Switch point worn, 3 locomotive derailed
07/22/1978	\$4,125	None	Worn flange, 2 cars derailed
10/31/1978	\$71,000	1 injury	Highway/rail collision
08/09/1979	\$105,000	None	Human caused, head-on collision
07/15/1980	\$13,420	None	Switch point worn, 3 cars derailed
08/16/1980	\$4,582	None	Roadbed settled, 3 locomotives derailed
12/20/1980	\$6,350	None	Horizontal split head, 5 cars derailed
06/01/1981	\$15,550	None	Damaged switch, 5 cars derailed
09/07/1981	\$9,000	None	Track vandalism, 4 cars derailed
11/24/1981	\$5,850	None	Human caused train handling, 5 cars derailed
02/04/1982	\$8,050	None	Movement with air hose uncoupled, 14 cars derailed
12/07/1985	\$201,500	None	Engine improperly secured, 1 locomotive derailed
12/28/1988	\$17,500	None	Head and web separation, 5 cars derailed, 2 carrying hazardous materials, both derailed, one released 10-20 gallons of No. 5 fuel oil
04/01/1989	\$21,000	None	Soft track, 3 cars derailed
05/02/1989	\$6,000	None	Human caused improper run through switch, 3 locomotives derailed
02/20/1990	\$7,000	None	Wide gauge from poor tie condition, 2 locomotives derailed
09/22/1990	\$11,600	None	Brake not set, loaded coal train rolled backwards, 1 car derailed
11/29/1990	\$526,000	None	High winds blew trailers and containers off the track, 13 cars derailed
05/04/1992	\$7,615	None	Use of out-of-service track, 3 cars derailed
11/12/1992	\$7,200	None	Wide gauge at joint and soft track, 2 cars derailed, 5 cars carrying hazardous materials, none derailed
11/14/1992	\$13,800	None	Broken angle bar at switch point, 4 cars derailed
09/09/1993	\$23,500	None	Wide gauge, 5 cars derailed
10/29/1993	\$30,000	1 injury	Rear-end collision of single cars
08/07/1995	\$7,000	None	Human error, collision while switching
04/12/1996	\$19,500	None	Wide gauge, 8 cars derailed

Table 4.10.2A Railroad Accidents in Park County, Montana (continued)

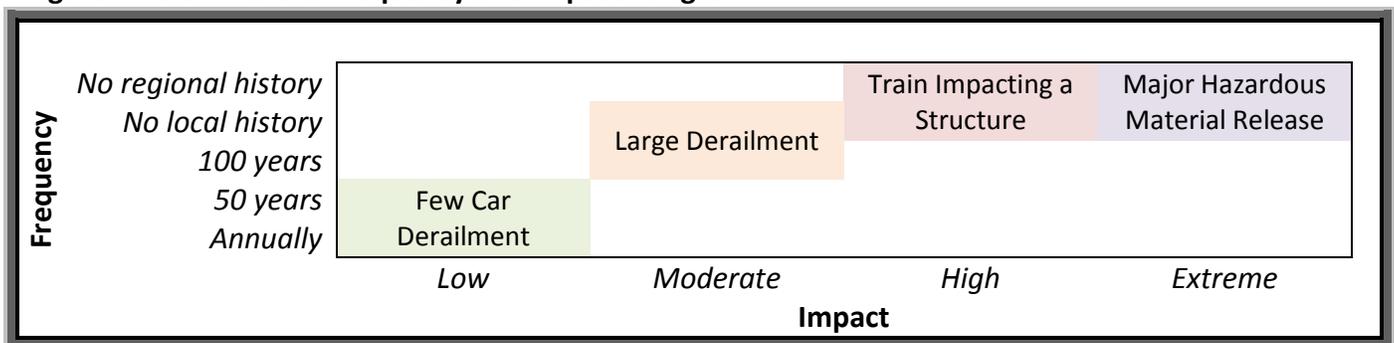
Date	Reportable Damage	Casualties	Cause/Effect
10/22/1996	\$16,000	None	Switch point defect, 2 cars derailed, 14 cars carrying hazardous materials - none of which derailed
09/11/1997	\$10,200	None	Yard overloaded, cars collided
12/05/1998	\$12,650	None	Wide gauge, 3 locomotives derailed
05/25/2002	\$12,000	None	Brakes released by vandals, 3 cars derailed
08/07/2003	\$18,000	None	Worn switch point, 2 cars derailed
01/07/2004	\$18,091	None	Snow and ice raised rubber material at Fifth Street Crossing, damaging snow plow, and became stuck under the third car
12/11/2004	\$320,000	None	Worn switch point, empty grain car derailed and collided with train, 7 cars derailed, 23 cars carrying hazardous materials - none of which derailed
09/21/2008	\$36,102	None	Hand brake not secured, 1 car containing hazardous materials derailed but did not release
10/08/2008	\$27,000	None	Grain train doubled back together, 3 cars derailed
02/13/2011	\$48,500	None	Excessive horsepower, 4 cars derailed

Source: Federal Railroad Administration, 2011.

4.10.3 Probability and Magnitude

Since 1975, 37 railroad accidents have occurred resulting in \$1,675,320 in track and equipment damages and 2 injuries. Using this historical record, on average, a railroad accident occurs about once per year (37 accidents / 37 years) in Park County. The average accident causes \$45,279 (\$1,675,320 / 37 accidents) in damage; however, the range over the past 37 years has been from \$3,900 to \$526,000. Another important consideration in a railroad accident is the release of hazardous materials. The historical record shows this has only occurred once in the past 37 years, but the potential certainly exists as demonstrated by the number of hazardous material cars involved, but not damaged, in railroad accidents.

Figure 4.10.3A Hazard Frequency and Impact Ranges



4.10.4 Vulnerabilities

Methodology

Since the location and probability of a significant railroad accident is extremely difficult to determine, two scenarios were used to determine potential losses. The first is a large derailment causing road closures and extended clean-up efforts. The second is a derailment and collision with two structures, resulting in casualties and structural losses.

Exposure

Critical Facilities and Infrastructure

Park County critical facilities are not to be considered at enhanced risk from a railroad accident. All critical facilities and vulnerable populations are more than 250 feet from the tracks.

Most of the losses from a railroad accident are paid for by Montana Rail Link or their insurance. Potential community losses are most probable to infrastructure such as roadways. Should a derailment occur on a state, county, or city road, that road could be unusable for several days or weeks. Staff time in coordinating the clean up or response could be considered additional railroad accident losses.

Existing Structures

In terms of structures that could be impacted by a derailment, 107 structures are within 250 feet of the railroad. Most accidents would probably only impact one or two structures. Damages could vary in the hundreds of thousands of dollars depending on the structure or structures impacted.

Population

Since the active railroad in Park County no longer serves passengers, the potential for high casualties from the impact of a railroad accident is low. The potential certainly exists, however, for casualties to railroad workers and those in the general vicinity, especially since the trains pass by community parks and near downtown Livingston.

Values

Economic losses due to a train derailment are possible. Emotional impacts, such as a fear of trains, may occur should an accident result in the loss of life.

Future Development

Future development should have little to no impact on the railroad accident hazard. Most development is occurring in areas away from the railroad's immediate impact area. Little restrictions are in place, however, to prevent such development.

Vulnerabilities and Impacts

Table 4.10.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Park County Livingston	Critical Facilities		• \$0 losses	Low
Park County Livingston	Critical Infrastructure	• Road closures		Low
Park County Livingston	Existing Structures		<ul style="list-style-type: none"> • \$200,000 losses • Structural losses • Contents losses • Displacement/functional losses • Clean-up/debris removal costs 	Low-Moderate
Park County Livingston	Population		<ul style="list-style-type: none"> • Injuries • Fatalities 	Low-Moderate
Park County Livingston	Values		<ul style="list-style-type: none"> • Business disruption losses • Historic structure losses • Historic site losses • Historic item losses • Emotional impacts • Cancellation of activities • Restrictions on activities • Aesthetic value losses 	Low-Moderate
Park County Livingston	Future Structures		<ul style="list-style-type: none"> • Somewhat likely to occur in hazard areas • Increases the total hazard exposure 	Low-Moderate

* in addition to probable (100-year) impacts

4.10.5 Data Limitations

Data limitations include:

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

4.11 Severe Thunderstorms and Tornadoes

Table 4.11A Hazard Summary for Park County

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	History of large hail, strong winds, and tornadoes.
Vulnerability	Moderate-High	Critical infrastructure and structures are vulnerable, especially those not built to building code standards.

Table 4.11B Hazard Summary for the City of Livingston

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	History of large hail, strong winds, and tornadoes in the area.
Vulnerability	Moderate	Critical infrastructure and structures are vulnerable.

Table 4.11C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	History of large hail, strong winds, and tornadoes in the area.
Vulnerability	Moderate-High	Critical infrastructure and structures are vulnerable, especially those not built to building code standards.

Table 4.11D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.11.1 Description

Severe thunderstorms and tornadoes can be hazardous under the right conditions and locations. Thunderstorms in Montana develop when moisture in the air rises, often from daytime ground heating, an unstable atmospheric condition, synoptic front, or by terrain uplift, and cools higher in the atmosphere, condensing into rain droplets or ice crystals. The cloud grows as these conditions continue and the atmospheric instability allows. Lightning can be produced, with or without rain, as a charge builds up in the cloud. With the right atmospheric conditions, updrafts and downdrafts form in the thunderstorm structure. These strong updrafts and downdrafts can produce hail, strong straight-line winds, and even tornadoes. Strong thunderstorm 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.

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 4.11.1A.

Table 4.11.1A Tornado Scales

Fujita Scale		Enhanced Fujita Scale	
Scale	Estimated Wind Speed	Scale	Estimated Wind Speed
F0	<73 mph	EF0	65-85 mph
F1	73-112 mph	EF1	86-110 mph
F2	113-157 mph	EF2	111-135 mph
F3	158-206 mph	EF3	136-165 mph
F4	207-260 mph	EF4	166-200 mph
F5	261-318 mph	EF5	>200 mph

Source: Storm Prediction Center, 2011.

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 one inch or greater in diameter is considered “severe” by the National Weather Service. Hail up to 1.75 inches in diameter, as big as a golf ball, has been reported in Park County. Nationally, hailstorms cause nearly \$1 billion in property and crop damage annually, as peak activity coincides with peak agricultural seasons. Major hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life.

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. Thunderstorm winds of 58 miles per hour (mph) or greater are considered “severe” by the National Weather Service. 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.

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, 2011b)

4.11.2 History

Severe weather reports are collected from weather observing stations and trained spotters by the National Weather Service (NWS) office in Billings. 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 areas and areas lacking trained spotters.

Tornadoes

Since 1950, only one tornado has been reported in Park County, but the tornado was strong, an EF2 with winds to 120 mph and caused significant damage northeast of Wilsall. The tornado touched down on July 2, 2010 at about 3:45 p.m. and traveled about 2 miles from 14 miles northeast of the Wilsall Airport to 16 miles northeast and had a width of about 150 yards. Much of the damage occurred from a surrounding microburst and large hail in the foothills of the Crazy Mountains. Thousands of trees were damaged, uprooted, or snapped off at the base. Property damage was estimated at \$32.5 million. (National Climatic Data Center, 2011) Note that in 2011, a tornado was reported near Clyde Park but has not been officially recorded yet.

Although tornadoes are not common in Park County, in nearby Yellowstone National Park just to the south, an F4 tornado (207-260 mph) formed on July 21, 1987. The Teton-Yellowstone Tornado, as it was named, was 1.5 miles wide and traveled for 24 miles. The tornado crossed the Continental Divide at an elevation of 10,072 feet. (Fujita, 1989)

Hail

Since 1950, 14 severe hail reports (1 inch or greater) have been recorded in Park County with a recurrence interval of about 4-5 years. Using only data from 2000-2010 since severe weather reporting and documentation has improved over time, 11 severe hail reports (1 inch or greater) have been recorded in Park County with an annual average of about one severe hail events per year. Table 4.11.2A lists the severe hail events of 1 inch in diameter or greater.

Table 4.11.2A Severe Hail Reports

Location	Date	Size	Impacts
Park County	07/29/1973	1.00 inch	
Livingston	07/18/1997	1.75 inches	
Livingston, 12 miles SW	08/18/1997	1.00 inch	
Emigrant, 3 miles N	06/29/2002	1.00 inch	
Livingston, 5 miles W	06/27/2005	1.00 inch	
Livingston, 1 mile S	08/16/2006	1.00 inch	
Pine Creek, 3 miles S	08/17/2006	1.00 inch	
Livingston Airport, 4 miles ESE	05/13/2007	1.00 inch	
Hunter Hot Springs, 7 miles NW	06/30/2010	1.75 inches	
Clyde Park	06/30/2010	1.00 inch	
Clyde Park, 4 miles SE	06/30/2010	1.50 inches	Windows broken.
Grannis, 3 miles N	06/30/2010	1.00 inch	
Grannis, 4 miles N	06/30/2010	1.50 inches	
Clyde Park, 4 miles SE	07/01/2010	1.50 inches	

Source: National Climatic Data Center, 2011.

Downbursts

Since 1950, 83 severe thunderstorm wind reports (58 mph or greater) have been recorded in Park County with an annual average of 1-2 severe thunderstorm wind events per year. Using only data from 2000-2010 since severe weather reporting and documentation has improved over time, 31 severe thunderstorm wind reports (58 mph or greater) have been recorded in Park County with an annual average of 2.8 severe thunderstorm wind events per year. Table 4.11.2B lists the severe thunderstorm wind events of 75 mph or greater or causing damages.

Table 4.11.2B Severe Thunderstorm Wind Reports of 75 mph or Greater or Causing Damages

Location	Date	Speed	Impacts
Park County	07/31/1967	78 mph	
Park County	07/11/1973	79 mph	
Park County	07/06/1983	100 mph	
Park County	05/13/1988	81 mph	
Livingston, 18 miles S	06/25/1994	Unknown	Trees blown down at Pine Creek Camp Ground. One vehicle damaged by a falling tree. \$5,000 estimated property damage.
Livingston, 6 miles S	08/24/1995	Unknown	Large trees blown down. One person injured by falling tree. Campers trapped by fallen trees across the road.
Wilsall, 8 miles ENE	07/17/1997	61 mph	Power lines knocked down.
Livingston	06/22/2005	78 mph	Extensive damage to roofs, semi trailers blown over, and power outages.
Livingston, 2 miles NE	06/22/2005	92 mph	
Livingston, 12 miles SW	08/17/2005	81 mph	Large tree knocked down across a driveway.

Table 4.11.2B Severe Thunderstorm Wind Reports of 75 mph or Greater or Causing Damages (continued)

Location	Date	Speed	Impacts
Wilsall, 8 miles ENE	07/22/2008	70 mph	Wooden shed and tree blown onto a county road.
Clyde Park	07/22/2008	70 mph	Scattered power outages.
Pine Creek, 3 miles SSW	07/31/2010	75 mph	Large tree hit part of a home roof. Two large treetops broken, one landed on power lines, another on a camper.

Source: National Climatic Data Center, 2011.

4.11.3 Probability and Magnitude

Generally, June, July, and August are the months when the probability of severe thunderstorms in Park County is highest, but some have been recorded as early as April and as late as September. Table 4.11.3A shows a summary of the severe thunderstorm and tornado events.

Table 4.11.3A Severe Thunderstorm and Tornado Events Historical Summary 2000-2010

Event Type	Park County
<i>Reported Tornadoes</i>	1 event Highest Magnitude: EF2 1 damaging event \$32,500,000 property damage
<i>Reported Severe Hail</i>	11 events Highest Magnitude: 1.75" 1 damaging event Unknown property damage
<i>Reported Severe Thunderstorm Winds</i>	31 events Highest Magnitude: 92 mph 5 damaging events Unknown property damage

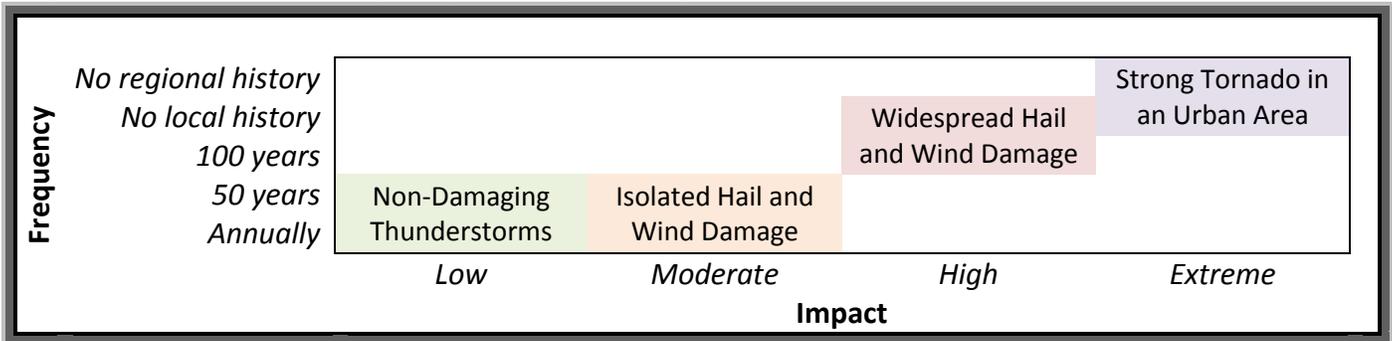
Source: National Climatic Data Center, 2011.

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

- In an average 10 year period, 1 tornado (perhaps less given the broader historical record).
- In an average year, 1 severe hail event.
- In an average year, 3 severe thunderstorm wind events.

The Federal Emergency Management Agency places this region in Zone II (160 mph) for structural wind design. (Federal Emergency Management Agency, 2008)

Figure 4.11.3B Hazard Frequency and Impact Ranges



4.11.4 Vulnerabilities

Methodology

Severe thunderstorms and tornadoes are a threat to all areas of the county, and therefore, specific hazard areas are not applicable. Therefore, for the purposes of assessing the vulnerabilities, a 100-year event of large hail and strong winds damaging property was used as a scenario for each jurisdiction. For a 500-year event, a tornado in a populated area was considered.

Exposure

Critical Facilities and Infrastructure

All critical facilities and vulnerable populations are considered to have the same vulnerability to severe thunderstorms and tornadoes, unless specific reinforcements have been made to protect them from strong winds. 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, 2008) Most structures should be able to provide adequate protection from hail but the structures could suffer broken windows, damaged roofs, and dented exteriors.

The Storm Prediction Center has developed damage indicators to be used with the Enhanced Fujita Scale for different types of buildings. Table 4.11.4A shows the indicators for institutional buildings.

Table 4.11.4A Institutional Buildings

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	59-88 mph (72 mph)
Loss of roof covering (<20%)	72-109 mph (86 mph)
Damage to penthouse roof and walls, loss of rooftop HVAC equipment	75-111 mph (92 mph)
Broken glass in windows or doors	78-115 mph (95 mph)

Table 4.11.4A Institutional Buildings (continued)

Damage Description	Wind Speed Range (expected in parentheses)
Uplift of lightweight roof deck and insulation, significant loss of roofing material (>20%)	95-136 mph (114 mph)
Façade components torn from structure	97-140 mph (118 mph)
Damage to curtain walls or other wall cladding	110-152 mph (131 mph)
Uplift of pre-cast concrete roof slabs	119-163 mph (142 mph)
Uplift of metal deck with concrete fill slab	118-170 mph (146 mph)
Collapse of some top story exterior walls	127-172 mph (148 mph)
Significant damage to building envelope	178-268 mph (210 mph)

Source: Storm Prediction Center, 2011.

Above ground infrastructure, namely overhead power lines, communications towers and lines, and structures, are very susceptible to severe thunderstorms and tornadoes. High winds and falling trees can damage this type of infrastructure and disrupt services. Table 4.11.4B shows the Enhanced Fujita Scale Damage Indicators for electric transmission lines.

Table 4.11.4B Electrical Transmission Lines

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	70-98 mph (83 mph)
Broken wood cross member	80-114 mph (99 mph)
Wood poles leaning	85-130 mph (108 mph)
Broken wood poles	98-142 mph (118 mph)
Broken or bent steel or concrete poles	115-149 mph (138 mph)
Collapsed metal truss towers	116-165 mph (141 mph)

Source: Storm Prediction Center, 2011.

Existing Structures

With the entire county at risk from severe thunderstorms and tornadoes, estimates of damages are hard to determine. Realistically, an event involving a tornado or severe thunderstorm would most likely significantly affect only a small area. A large hail and strong wind event damaging the roofs, siding, and windows of 100 homes, estimating a loss of approximately 25% of the structure’s value, losses would be about \$2,447,500 (100 homes x \$97,900/home x 25% damage). A tornado through the same community causing structural damage with a loss of approximately 50% of the structure’s value, losses would be about \$4,895,000 (100 homes x \$97,900/home x 50% damage)

Tables 4.11.4C and 4.11.4D show the damage indicators for various types of residential and ranch structures. In Park County, 1,307 residences are mobile homes, including 148 in Livingston and 47 in Clyde Park. (Montana Census and Economic Information Center, 2011)

Table 4.11.4C One and Two Family Residences

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	53-80 mph (65 mph)
Loss of roof covering material (<20%), gutters, and/or awning; loss of vinyl or metal siding	63-97 mph (79 mph)
Broken glass in doors and windows	79-114 mph (96 mph)
Uplift of roof deck and loss of significant roof covering material (>20%); collapse of chimney; garage doors collapse inward; failure of porch or carport	81-116 mph (97 mph)
Entire house shifts off foundation	103-141 mph (121 mph)
Large sections of roof structure removed, most walls remain standing	104-142 mph (122 mph)
Top floor exterior walls collapsed	113-153 mph (132 mph)
Most interior walls of top story collapsed	128-173 mph (148 mph)
Most walls collapsed in bottom floor, except small interior rooms	127-178 mph (152 mph)
Total destruction of entire building	142-198 mph (170 mph)

Source: Storm Prediction Center, 2011.

Table 4.11.4D Single Wide Manufactured Homes

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	51-76 mph (61 mph)
Loss of shingles or partial uplift of one-piece metal roof covering	61-92 mph (74 mph)
Unit slides off block piers but remains upright	72-103 mph (87 mph)
Complete uplift of roof, most walls remain standing	73-112 mph (89 mph)
Unit rolls on its side or upside down, remains essentially intact	84-114 mph (98 mph)
Destruction of roof and walls leaving floor and undercarriage in place	87-123 mph (105 mph)
Unit rolls or vaults, roof and walls separate from floor and undercarriage	96-128 mph (109 mph)
Undercarriage separates from unit, rolls, tumbles, and is badly bent	101-136 mph (118 mph)
Complete destruction of unit, debris blown away	110-148 mph (127 mph)

Source: Storm Prediction Center, 2011.

Population

The National Weather Service in Billings warns for severe thunderstorms and tornadoes when recognized on Doppler radar or by other means. The warnings are broadcast over NOAA weather radio and may be transmitted over television scrolls and cable networks such as the Weather Channel. Some events have 15-20 minutes warning time and others have little to no warning. Depending on the effectiveness of the warning reaching the population, those at greatest risk may or may not receive the warning and take precautionary measures. NOAA weather radio transmitters are located in Livingston and Mammoth, and those with specially built receivers can be alerted to weather hazards rapidly. The numerous campgrounds in the National Forests become particularly vulnerable populations if the

warnings are not received. Depending on the significance of the storm, much of the population can be at risk if they do not take appropriate action.

Mobile homes, even if tied down, and automobiles are not safe places to be during a tornado. With 1,307 mobile homes in Park County, approximately 2,143 people (1.64 people/structure x 1,307 structures) 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.

Values

Severe thunderstorms and tornadoes can cause economic losses such as business closures and associated disruption losses and crop and livestock losses. Often, the agriculture losses can be the most significant. Historic values may also be lost if a historic structure is damaged. Population losses may also lead to lasting emotional impacts.

Future Development

The severe thunderstorm and tornado risk is assumed to be uniform countywide. Therefore, the location of development does not increase or reduce the risk necessarily. Park County and the Town of Clyde Park lack building codes, and therefore, new development might not be built to current standards for wind resistance. Building codes adopted and enforced within the City of Livingston decrease the threat to future development from severe thunderstorms and tornadoes.

Vulnerabilities and Impacts

Table 4.11.4E Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities	<ul style="list-style-type: none"> ▪ \$250,000 losses 	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses ▪ Clean-up/debris removal costs 	Moderate
All	Critical Infrastructure	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Loss of electricity 	<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Road closures ▪ Loss of potable water ▪ Loss of sanitary sewers ▪ Loss of telephone service ▪ Loss of internet service 	Moderate-High

Table 4.11.4E Hazard Vulnerabilities and Impacts (continued)

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Existing Structures	<ul style="list-style-type: none"> ▪ \$2,500,000 losses 	<ul style="list-style-type: none"> ▪ \$5,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	Moderate-High
All	Population	<ul style="list-style-type: none"> ▪ Injuries 	<ul style="list-style-type: none"> ▪ Fatalities 	Moderate
All	Values	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Cancellation of activities ▪ Restrictions on activities ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Service industry losses ▪ Habitat damages ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Emotional impacts 	Moderate-High
Park County Clyde Park	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Lacking building codes to minimize losses 	Moderate
Livingston	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Enforces building codes to minimize losses 	Low-Moderate

* in addition to probable (100-year) impacts

4.11.5 Data Limitations

Data limitations 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.

4.12 Terrorism, Civil Unrest, and Violence

Table 4.12A Hazard Summary for Park County

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	History does not indicate these types of incidents with high impacts are likely.
Vulnerability	Low-Moderate	Critical infrastructure is present throughout the county.

Table 4.12B Hazard Summary for the City of Livingston

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	History does not indicate these types of incidents with high impacts are likely.
Vulnerability	Moderate	Critical facilities and infrastructure exist throughout Livingston.

Table 4.12C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	History does not indicate these types of incidents with high impacts are likely.
Vulnerability	Low	Very few high impact targets exist in Clyde Park.

Table 4.12D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.12.1 Description

Terrorism, civil unrest, and violence 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, nuclear, 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.

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.

Nuclear weapons have the potential for causing catastrophic damage through an explosion and subsequent radiation exposure. Many countries have nuclear capabilities. Such weapons at the control of terrorists could cause significant devastation, particularly in an urban area. Most nuclear threats have been related to international unrest.

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. Forms of civil unrest can range from groups blocking sidewalks, roadways, and buildings to mobs rioting and looting. Civil unrest may be spontaneous, as when a mob erupts into violence, or they may be planned, as when a demonstration or protest intentionally interferes with another individual’s or group’s lawful business.

Most times, terrorist acts, both domestic and international, are driven by a 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. Table 4.12.1A lists several, but not all, types of organizations existing in the United States that could initiate a terrorist incident.

Table 4.12.1A Types of Domestic Hate and Terrorist Organizations and Movements

Type	Description
Anti-Gay	These groups go beyond mere disagreement with homosexuality by subjecting gays and lesbians to campaigns of personal vilification.
Anti-Immigrant	These groups generally attack immigrants as individuals, rather than merely disagreeing with immigration policy. Some have close ties to white supremacist ideas, groups, and individuals.
Black Separatists	They typically oppose integration and racial intermarriage, and they want separate institutions, or even a separate nation, for blacks. Most forms of black separatism are strongly anti-white and anti-Semitic.
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.
Ecoterrorism	These groups aim to end the exploitation of animals and the destruction of the environment, typically by causing damage to the operations of companies in related industries or terrorizing executives and employees of these and associated companies.
General Hate	These groups espouse a variety of hateful doctrines, and this type generally captures those groups not included in another category.
Holocaust Denial	These groups insist that Nazi Germany did not engage in a conscious attempt to commit genocide against European Jews.
Ku Klux Klan	This organization, with its long history of violence, is the most infamous, and oldest, American hate group. Although black Americans have typically been the Klan’s primary target, it has also attacked Jews, immigrants, homosexuals, and, until recently, Catholics.
Militia	This movement consists of right-wing extremist, armed, paramilitary groups with an anti-government, conspiracy-oriented ideology, often with a prominent focus on firearms.
Neo-Confederate	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.
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.
Racist Music	These groups are typically white power music labels that record, publish, and distribute racist music in a variety of genres.
Racist Skinhead	These groups form a particularly violent element of the white supremacist movement. Racist Skinheads often operate in small “crews” that move from city to city with some regularity.
Racist Traditionalist Catholic	These organizations embrace anti-Semitism and the theology is typically rejected by the Vatican and mainstream Catholics in general.

Table 4.12.1A Types of Domestic Hate and Terrorist Organizations and Movements (continued)

Type	Description
Sovereign Citizen	These groups embrace anti-government ideologies and some have white supremacist elements. They often believe that all existing government in the United States is illegitimate and seek to restore an idealized, minimalist government that never actually existed.
Tax Protest	These anti-government groups believe that income taxes are illegitimate and often engage in tax evasion activities and sometimes violence.
White Nationalist	These groups espouse white supremacist or white separatist ideologies, often focusing on the alleged inferiority of non-whites.

Sources: Southern Poverty Law Center, 2011; Anti-Defamation League, 2011.

Montana has traditionally attracted activist/extremist individuals and groups because of its low population and large geographic area. Groups active in Montana vary from white supremacists to single issue groups, such as environmental extremists. These groups are attracted to the state and many of them view Montana as their "home" or safe haven. Because of these views, they commit their illegal activities outside of the state. An example of this would be the Unabomber, Ted Kaczynski. Kaczynski advocated the destruction of technology and the protection of the environment. The Unabomber was responsible for sixteen bombings and three deaths around the United States.

According to the Southern Poverty Law Center Intelligence Project, Neo-Confederate, Neo-Nazi, and Racist Music groups exist in Montana, but none are listed in Park County. (Southern Poverty Law Center, 2011)

The City of Livingston is the most populous part of Park County. This area, with close proximity to hazardous material facilities and government buildings, could be considered the area at greatest risk for terrorism. Domestic and international terrorism can be hard to predict, and therefore, specific targets are not easily identified. National Parks are also considered potential terrorist targets, and therefore, Yellowstone National Park to the south puts Park County communities, particularly Gardiner, in close proximity this potential hazard area.

4.12.2 History

Fortunately, Park County has not been the location of a modern terrorism or civil unrest incident. Significant terrorist incidents occurring in the United States are shown in Table 4.12.2A.

Table 4.12.2A Significant Modern US Terrorist Incidents

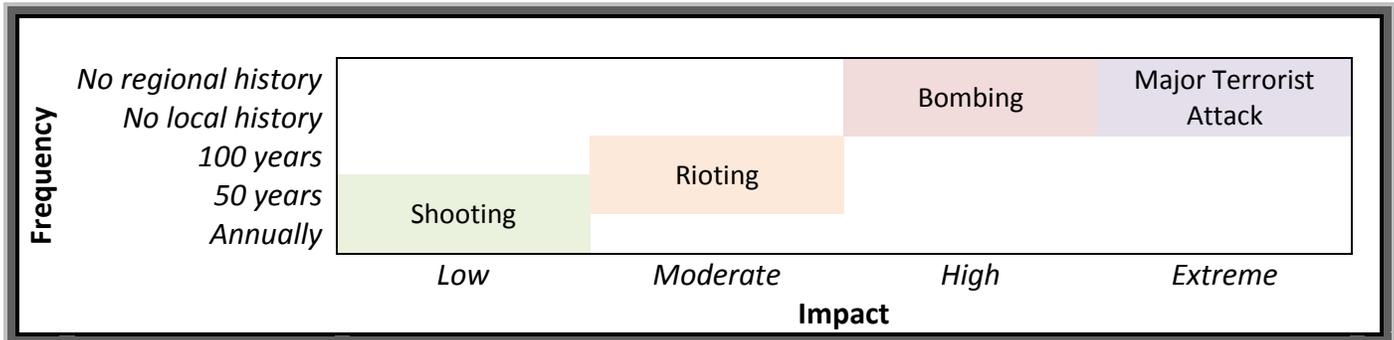
Incident	Date	Description
World Trade Center Bombing	02/29/1993	A bombing in the parking area of the World Trade Center killed 6 and wounded about 1,000. The bombing was organized by the foreign terrorist organization, Al Qaeda.
Oklahoma City Bombing	04/19/1995	Domestic terrorist Timothy McVeigh blew up the Alfred P. Murrah Federal Building in Oklahoma City, killing 168 people and injuring hundreds more.
September 11 th Attacks	09/11/2001	Four commercial planes hijacked by 19 members of the Al Qaeda terrorist organization were intentionally crashed into buildings; two planes hit the World Trade Center buildings in New York City, one into the Pentagon outside Washington, DC, and one into a field in Pennsylvania after passengers stormed the cockpit. Nearly 3,000 people were killed.

Source: Memorial Institute for the Prevention of Terrorism, 2010.

4.12.3 Probability and Magnitude

With very little experience and data locally on this hazard, a specific probability for future terrorism, civil unrest, and violence is hard to determine. Based on the historical record and the terrorism threat present for the area, the probability of a large scale terrorism, civil unrest, or violence event is considered low.

Figure 4.12.3A Hazard Frequency and Impact Ranges



4.12.4 Vulnerabilities

Methodology

Since the location and probability of a terrorism, civil unrest, or violence incident is extremely difficult to determine, two scenarios were used to determine potential losses. The first is the bombing of a critical facility. The second is a major terrorist attack with direct impact on the county.

Exposure

Critical Facilities and Infrastructure

Critical facilities in Park County are considered to be at greatest risk from terrorism, civil unrest, and violence. Often, terrorists target facilities that are highly important for government services and community stability or are particularly vulnerable. Threat data is not specific enough to identify what facilities are most vulnerable, and therefore, all critical facilities are considered to have the same risk countywide. Those facilities with barriers, security, and other forms of protection could be considered to be at lower risk. Most facilities in Park County, however, do not have those protections.

Critical infrastructure often relies on complex and interdependent systems. A major system failure usually has widespread consequences.

Existing Structures

Residential structure losses are possible from terrorism, civil unrest, and violence but are not likely. Often the losses are at critical facilities or to the population. Looting, however, can be commonly found in association with these types of events. Therefore, this hazard places both the population and property at risk. Urban areas, places of public gathering, and important government or economic assets are generally going to be the areas of greatest risk.

Population

The effects of terrorism, civil unrest, and violence are usually felt by the population. The greatest risk is to human lives during times of unrest. Terrorists typically try to make a dramatic impact 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 Park County population.

Values

Depending on the type and location of the incident, economic losses could range from general national economic slowdowns to the destruction of local businesses. Livestock and the environment are additionally at risk from biological, chemical, and radiological attacks.

Future Development

Development should have little to no impact on the terrorism, civil unrest, and violence threat. The exception would be the increase in population and the associated increase of potential losses to life and property within the county. With larger communities around, however, development should have little effect in this regard. Given the goals of eco-terrorists, however, future development could serve as the basis for an event over controversial development.

Vulnerabilities and Impacts

Table 4.12.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities	<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Critical functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical data losses 	Moderate-High
All	Critical Infrastructure	<ul style="list-style-type: none"> ▪ Road closures 	<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Loss of electricity ▪ Loss of utility gas ▪ Loss of potable water ▪ Loss of sanitary sewers ▪ Loss of telephone service ▪ Loss of internet service ▪ Fuel/energy shortages 	Moderate-High
All	Existing Structures	<ul style="list-style-type: none"> ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Structural losses ▪ Contents losses 	Low-Moderate
All	Population	<ul style="list-style-type: none"> ▪ Illness ▪ Injuries ▪ Fatalities 		High
All	Values	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Emotional impacts ▪ Cancellation of activities ▪ Restrictions on activities 	<ul style="list-style-type: none"> ▪ Service industry losses ▪ Agricultural losses ▪ Reduced air quality ▪ Reduced water quality ▪ Soil contamination ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Aesthetic value losses 	Moderate-High
All	Future Structures		<ul style="list-style-type: none"> ▪ Somewhat likely to occur in hazard areas ▪ Increases the total hazard exposure 	Low-Moderate

* in addition to probable (100-year) impacts

4.12.5 Data Limitations

Data limitations include:

- Inability to quantify the probability and magnitude of a terrorist, civil unrest, or violence incident.
- General uncertainties related to how and when future terrorist, civil unrest, and violence incidents may occur.

4.13 Urban Fire

Table 4.13A Hazard Summary for Park County

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	Several critical facilities and businesses present unique firefighting challenges.
Vulnerability	Low-Moderate	Many rural businesses and critical facilities are at risk from urban fires.

Table 4.13B Hazard Summary for the City of Livingston

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate	Livingston has many older downtown buildings that are at enhanced risk from urban fire.
Vulnerability	Moderate	Livingston’s large downtown area could fuel a major urban fire.

Table 4.13C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	Clyde Park has many wooden structures lacking fire suppression systems.
Vulnerability	Moderate	The lack of building codes and structures in close proximity could fuel a significant urban fire.

Table 4.13D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.13.1 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, 2011)

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 Livingston and Gardiner, are especially vulnerable. Clyde Park, although not particularly dense, has primarily older wood construction and is also vulnerable. 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. Some downtown buildings have been retrofitted with sprinklers while others have not. Other older structures in the county such as the buildings at Chico Hot Springs Resort also threaten to be large fire hazards. Businesses with special inventory, such as Golden Ratio Woodworks, south of Emigrant, could also potentially have large fires. Newer resort areas, such as the Crazy Mountain Ranch, still present fire hazards but fortunately have been mitigated significantly through the installation of sprinkler systems.

4.13.2 History

Park County, the City of Livingston, and the Town of Clyde Park have experienced devastating fires for individuals and businesses. Table 4.13.2A list some of the more disastrous urban fires based on fire department records. None of these fires have resulted in a major loss of life.

Table 4.13.2A Large Structure Fires

Date	Location
February 29, 1904	"Post Office Block" in Livingston was destroyed.
August 10, 1969	Grand Hotel Block in Livingston was destroyed. Damages were estimated at \$1 million.
October 26, 1975	Cave Supper Club in downtown Livingston destroyed the city block.
July 14, 1979	A fire at the Chico Hot Springs Resort resulted in approximately \$10,000 in damage.
April 1, 1980	Sumner's Warehouse Carpet and Supply fire caused approximately \$110,000 in damages.
March 22, 1981	Calamity Jane's Gambling Parlour and Saloon in downtown Livingston destroyed that city block.
September 7, 1985	Arsonists destroyed the Livingston Middle School.
November 17, 1985	Gardiner High School was destroyed.
Spring 1995	A propane leak at Chico Hot Springs led to an explosion at the resort. Fortunately, due to the time of the explosion, no one was hurt.
April 2004	An underground liquid propane line at the Crazy Mountain Ranch caught fire, flashed, and continued to burn for two days until all of the propane burned off. Fortunately, no buildings were damaged and losses were confined to just the underground tanks and the liquid to gas converter.

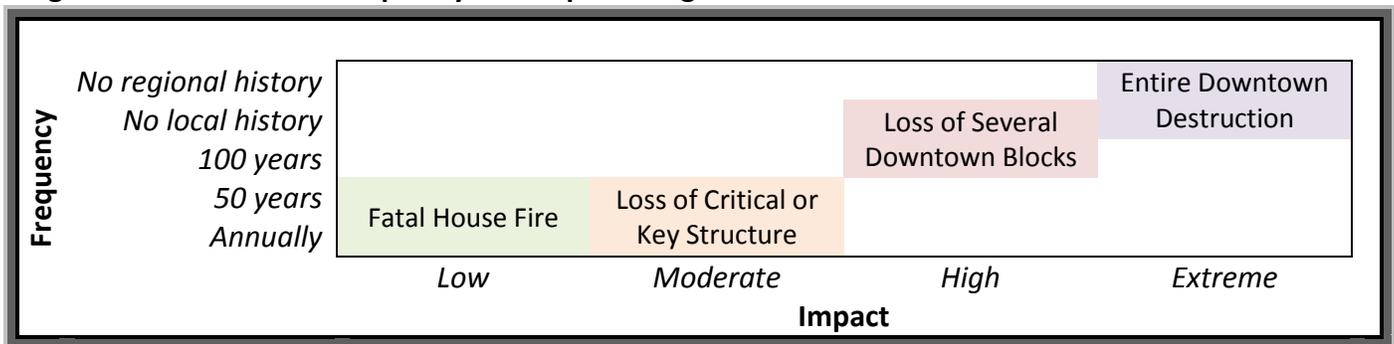
Source: Park County Rural Fire District, 2005.

4.13.3 Probability and Magnitude

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. The fire death rate in 2007 was 9.4 people per million in Montana. The national death rate was 13.2 people per million. (US Fire Administration, 2007)

A realistic yet devastating scenario for Park 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.

Figure 4.13.3A Hazard Frequency and Impact Ranges



4.13.4 Vulnerabilities

Methodology

Since the location and probability of a significant urban fire is extremely difficult to determine, two scenarios were used to determine potential losses. The first is the loss of a critical or important business facility. The second is the loss of several downtown blocks in a Park County community.

Exposure

Critical Facilities and Infrastructure

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. Most critical facilities within the downtown areas of Livingston and Gardiner are sprinklered, and therefore, should not be affected by a large urban fire.

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.

Existing 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 or many structures are lost.

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.

Values

Urban fires often result in significant business disruption losses. Historic values can are also frequently lost in urban fires. The loss of life may result in lasting emotional impacts.

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. In Park County and Clyde Park, some commercial and multi-residential development is regulated with respect to fire regulations, but most new development is not. In the City of Livingston, new development must meet current fire building codes.

Vulnerabilities and Impacts

Table 4.13.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities	<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$500,000 losses 	Moderate

Table 4.13.4A Hazard Vulnerabilities and Impacts (continued)

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Physical losses ▪ Road closures ▪ Loss of electricity ▪ Loss of utility gas ▪ Loss of potable water ▪ Loss of sanitary sewers ▪ Loss of telephone service ▪ Loss of internet service 	Low-Moderate
All	Existing Structures		<ul style="list-style-type: none"> ▪ \$3,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	Moderate
All	Population	<ul style="list-style-type: none"> ▪ Injuries ▪ Fatalities 		Moderate
All	Values	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Reduced air quality ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Emotional impacts ▪ Cancellation of activities ▪ Restrictions on activities 	Moderate
Park County Clyde Park	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Lacking building codes to minimize losses 	Moderate
Livingston	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Enforces building codes to minimize losses 	Low-Moderate

* in addition to probable (100-year) impacts

4.13.5 Data Limitations

Data limitations include:

- Quantifying the risk of urban fires given the unique fire hazards of each structure.

4.14 Utility Outage

Table 4.14A Hazard Summary for Park County

Overall Hazard Rating	Low	
Probability of High Impact Event	Low-Moderate	Limited history of significant utility outages.
Vulnerability	Low-Moderate	Rural residents may become isolated and/or need additional resources during utility outages.

Table 4.14B Hazard Summary for the City of Livingston

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Low-Moderate	Limited history of significant utility outages.
Vulnerability	Moderate	The number of people that would need to be supported adds to utility outage challenges.

Table 4.14C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Low	
Probability of High Impact Event	Low-Moderate	Limited history of significant utility outages.
Vulnerability	Low-Moderate	Some resources may be needed to assist the population but many residents are rather self-sufficient.

Table 4.14D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.14.1 Description

A utility outage is an interruption in the distribution of services or supplies or interruption in the collection of waste materials. Utilities 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.

The public has come to rely upon utility, communication, energy, and fuel services for everyday life and basic survival. Many in Park 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 outage, 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 Park County.

Park County and its communities could experience a number of different types of utility outages. The most likely failures are in the distribution of electricity, natural gas, and gasoline/diesel. These types of outages could prove to be most devastating during the winter months. Winters can be long and very cold. Homes and businesses need heating fuels, while the agriculture industry must have diesel and gasoline in order to keep the farm or ranch operating. During summer months, the agriculture industry again requires large quantities of fuel in order to complete their farming operations.

Electrical service is provided by two power companies. Park Electric Cooperative supplies the county with electricity while NorthWestern Energy is responsible for supplying electricity and natural gas. NorthWestern Energy has two transmission lines crossing the county. Park Electric primarily serves the outlying areas and rural communities of Park County. NorthWestern Energy is responsible for supplying Livingston and areas in close proximity of Livingston. Along with above ground electrical utility lines, Park Electric and NorthWestern Energy have numerous substations. NorthWestern Energy also has a network of underground natural gas lines. Each jurisdiction and/or business is responsible for the care and operation of other utilities including water treatment plants, wastewater treatment plants, and gasoline, diesel, and propane bulk plants.

4.14.2 History

Residents of Park 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.

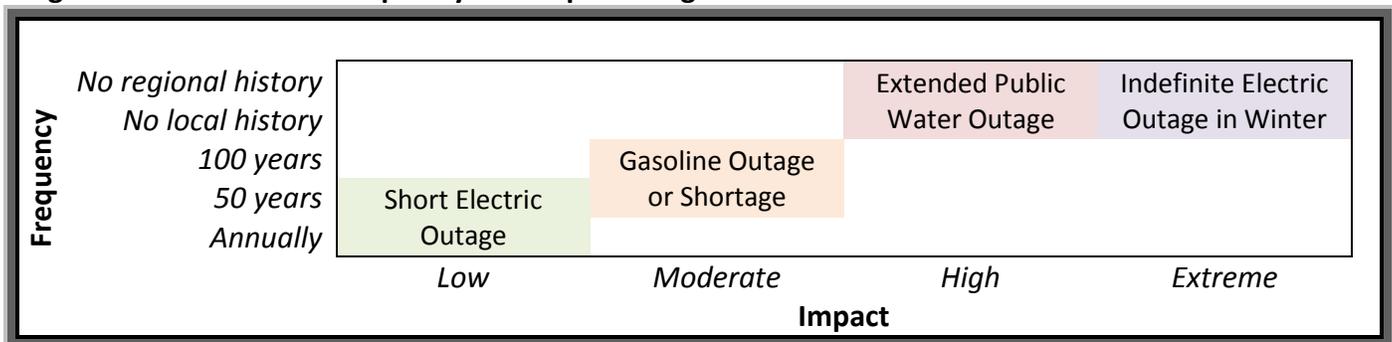
Park County has not experienced gasoline shortages like large metropolitan areas, however, drastic price fluctuations have occurred, thus affecting travel, availability of fuels, and the economics of the county. Increases in gasoline and diesel prices create hardships on consumers, especially those in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

4.14.3 Probability and Magnitude

With a limited history of events, the probability of utility outages 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 outage scenario for Park 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.

Figure 4.14.3A Hazard Frequency and Impact Ranges



4.14.4 Vulnerabilities

Methodology

Since the extent and impacts of a significant utility outage is extremely difficult to determine, two scenarios were used to determine potential losses. The first is the loss of a public water supply for an extended period of time. The second is a long term electric outage during the winter.

Exposure

Critical Facilities and Infrastructure

Most utility outages 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. Some critical facilities do have back-up generators in case of an electricity outage. These facilities include the Livingston City/County Complex which serves as an EOC during times of disaster and provides 911 services. Others, however, may have limited functionality following an event due to a utility failure. 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.

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.

Existing Structures

Similar to critical facilities, structures across the county could be without heat during an electric, 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 outages, but in some cases, direct damages may result.

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, 5,484 people in Park County rely on natural gas for heat, 2,342 rely on propane, and 1,420 rely on electric heat. 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.

Values

Utility outages often result in business disruption losses as most businesses rely on utilities for production, sanitation, or employee well being.

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.

Vulnerabilities and Impacts

Table 4.14.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities	<ul style="list-style-type: none"> ▪ Critical functional losses 	<ul style="list-style-type: none"> ▪ \$0 losses 	Low-Moderate
All	Critical Infrastructure	<ul style="list-style-type: none"> ▪ Loss of electricity ▪ Loss of utility gas ▪ Loss of potable water ▪ Loss of sanitary sewers ▪ Loss of telephone service ▪ Loss of internet service ▪ Fuel/energy shortages 	<ul style="list-style-type: none"> ▪ \$0 losses 	Moderate-High
All	Existing Structures		<ul style="list-style-type: none"> ▪ \$0 losses ▪ Displacement/functional losses 	Low-Moderate
All	Population		<ul style="list-style-type: none"> ▪ Illness ▪ Injuries ▪ Fatalities 	Moderate
All	Values	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Service industry losses ▪ Restrictions on activities 	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Emotional impacts ▪ Cancellation of activities 	Moderate
All	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure 	Low-Moderate

* in addition to probable (100-year) impacts

4.14.5 Data Limitations

Data limitations 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.

4.15 Volcano

Table 4.15A Hazard Summary for Park County

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	Volcano impacts are very unlikely when compared to other hazards.
Vulnerability	Moderate	Areas in southern Park County are at greatest risk from Yellowstone volcanic activity.

Table 4.15B Hazard Summary for the City of Livingston

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	Volcano impacts are very unlikely when compared to other hazards.
Vulnerability	Low-Moderate	Livingston is at risk from volcanic impacts, but building codes reduce the chance of structural damages.

Table 4.15C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Low	
Probability of High Impact Event	Low	Volcano impacts are very unlikely when compared to other hazards.
Vulnerability	Low-Moderate	Clyde Park is at risk from volcanic activity, but is further from Yellowstone than other areas of Park County.

Table 4.15D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.15.1 Description

Park County does not have any known active volcanoes, however, the Yellowstone Caldera within Yellowstone National Park is just south of Park County, 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 500 miles away. This region includes the volcanoes at Mount St. Helens, Mount Rainer, and Mount Hood. Park 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) An eruption of lava could cause widespread havoc in the Park, including fires and the loss of roads and facilities, but more distant areas such as Livingston would probably remain largely unaffected.

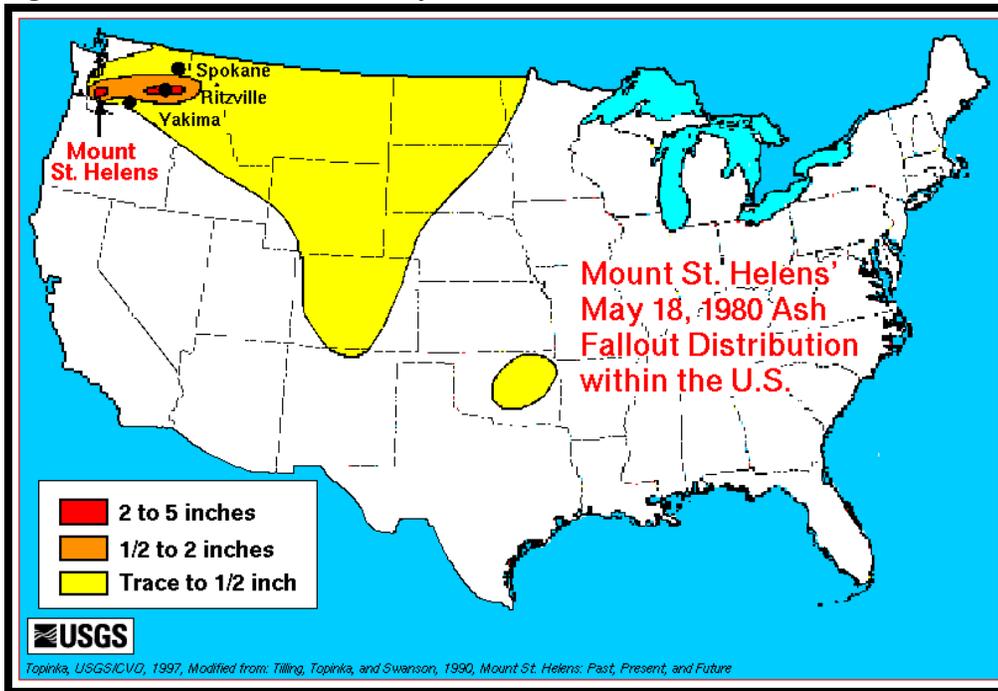
The Cascade Region does not have the same caldera-forming potential as Yellowstone, but has been much more active in recent years. The volcanoes in this region can drop and have dropped measurable ash over Montana. Volcanic ashfall may not sound harmful hundreds of miles away, but depending on the volume 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. Even relatively small amounts of airborne ash can disrupt air travel.

The areas affected by volcanic eruptions are dependent on the type of eruption and the prevailing wind direction. In an actual event, models would be used to predict the areas that would receive ash and other effects from the volcano. Lacking specific eruption data, the county is assumed to have the same risk countywide for a Cascade Range eruption and decreasing risk from south to north for a Yellowstone eruption.

4.15.2 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 Park County, as shown in Figure 4.15.2A. 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 three day period.

Figure 4.15.2A Generalized Map of United States Ashfall from Mount St. Helens



Source: Cascades Volcano Observatory, 2011.

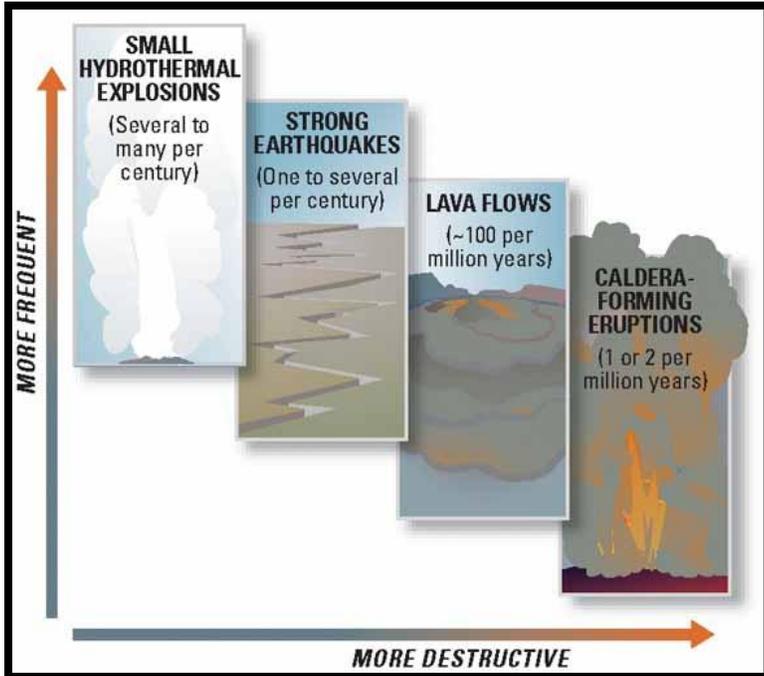
The Yellowstone region has produced three exceedingly large volcanic eruptions in the past 2.1 million years. In each of these cataclysmic events, enormous volumes of magma erupted at the surface and into the atmosphere as mixtures of red-hot pumice, volcanic ash (small, jagged fragments of volcanic 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 Park County now sits.

4.15.3 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. U.S. 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 4.15.3A shows the probability of the various events that can occur in Yellowstone National Park.

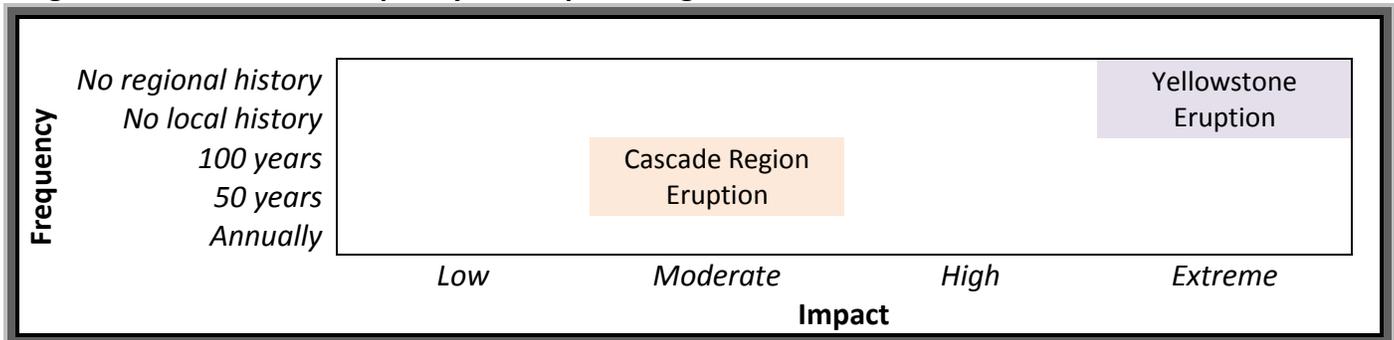
The Cascade region, being more active, has a higher probability of eruptions over the next 100 years. Based on eruptions in the Cascade region over the past 4,000 years, the probability of an eruption is about 1.25% in any given year or approximately 1-2 eruptions per 100 years within the Cascade Range.

Figure 4.15.3A Recurrence Intervals for Geological Events in Yellowstone National Park



Source: US Geological Survey, 2005.

Figure 4.15.3B Hazard Frequency and Impact Ranges



4.15.4 Vulnerabilities

Methodology

Given that volcanic eruptions are such infrequent events, two scenarios were used to determine potential losses. The first is an eruption in the Cascade Region that drops about an inch of ash over Park County. The second is an eruption of the Yellowstone Caldera causing catastrophic damage.

Exposure

Critical Facilities and Infrastructure

All critical facilities are at risk from volcanic eruptions. The impact on the facilities will depend on the amount of ash that falls and the ability to remove it. Significant amounts of ash have the potential to clog air systems and shut down facilities. Given enough wet, heavy ash, the potential exists for roofs to fail. Infrastructure exposed to the ash fall, such as power systems, could be brought down by the ash as well. The removal of ash from government facilities and infrastructure could potentially create costs beyond the community's capabilities. 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. Therefore, all critical facilities and vulnerable populations are vulnerable to ash fall.

Existing Structures

During Mount St. Helens' 1980 eruption, the greatest costs came from the difficult task of removing volcanic ash. The greatest threat is not necessarily to people or residences but to property such as vehicles and equipment. The volcanic dust is corrosive to metals and without proper removal can certainly cause damages to property. In a Yellowstone eruption, the potential for heavy, wet ash could threaten structures by collapsing roofs. The probability of an event of this magnitude is very low.

Population

Light ash fall does not significantly impact the population if those with respiratory sensitivities remain indoors. Ash fall conditions that exist for several days, however, could lead to significant health problems for many in Park County. The extremely rare major Yellowstone eruption could lead to deaths to those close to the Park from pyroclastic flows and extreme amounts of falling ash. The degree of population impacts will greatly vary depending on the type of event.

Values

The economy, particularly the tourist economy, could be severely affected should an eruption occur or be imminent.

Future Development

Future development will have little to no effect on the volcano hazard. Any new development will be exposed to the volcano hazards of Park County and increase the population and property values at risk. Building codes in the City of Livingston may decrease the probability of structure failures.

Vulnerabilities and Impacts

Table 4.15.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities	<ul style="list-style-type: none"> ▪ Critical functional losses ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical data losses 	Low-Moderate
All	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$5,000,000 losses ▪ Road closures ▪ Loss of electricity ▪ Loss of potable water ▪ Loss of telephone service ▪ Loss of internet service 	Moderate
All	Existing Structures	<ul style="list-style-type: none"> ▪ Clean-up/debris removal costs 	<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses 	Low-Moderate
All	Population	<ul style="list-style-type: none"> ▪ Illness 	<ul style="list-style-type: none"> ▪ Injuries ▪ Fatalities 	Moderate
All	Values	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Habitat damages ▪ Reduced air quality ▪ Reduced water quality ▪ Soil contamination ▪ Restrictions on activities ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Service industry losses ▪ Biodiversity losses ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Emotional impacts ▪ Cancellation of activities 	Moderate-High
Park County Clyde Park	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Lacking building codes to minimize losses 	Low-Moderate
Livingston	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Enforces building codes to minimize losses 	Low

* in addition to probable (100-year) impacts

4.15.5 Data Limitations

Data limitations include:

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

4.16 Wildfire

Note: Some information for this hazard profile was summarized from the Park County Community Wildfire Protection Plan dated December 2009. The Park County Community Wildfire Protection Plan remains an important stand-alone document and provides additional detail regarding the wildfire hazard and response capabilities in the county.

Table 4.16A Hazard Summary for Park County

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate-High	Regular occurrence of large wildfires.
Vulnerability	Moderate-High	Structures, critical facilities, critical infrastructure, and future development are all at risk from wildfires.

Table 4.16B Hazard Summary for the City of Livingston

Overall Hazard Rating	Low	
Probability of High Impact Event	Low-Moderate	Infrequent occurrence of damaging wildfires.
Vulnerability	Low-Moderate	Most structures within Livingston are not at high or even moderate risk of wildfires.

Table 4.16C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	Wildfire threatening Clyde Park is possible, but historically has not happened.
Vulnerability	Moderate	All structures, critical facilities, and critical infrastructure within Clyde Park are exposed to moderate wildfire hazard.

Table 4.16D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
FEMA-DR-1340	2000	Individual Assistance for nearly the entire state	None	\$11,579,000 federal assistance statewide
FEMA-FSA-2321	2000	Fire Suppression Assistance	None	\$18,783 in federal assistance to Park and Gallatin Counties \$91,940 in federal assistance to MT DNRC

4.16.1 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. Fuels in Park County range from dense timber stands in varying terrain to native grasslands. Douglas fir, lodgepole pine, Engelmann spruce, sagebrush, rough fescue,

and other grasses make up many of the wildland fuels in the county. Periods of drought, disease, insect infestations, and low fire activity may all lead to an increase in hazardous fuels. 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.

Any flame source can trigger a wildfire, but they are most often triggered by lightning, human carelessness, arson, or train sparks. 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. Forest fires can travel quickly through the crowns of trees or spread along the forest floor. Grass fires are common in non-irrigated fields and open areas scattered with sage brush and native grasses due to the arid climate during almost any season but winter. Both types of wildfires are often aggravated by the exceptionally windy conditions in parts of the county. The Gallatin National Forest, Lewis and Clark National Forest, Custer National Forest, Absaroka-Beartooth Wilderness, Yellowstone National Park, and other state and federal lands regularly experience wildfires, and the mixed fuels and rugged terrain of those areas make firefighting especially difficult. The privately owned timber, shrub, native grass, and non-irrigated lands in the remainder of the county also present significant wildfire hazards.

Park County has large areas of government owned lands. The national forests and Absaroka-Beartooth Wilderness are managed by the US Forest Service. Yellowstone National Park is managed by the National Park Services. Scattered across the county are 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.

Problems with wildfire occur when combined with the human environment. Most structures are flammable, and therefore, are threatened when wildfire approaches. In addition, a significant loss of life could occur with residents who do not evacuate, firefighters, and others who are in the wildfire area. Infrastructure such as electric transmission lines, fuel tanks, and radio transmission towers are not often equipped to withstand the heat from a wildfire. Timber resources, animal habitats, and waterways can all be damaged leading to negative economic and environmental impacts. The area where human development meets undeveloped, vegetative lands is called the wildland urban interface (WUI). The most extreme situation with respect to fuel conditions and values at risk occurs in rural subdivisions where numerous high-value individual homes and subdivisions are located in the wildland urban interface area in close proximity to the National Forest boundary.

Wildland urban interface areas include subdivision and private lands with structures in the following locations:

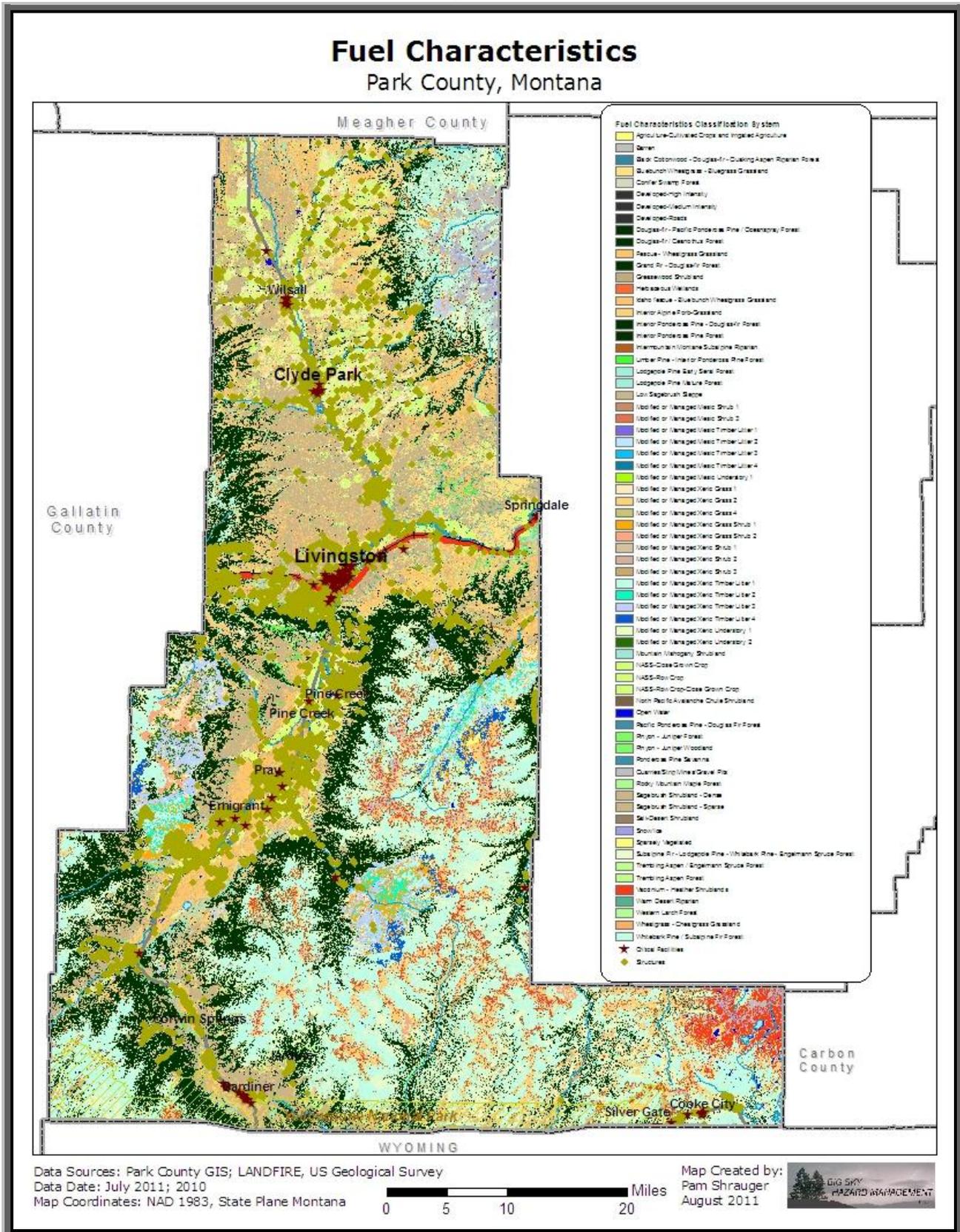
- Cooke City
- Gardiner
- Chico
- Old Chico
- Glastonbury area
- Rock Creek South
- Cottonwood Creek
- Jardine
- Livingston Peak
- Ninth Street Island
- Pine Creek
- Silver Gate
- Mill Creek
- Deep Creek
- Big Creek
- Mission Creek
- West Boulder
- Wine Glass area

Source: Park County, 2009.

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 shrublands 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 4.16.1A shows the fuel characteristics in the county. These characteristics were used to generalize the high, moderate, and low hazard areas. Areas within the general proximity of evergreen trees were categorized as “high” hazard. Areas within the general proximity of shrublands, prairie grasses, and agricultural fields, essentially the remainder of the county with the exception of the City of Livingston, were categorized as “moderate” hazard. The City of Livingston was categorized as “low” hazard due to its urbanized setting and local fire protection. These generalizations allow for planning estimations. The actual wildfire hazard for a particular structure can only be determined based on a site evaluation or other assessment tool such as that found on the Park County website.

The heavy smoke produced by a wildfire, often trapped in the valleys of Park County due to inversions, can cause unhealthy air conditions that may affect those with respiratory problems and otherwise healthy people. Smoky conditions can also lead to poor visibility and an increased probability of ground transportation or aircraft accidents. Besides air pollution, water pollution may also occur during and after a wildfire. Many watersheds in wildland areas serve as the public water supplies for area communities. Should a significant wildfire pass through the area, pollution of the watershed can occur. With vegetation removed and the ground seared from a wildfire, the area also becomes more prone to flash floods and landslides because of the ground’s reduced ability to hold water.

Map 4.16.1A



4.16.2 History

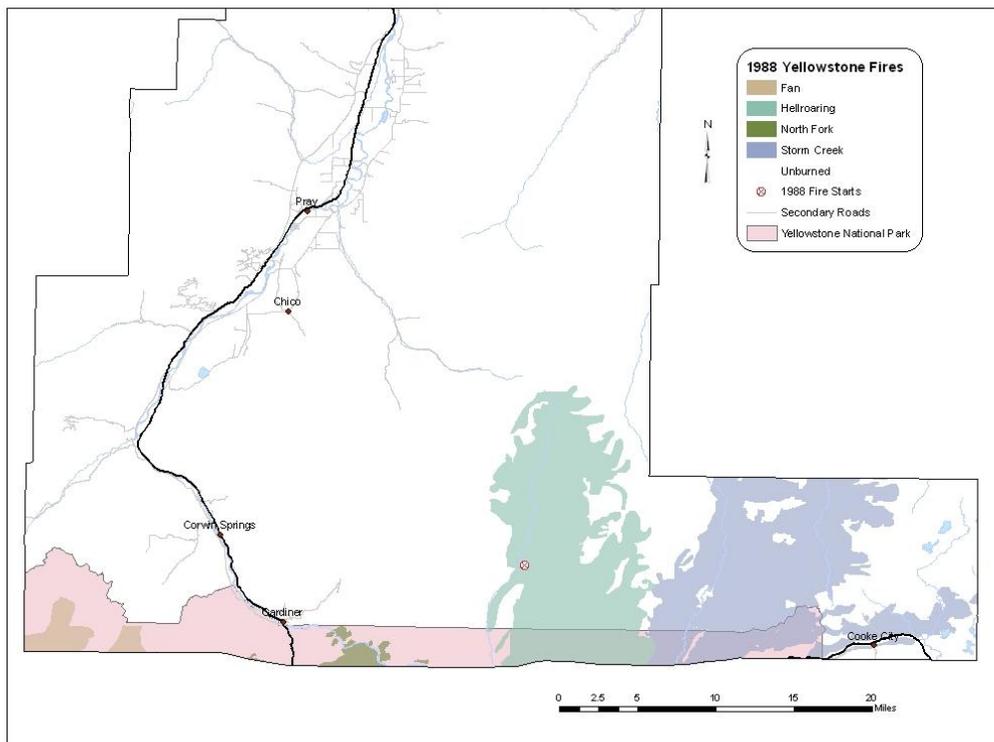
Park County has a long history of wildfires from small to large. Some have caused damages and others have not. The extent of damages often depend on the proximity to the wildland urban interface, fire spread rates, and the effectiveness of suppression and mitigation measures. The history of wildfires can be difficult to compile because the various firefighting entities involved and a variety of recordkeeping measures over the years. The following events have been compiled based on fire department records, firefighters’ memories, a National Forest database, and other miscellaneous sources.

1983 - In April 1983, a large grass fire burned west of Livingston and south of Interstate 90. The Wan-I-Gan Fire near Emigrant that year destroyed 6 cabins.

July 1985 - A lightning sparked fire at the base of Sheep Mountain threatened 5 homes and burned 1,000 acres.

1988 - The Greater Yellowstone Fires of 1988, including some areas extending into Park County as shown in Map 4.16.2A, covered 2.3 million acres, employed an estimated 25,000 firefighters, and cost nearly \$120 million for fire suppression. Park County Resolution # 274, issued on September 6, 1988, ordered the evacuation of Cooke City and Silver Gate. One firefighter and one pilot were killed and structure losses were estimated at \$3 million, mostly within Yellowstone National Park. The Hellroaring and Storm Creek Fires were the largest ones to go through Park County.

Map 4.16.2A 1988 Wildfires in Park County



1991 - The Thompson Creek Fire, starting on July 16, 1991, threatened two youth church camps. Two hundred-fifty campers were evacuated and sheltered in Livingston. The Area Creek region also experienced a fire from July 31 through August 1. On August 7, a railroad sparked fire quickly spread between Billman and Fleshman Creeks. Six homes were threatened.

1994 - 1994 was a busy year for fires in Park County. The Deckard Flats Fire, Smith Creek Fire, Wineglass Fire, and Yak Fire were the largest fires. The Smith Creek Fire burned in a subdivision, but no structures were lost. Fires also burned in Paradise Valley in August including the Dry Creek Fire (40 acres), Eightmile Creek Fire (33 acres), and South Glastonbury Fire (30-50 acres).

1996 - The Trowbridge Fire burned on Livingston Peak. In September and October, notable grass fires were sparked along Interstate 90. The Wineglass Fire on October 11, 1996 injured two people.

August 1999 - The Six Mile fire in Paradise Valley, 3 miles east of Dailey Lake, burned 1,100 acres.

2000 - During this particularly severe fire season for Montana, the only large fire in Park County was one that burned in the north Crazy Mountains but did not threaten structures or infrastructure.

August 2001 - Lightning ignited the Fridley Fire on August 19 near Fridley Creek in the Gallatin National Forest. Park County Resolution # 727, issued on August 20, 2001, ordered evacuations of threatened areas. The fire doubled in size on August 22 and displayed "extreme" behavior on August 23 when high winds caused it to double in size again. Then on August 25, 2001, Park County Resolution # 728 closed roads near the Fridley Fire. Montana Executive Order 20-01, issued on August 25, 2001, declared a state of emergency in Park County and other locations across the state and mobilized state resources and the National Guard to fight the wildfires. On Wednesday, August 29, the fire threatened a privately owned cabin southwest of Emigrant on the fire's southeast edge. The cabin was on a ridge top, making it difficult to protect. On August 31, three members of a firefighting helicopter crew were killed on a maintenance flight when a bucket line tangled with a rotor causing the helicopter to crash three miles south of Emigrant. The Fridley Fire was contained on September 13, 2001. In all, 26,373 acres burned from this fire and firefighting costs totaled over \$11 million with 1,261 personnel, 50 pieces of heavy equipment, and 14 helicopters used. Fortunately, no structures were lost. (Pacific Biodiversity Institute, 2001)



A ball of flames rolls skyward as part of the Fridley Fire engulfs a stand of trees Monday, Aug. 20, 2001 between Fridley and Eightmile Creeks southwest of Livingston. Source: Livingston Enterprise, Erik Petersen/Associated Press.

Although the Fridley Fire was the largest in Park County in 2001, it was preceded by two other fires, the Hoppe and Monitor Fires, in late July and early August. The Monument Wilderness and Little Joe Fires

also burned in Park County during August 2001. Both fires started on August 24 by lightning and were contained by September 3, 2001. The Monument Wilderness Fire started 10 miles northwest of Cooke City, burned 1,660 acres, with \$417,000 in suppression costs. The Little Joe Fire was 20 miles east of Gardiner and burned 860 acres with suppression costs of \$3 million. (National Climatic Data Center, 2011)

August 2003 - The Rough Draw Complex Fires started on August 10 by lightning. Park County Resolution # 806, issued on August 14, 2003, declared an emergency to exist in Park County from wildfires. Then, the following resolution # 807 on that same day closed roads near the Rough Draw Fire in Mission Creek on the northern boundary of the Absaroka-Beartooth Wilderness and the Slippery Fire in Cottonwood Creek near the Crazy Mountains. These fires, contained by September 5, 2003, were part of the larger Rough Draw Complex that burned over 3,000 acres and cost nearly \$7 million. The Small Business Administration declared a disaster (#9W74) in Park County and offered loans to small business that suffered financial losses from the fires. Additionally, the Brundage Fire, started on August 15, by lightning, burned 3,200 acres in all. This fire, although ultimately larger than the Rough Draw Complex, was in a more remote part of the county and did not require as many resources.

Big Creek Fire, August-September 2006 – The lightning-caused Big Creek Fire burned about 14,000 acres, destroyed two homes and four outbuildings in a rural subdivision near Emigrant. (Park County, 2009) Suppression efforts totaled nearly \$10 million for the Paradise Valley Complex, including the Big Creek Fire, Passage Falls Fire, and South Pine Fire. (National Interagency Fire Center, 2011)

Jungle Fire, September 2006 – The Jungle Fire burned about 37,000 acres and destroyed three outbuildings in the West Boulder drainage. (Park County, 2009) Suppression costs totaled about \$824,000. (National Interagency Fire Center, 2011)

WH Complex, August-September 2007 – These fires, consisting of the Wicked Creek Fire and Hicks Fire, burned about 30,500 acres in the upper Mill Creek drainage, destroyed one bridge, and threatened rural residences, church camps, and homes in a 54 acre inholder above Passage Falls. (Park County, 2009) Suppression costs totaled about \$5.4 million. (National Interagency Fire Center, 2011)

The largest fires and costliest can be found in Tables 4.16.2B and 4.16.2C.

Table 4.16.2B Largest Wildland Fires by Acreage Burned

Name	Start Date	Acres Burned	Cause
Storm Creek	June 14, 1988	107,347 acres	Miscellaneous cause
Hellroaring	August 15, 1988	81,890 acres	Campfire cause
Jungle	September 2006	37,000 acres	
Fridley	August 19, 2001	26,873 acres	Lightning cause
Wicked Creek	August 2007	26,500 acres	
Big Creek	August 2006	14,000 acres	Lightning cause
Thompson Creek	July 16, 1991	7,746 acres	Lightning cause
Passage Falls	August 2006	6,620 acres	

Table 4.16.2B Largest Wildland Fires by Acreage Burned (continued)

Name	Start Date	Acres Burned	Cause
Brundage	August 15, 2003	3,200 acres	Lightning cause
Hicks Park	August 2007	2,500 acres	
Deckard Flats	September 1, 1994	2,200 acres	Lightning cause
Slippery Creek	August 11, 2003	1,072 acres	Lightning cause
Rough Draw	August 8, 2003	1,029 acres	Lightning cause
Horseshoe Basin	July 18, 1953	1,007 acres	Lightning cause

Sources: Gallatin National Forest, 2005; Park County, 2009.

Table 4.16.2C Costliest Wildland Fires in Park County, Montana

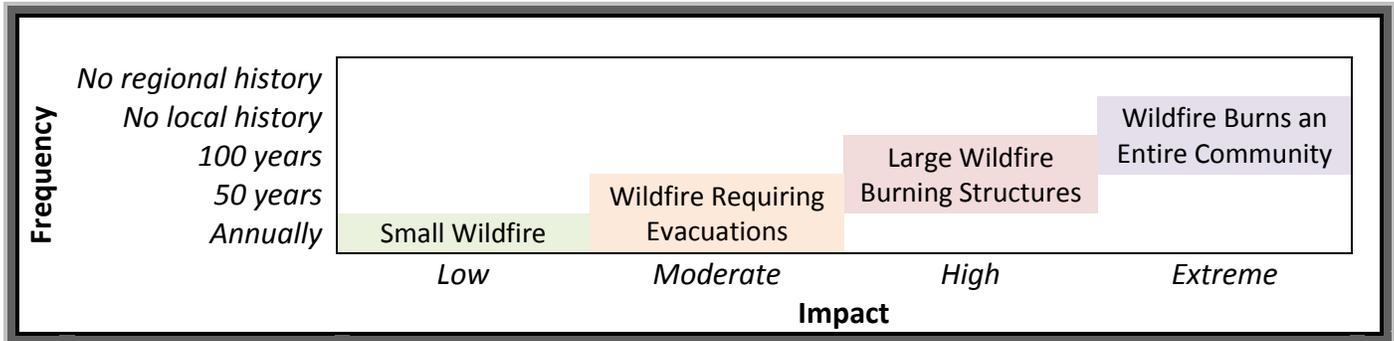
Name	Start Date	Cost	Acres Burned	Cause
Fridley	August 19, 2001	\$12,500,000	26,873 acres	Lightning cause
Paradise Valley Complex	August 2006	\$9,600,000	20,000 acres	Lightning cause
Storm Creek	June 14, 1988	\$8,700,000	107,347 acres	Miscellaneous cause
Wicked Hicks Complex	August 2007	\$5,400,000	30,500 acres	
Hellroaring	August 15, 1988	\$4,700,000	81,890 acres	Campfire cause
Little Joe	August 25, 2001	\$4,200,000	860 acres	Miscellaneous cause
Slippery Creek	August 11, 2003	\$3,400,704	1,072 acres	Lightning cause
Rough Draw	August 8, 2003	\$3,264,295	1,029 acres	Lightning cause
Hoppe	July 27, 2001	\$1,650,000	550 acres	Lightning cause
Monitor	August 6, 2001	\$1,500,000	420 acres	Lightning cause

Source: Gallatin National Forest, 2005; National Interagency Fire Center, 2011.

4.16.3 Probability and Magnitude

A study by the Montana Department of Natural Resources and Conservation in 1997 reports that approximately 80-100 fire starts per year occur in Park County. About 35-40% of those fire starts occur on US Forest Service (USFS) land and 60-65% occur on county protected lands. On the USFS lands, approximately 50% are natural and 50% human-caused, but on county lands, approximately 85% are human-caused and 15% are natural with debris/field burning, trains, and campfires being top three human caused ignition sources. This same study also found that a belt running from southwest to northeast through the Paradise Valley, Gardiner, and the Wineglass areas have the highest concentration of lightning strikes in the county. (Montana Department of Natural Resources and Conservation, 1997)

Figure 4.16.3A Hazard Frequency and Impact Ranges



4.16.4 Vulnerabilities

Methodology

To assess the vulnerabilities from wildfires in Park County, assets were visually compared to three general hazard areas using the LANDFIRE project, Fuel Characteristics Classification System:

- High Hazard Areas: Areas within the general proximity of evergreen trees and mountainous terrain.
- Moderate Hazard Areas: Areas within the general proximity of shrublands, prairie grasses, agricultural fields, and valley riparian areas. Essentially the remainder of the county, except the City of Livingston.
- Low Hazard Areas: Areas within the City of Livingston due to the urbanized setting and local fire protection.

Note: The actual wildfire hazard for a particular structure can only be determined based on a site evaluation or other assessment tool such as that found on the Park County website.

This methodology is more aggressive than that used in the previous plan. Therefore, the vulnerabilities are much greater. In addition, the structure data layer has improved since 2005 and includes many more structures than the previous plan, especially in the rural areas.

For population estimates, the 2010 county population of 15,636 was divided by the total number of structures in the Park County GIS database of 9,507 for an estimate of 1.64 people per structure.

Exposure

Critical Facilities and Infrastructure

Critical facilities in close proximity to forested areas or constructed with especially flammable materials are more likely to suffer losses from a wildfire. Since a wildfire is possible in essentially all areas of Park County, all critical facilities are assumed to have some risk. Those critical facilities outside the City of Livingston in more rural areas are at greater risk due to increased distances from fire suppression assets and closer proximity to wildland areas. Nine critical facilities are within the high hazard areas including:

- Christikon Camp

- Cooke City Compactor
- Cooke City School
- Cooke City Water
- Cooke City/Silver Gate Fire Hall and Cooke City Search and Rescue
- Northeast Entrance of Yellowstone National Park
- Silver Gate Water
- US Post Office – Cooke City
- Yellowstone Bible Camp

Fifty-one critical facilities are within the Moderate Hazard Area.

Electric and communications infrastructure, including the major regional electric transmission lines, can be found in wildland areas. This infrastructure is highly vulnerable to wildland fire without mitigation. Wooden bridges in wildland areas are also quite vulnerable.

Existing Structures

Wildfires have the greatest potential to substantially burn National Forests and National Parks acreage, however, private residences become threatened when the fire enters the wildland urban interface. Park County has many wildland urban interface areas that may be threatened should a wildfire encroach. Using the Fire Characteristics map in conjunction with structure data, an estimate of the number of structures in the High Hazard Areas was derived. Approximately 1,073 structures are located in the High Hazard Areas. This figure is a planning estimate based on available GIS data. Using the state tax assessment data, the total value of these structures is estimated at \$316,987,646. Approximately 4,965 structures with a total building value of \$270,577,696 are located in the Moderate Hazard Areas. Note that the structures within the High Hazard Areas generally have a much higher building value than those that are not.

A wildfire damage factor is rather difficult to determine because any actual losses will be highly dependent on the fire characteristics and its location. Not all areas will be affected by one wildfire. Losses in the area of the WUI fire, however, could have a high loss rate. Given the assumption that 10% of the structures in the total High Risk Areas could be lost in a probable wildfire, the structure losses from that fire would roughly total \$31.7 million dollars with 107 structures affected.

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. Suppression costs, particularly due to the efforts needed for structure protection, can easily total in the millions of dollars.

Population

Using the estimate of 107 structures affected in a major wildfire, roughly 175 people would live in the affected area (107 structures x 1.64 people/structure). The total High Risk Area population exposure is about 1,760 people. (1,073 structures x 1.64 people/structure). In many cases, residents can be evacuated before the fire moves into their area. Some residents, however, may choose to remain in the

evacuated area or a rapidly spreading fire may not allow enough time for a formal evacuation. Firefighters can also be particularly threatened during wildfires. Advances in firefighter safety and technology have improved firefighting efforts, however, the potential for loss of life and injuries still exists.

Values

Although the primary concern is to structures and the interface residents, most of the costs associated with fires, come from firefighting efforts in suppression costs. Additional losses to natural resources, water supplies, air quality, and the economy are also typically found. Wildfire’s impact on the regional economy can be significant with the loss of timber, natural resources, recreational opportunities, and tourism, all of which are of particular importance in Park County. The economic dependency on the tourist population through Yellowstone National Park is such that even a fire outside of Park County can have very substantial economic impacts.

Future Development

The wildland urban interface is a very popular place to live as national trends show. More and more homes are being placed in this interface, particularly in Montana, and Park County is no exception. Development in the hazard areas has increased in recent years and has amplified the vulnerabilities in the unincorporated parts of Park County significantly. Regulating growth in these areas is a delicate balance between protecting private property rights and promoting public safety.

About 1,822 parcels of private, undeveloped land coincide with High Risk Areas. These areas could be developed in the future. The risk to individual structures can be mitigated through landscaping and/or building placement. Should these parcels be subdivided, the subdivision would need to meet the requirements set forth in the Park County Subdivision Regulations that have regularly undergone improvements to increase wildfire resistance, particularly in wildland urban interface areas. Approximately 2,747 parcels of private, undeveloped land exist in the Moderate Risk Areas. Similarly, those parcels that are subdivided would be subject to the regulations in place for their jurisdiction.

Vulnerabilities and Impacts

Table 4.16.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Park County	Critical Facilities	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses 	▪ \$1,500,000 losses	Moderate
Livingston	Critical Facilities		▪ \$0 losses	Low

Table 4.16.4A Hazard Vulnerabilities and Impacts (continued)

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Clyde Park	Critical Facilities		<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Critical functional losses ▪ Critical data losses 	Low-Moderate
Park County	Critical Infrastructure	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Road closures 	<ul style="list-style-type: none"> ▪ \$2,000,000 losses ▪ Loss of electricity 	Moderate
Livingston	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$100,000 losses ▪ Road closures 	Low-Moderate
Clyde Park	Critical Infrastructure		<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Road closures ▪ Loss of electricity ▪ Loss of potable water 	Moderate
Park County	Existing Structures	<ul style="list-style-type: none"> ▪ \$3,169,876 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses 	<ul style="list-style-type: none"> ▪ \$31,698,765 losses 	High
Livingston	Existing Structures		<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses 	Low-Moderate
Clyde Park	Existing Structures		<ul style="list-style-type: none"> ▪ \$3,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses 	Moderate
Park County Clyde Park	Population		<ul style="list-style-type: none"> ▪ Injuries ▪ Fatalities 	Moderate
Livingston	Population		<ul style="list-style-type: none"> ▪ Injuries ▪ Fatalities 	Low
All	Values	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Reduced air quality ▪ Restrictions on activities ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Service industry losses ▪ Habitat damages ▪ Reduced water quality ▪ Soil contamination ▪ Historic structure losses ▪ Historic site losses ▪ Historic item losses ▪ Emotional impacts ▪ Cancellation of activities 	Moderate-High

Table 4.16.4A Hazard Vulnerabilities and Impacts (continued)

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Park County Clyde Park	Future Structures	<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ 1,822 undeveloped parcels in the High Hazard Areas ▪ Subdivision regulations in place to mitigate some impacts 	<ul style="list-style-type: none"> ▪ 2,747 undeveloped parcels in the Moderate Hazard Areas 	Moderate-High
Livingston	Future Structures		<ul style="list-style-type: none"> ▪ Somewhat likely to occur in hazard areas 	Low-Moderate

* in addition to probable (100-year) impacts

4.16.5 Data Limitations

Data limitations include:

- Lack of a comprehensive, multi-agency, historic wildfire digital database containing information on start location, cause, area burned, suppression costs, and damages.
- Need for an improved wildland urban interface definition and associated analysis.

4.17 Wind

Table 4.17A Hazard Summary for Park County

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate-High	High wind events are frequent in Park County, particularly in the Livingston area.
Vulnerability	Moderate	Electric infrastructure and possibly structures are vulnerable to damages from wind.

Table 4.17B Hazard Summary for the City of Livingston

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate-High	High wind events are frequent in Livingston.
Vulnerability	Moderate	Electric infrastructure and possibly older structures are vulnerable to damages from wind.

Table 4.17C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate	History of high wind events in Clyde Park.
Vulnerability	Moderate	Electric infrastructure and possibly structures are vulnerable to damages from wind.

Table 4.17D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.17.1 Description

Park County, and Livingston in particular, is known for its wind. Strong winds regularly blow through the area, even when neighboring areas are experiencing near calm conditions. Besides the high winds that can occur with severe thunderstorms, as described in the severe thunderstorm and tornadoes hazard profile, high winds can also occur with strong pressure gradients and gusty frontal passages. A study of high wind records from 1994-2003 showed that Park County was the third windiest county in Montana for synoptic scale winds. Over that ten year period, Park County had 22 reports of wind gusts of 75 mph or greater from non-thunderstorm winds. (Montana Disaster and Emergency Services, 2004) Therefore, on average, at least two occurrences of greater than hurricane force winds can be expected each year. Livingston’s windy conditions are primarily due to the topographical features of the area.

The strongest winds from the south to west directions in Livingston can be described in terms of the topography. During the winter, Yellowstone National Park gets very cold. As the air moves from the higher elevations into the valleys, it warms, accelerates, and gets funneled as it moves through the narrow Paradise Valley and constricts between the Wineglass Mountains and Livingston Peak. Like water in a hose, the constriction causes the air to move faster. Strong winds then rush through

Livingston. As the winds from the west pass over the Gallatin Valley and Bozeman, the air piles up on the west side of the Bridger and Gallatin Mountain Ranges only being able to pass through at the lower elevations such as Bozeman Pass which opens up to Livingston. The wind that does make it over the mountain ranges typically accelerates and rushes down the lee side of the mountains, creating strong surface winds throughout northern Park County.

Strong winds are so frequently over 30 mph in Park County that the National Weather Service increased their wind advisory and high wind warning thresholds for the county. A wind advisory is issued when sustained winds of at least 40 mph and gusts of 60 mph are expected for at least six hours. High wind warnings are issued when sustained winds of at least 50 mph are expected for an hour or more or wind gusts of 75 mph or greater are expected. In contrast, most locations in Montana start at 30 mph sustained for wind advisories and 40 mph sustained for high wind warnings.

All of Park County is considered to be at risk for high wind events. The most vulnerable areas, however, are in the Livingston area from south, southwest, and west winds and northern Park County from southwest and west winds. The base of the Crazy Mountains is also known to be particularly windy.

High winds can become particularly problematic when combined with falling snow or snow on the ground. Blizzard conditions from blowing and drifting snow can develop with the onset of strong winds. History also shows that the strong winds on Interstate 90 can lead to ground transportation or railroad accidents and possibly a hazardous materials release.

4.17.2 History

Park County has a long history of high wind events. In a study conducted for the State of Montana’s Hazard Assessment, Park County ranked third in the state for the most number of non-thunderstorm wind events over hurricane force (74 mph) with 22 recorded events over a 10 year period. The strongest non-thunderstorm wind events in the past ten years can be found in Table 4.17.2A.

Table 4.17.2A Non-Thunderstorm Wind Events Greater than 80 mph

Location	Date	Speed	Impacts / Additional Information
Livingston	11/03/1993	90 mph	Wind damage reported in Livingston.
Livingston	11/29/1994	92 mph	Several semi trucks blown off Interstate 90, hanger roof blown off at Mission Field, spotty power outages, Interstate 90 closed for the evening. Damages estimated at \$500,000.
South of Grey Owl Fishing Access	04/24/1996	100 mph	Wind speed estimated. Tree blown onto Highway 89.
Livingston	11/28/1996	81 mph	Measured at Mission Field.
Livingston	12/04/1996	100 mph	Measured at Mission Field.
Livingston	01/30/1997	85 mph	Measured at Mission Field.
Livingston	11/13/1998	85 mph	Measured at Mission Field.

Table 4.17.2A Non-Thunderstorm Wind Events Greater than 80 mph (continued)

Location	Date	Speed	Impacts / Additional Information
Livingston, 6 miles S	02/01/1999	92 mph	Sustained winds of 50 mph and gusts to 89 mph in Livingston. Several trees and power lines downed. 1,500 homes were without power for 2 hours.
Livingston	01/09/2000	84 mph	Measured at Mission Field.
Livingston	02/01/2000	84 mph	Measured at Mission Field. Winds sustained at 51 mph.
Livingston	01/10/2006	84 mph	Four trucks overturned on Interstate 90. Several power lines downed.
Chico, 9 miles ESE	02/16/2007	87 mph	Measured at Wicked Creek RAWS station.
Livingston	11/12/2007	85 mph	Measured at West Livingston I-90 DOT sensor. Power to Livingston was knocked out.
Livingston	01/30/2009	86 mph	Sustained winds of 50 mph with gusts to 86 mph were measured at Mission Field.

Source: National Climatic Data Center, 2011.

4.17.3 Probability and Magnitude

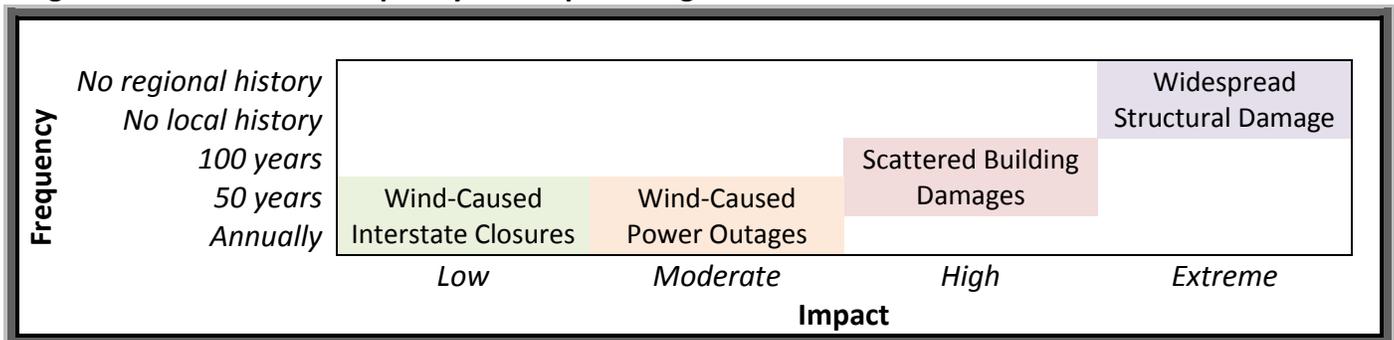
Based on the ten year historical record, the probabilities in Table 4.17.3A can be estimated.

Table 4.17.3A Non-Thunderstorm Wind Probabilities Based on Historical Occurrence

Speed	Average Occurrences Per Year	Recurrence Interval
75 mph or greater (hurricane force)	2.2 events/year	5-6 month event
80 mph or greater	1 event/year	1 year event
90 mph or greater	0.5 events/year	2 year event
100 mph or greater	0.2 events/year	5 year event

According to the National Weather Service, November is historically the windiest month in Park County with winds from the southwest.

Figure 4.17.3B Hazard Frequency and Impact Ranges



4.17.4 Vulnerabilities

Methodology

Since the threat from strong winds exists countywide, the vulnerabilities were assessed using two feasible scenarios. The first is a wind event of 85 mph overturning vehicles and causing power outages. The second scenario is for a wind gust well over 100 mph that creates widespread damages of roofs being blown off and structure collapse of weak buildings.

Exposure

Critical Facilities and Infrastructure

All of the critical facilities in Park County are susceptible to high winds. The risk will be assumed to be the same countywide since high winds can strike anywhere. Given a history of power outages, the electrical infrastructure is assumed to have a slightly greater risk to high winds than other types of infrastructure. The airport also has a history of wind-related losses.

Existing Structures

With wind problems occurring regularly in Park County, most structures are designed to withstand high winds. Therefore, the potential losses to structures are limited. They can, however, occur during some of the most extreme events. More often, the greatest threat is to high profile vehicles. During particularly severe winds, trucks are diverted from the Interstate through Livingston. An event severely damaging 10 structures could result in losses of about \$979,000 (10 structures x \$97,900/structure).

Population

Since Park County regularly has high wind events, most residents are prepared for and acclimated to windy weather. In most synoptic scale wind events, the National Weather Service is able to provide ample warning through their wind advisories and high wind warnings. The Montana Department of Transportation also regularly posts weather messages on Interstate message boards.

Values

Winds strong enough to destroy structures could also theoretically cause significant damages to businesses, including signs and other property, resulting in economic losses. Social values may also be impacted, especially if loss of life occurs.

Future Development

Future development would only be threatened if structures were built without consideration for wind. Since Park County regularly has strong winds, development typically occurs with that consideration, and therefore, is not often threatened by wind events. Developers are not required, however, to adhere to

any structural building codes for most residential structures, except for within the City of Livingston and its donut area. The City of Livingston does require tie downs for mobile home parks. The particularly windy area at the base of the Crazy Mountains currently has large ranches, but should development occur in this area, wind would be a notable hazard requiring consideration.

Vulnerabilities and Impacts

Table 4.17.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities		<ul style="list-style-type: none"> ▪ \$200,000 losses ▪ Structural losses ▪ Critical functional losses ▪ Clean-up/debris removal costs 	Low-Moderate
All	Critical Infrastructure	<ul style="list-style-type: none"> ▪ \$500,000 losses ▪ Road closures ▪ Loss of electricity 	<ul style="list-style-type: none"> ▪ \$5,000,000 losses 	Moderate-High
All	Existing Structures		<ul style="list-style-type: none"> ▪ \$1,000,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses ▪ Clean-up/debris removal costs 	Moderate
All	Population	<ul style="list-style-type: none"> ▪ Injuries 	<ul style="list-style-type: none"> ▪ Fatalities 	Moderate
All	Values	<ul style="list-style-type: none"> ▪ Business disruption losses ▪ Restrictions on activities ▪ Aesthetic value losses 	<ul style="list-style-type: none"> ▪ Agricultural losses ▪ Emotional impacts ▪ Cancellation of activities 	Moderate
Park County Clyde Park	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Lacking building codes to minimize losses 	Moderate
Livingston	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Enforces building codes to minimize losses 	Low-Moderate

* in addition to probable (100-year) impacts

4.17.5 Data Limitations

Data limitations include:

- Severe wind 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.

4.18 Winter Storms and Extended Cold

including blizzards, heavy snow, ice storms, and extreme cold

Table 4.18A Hazard Summary for Park County

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate-High	Frequent history of road closures and blizzards.
Vulnerability	Moderate	Residents are especially at risk during extended power outages and blizzards.

Table 4.18B Hazard Summary for the City of Livingston

Overall Hazard Rating	High	
Probability of High Impact Event	Moderate-High	Frequent history of road closures and blizzards.
Vulnerability	Moderate	Residents are especially at risk during extended power outages and blizzards.

Table 4.18C Hazard Summary for the Town of Clyde Park

Overall Hazard Rating	Moderate	
Probability of High Impact Event	Moderate-High	Frequent history of road closures and blizzards.
Vulnerability	Low-Moderate	Residents are especially at risk during extended power outages and blizzards.

Table 4.18D Federal Major Disaster and Emergency Declarations

Declaration	Year	Additional Information	Casualties	Damages/Assistance
None				

4.18.1 Description

Snow storms and bitterly cold temperatures are common occurrences in Park County and generally do not cause any problems as residents are used to winter weather and are prepared for it. Snow falls regularly during all seasons, except summer, and roads become slippery quite often. Residents understand that this is part of living in Montana. Sometimes, however, blizzards can occur and overwhelm the ability to keep roads passable. Heavy snow and ice events, particularly late season events, have the potential to bring down power lines and trees. The extreme wind chills, often dropping below zero, may harm residents if unprotected outdoors or if heating mechanisms are disrupted.

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 three 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.

Heavy Snow

Large quantities of snow may fall during winter storms. In general, six inches or more in 12 hours or eight inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. 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. These types of storms often cause the most winter storm related damages in Park County.

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.

Extreme Cold

Extended periods of cold temperatures frequently occur throughout the winter months in Park 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, 2011c)

4.18.2 History

Snow and cold are normal occurrences in Park 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 4.18.2A. The National Climatic Data Center also lists several other lower impact types of common winter weather events. Also note that the coding system used in this database for winter weather does not allow for a comprehensive search of winter weather events by county. Other significant events have likely occurred.

Table 4.18.2A Winter Weather Events

Date	Type	Impacts
12/25/1996	Winter Storm	12 inches of snow in Livingston.
12/03-04/1998	Heavy Snow	16 inches of snow in Livingston.
12/07-08/1998	Blizzard	Visibilities near zero. Interstate 90 was closed between Columbus and Bozeman after numerous accidents were reported.
12/29-30/1998	Ice Storm	Portions of Interstate 90 were closed.
01/23/1999	Heavy Snow	14 inches of snow 10 miles east of Livingston.
05/13/1999	Heavy Snow	13 inches of snow in Cooke City.
04/16/2002	Heavy Snow	10 inches of snow in Cooke City.
05/08/2002	Heavy Snow	17 inches of snow in Wilsall.
11/23/2002	Heavy Snow	10 inches of snow in Cooke City.
03/06/2003	Heavy Snow	11 inches of snow in Cooke City.
03/09/2003	Heavy Snow	10 inches of snow in Wilsall.
03/27/2003	Heavy Snow	19 inches of snow 2 miles west of Cooke City. 17 Inches of snow 12 miles south of Livingston.
10/04/2005	Heavy Snow	11 inches of snow 6 miles southeast of Clyde Park. Many trees and branches heavily damaged with widespread power outages, some lasting 36-48 hours.
11/27/2005	Heavy Snow	21 inches of snow in Wilsall.
12/28/2006	Heavy Snow	12 inches of snow 10 miles south of Livingston.
02/26/2009	Heavy Snow	12 inches of snow in Wilsall.
03/29/2009	Winter Storm	7-17 inches of snow in the Livingston area.
04/14/2009	Heavy Snow	10 inches of snow in Wilsall.
11/12/2009	Heavy Snow	6-12 inches of snow in the Livingston area.
01/05/2010	Winter Storm	Significant drifting in Clyde Park.
11/18/2010	Heavy Snow	12 inches of snow in Wilsall.
11/25/2010	Blizzard	Livingston area had sustained winds of 50 mph with gusts to 72 mph. Interstate 90 was closed due to severe blowing and drifting snow. Emergency travel only conditions existed throughout the county.
01/20/2011	Blizzard	Livingston area had wind gusts to 63 mph with blowing snow. Interstate 90 was closed from Springdale to Gallatin County.
02/06/2011	Heavy Snow	10 inches of snow in Clyde Park.
04/07/2011	Heavy Snow	12 inches of snow in Clyde Park.

Other events with less than 10 inches of snow are common, but no impacts were listed.

Source: National Climatic Data Center, 2011.

Table 4.18.2B Winter Weather Records

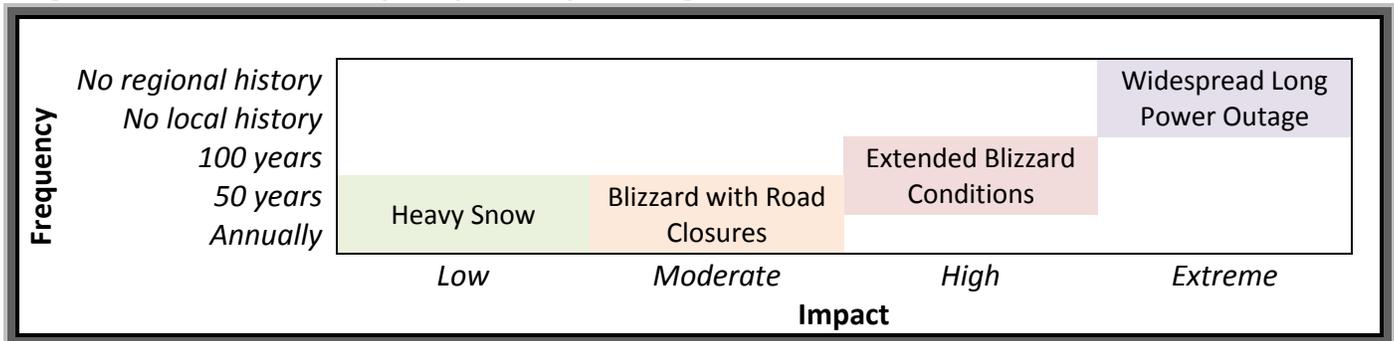
Location	Period of Record	Low Temperature Record	Annual Snowfall Record
Wilsall, 8 miles ENE	1957-2010	-42°F, February 3, 1989	210.5 inches, 1975
Springdale	1951-2010	Not Applicable	55.5 inches, 1967
Livingston Airport	1948-2010	-41°F, December 24, 1983	113.9 inches, 1975
Livingston	1895-1981	-45°F, February 15, 1936	81.6 inches, 1916
Livingston, 12 miles S	1951-2010	-36°F, December 24, 1983	123.8 inches, 1975
Gardiner	1956-2010	-31°F, February 3, 1989	74.5 inches, 1967
Jardine	1951-1976	Not Applicable	138.6 inches, 1955
Yellowstone National Park, near Silver Gate	1948-1967	-51°F, January 12, 1963	226.0 inches, 1963
Cooke City, 2 miles W	1967-2010	-43°F, February 5, 1982	332.1 inches, 1977

Source: Western Regional Climate Center, 2011.

4.18.3 Probability and Magnitude

The probability of winter storms each season is almost a certainty. The probability of an event that overwhelms the community capabilities, though, is harder to determine. To date, Park County has not had any winter weather events that have lead to a Presidential Disaster Declaration, but such an event is certainly possible and cannot be overlooked.

Figure 4.18.3A Hazard Frequency and Impact Ranges



4.18.4 Vulnerabilities

Methodology

Since the winter weather and extended cold risk extends countywide and the impacts can widely vary, to assess the vulnerabilities, two scenarios were considered. First is an extended, multi-day blizzard that closes roadways, creates major snow drifting, and isolates communities and residents. The second is a widespread power outage for a week or more during extreme cold and blizzard conditions, leaving most residents without heat and other supplies. Persistent heavy snow events may also create conditions favorable for roof collapses.

Exposure

Critical Facilities and Infrastructure

All critical facilities are assumed to have the same vulnerability from winter storms and cold temperatures. Those facilities with back-up generators are better equipped to handle a winter storm situation should the power go out. Otherwise, all are designed to withstand winter storms but may not be able to provide heat if electric service is lost.

Existing Structures

Snow in Park County generally does not cause the communities to shut down or disrupt activities. Occasionally, though, extreme winter weather conditions can cause problems. The most common incidents in these conditions are motor vehicle accidents due to poor road conditions. These losses are usually covered by insurance. Losses to structures are usually minimal. Most structures are built to withstand reasonable snow loads in this region.

Population

Since winter storms and cold spells typically do not cause major structural damage, the greatest threat to the population is the potential for utility failure during a cold spell. Although cold temperatures and snow are normal for Park County, extremes can exist that would go beyond the capabilities of the community to handle. Should the temperatures drop below -15°F for several weeks or several feet of snow fall in a short period of time, the magnitude of frozen water pipes and sewer lines or impassable streets could result in disastrous conditions for many people. If power lines were to fail due to snow/ice load, winds, or any other complicating factor, the situation would be compounded. In the event power or other utilities were disrupted, many homes could be without heat or water. With temperatures frequently dropping below zero in a typical winter, an event where heating systems failed could send many residents to shelters for protection. Other residents may try to heat their homes through alternative measures, and thereby, increase the chance for structure fires or carbon monoxide poisoning.

Sheltering of community members would present significant logistical problems when maintained over a period of more than a day. Transportation, communication, energy (electric, natural gas, and vehicle fuels), shelter supplies, medical care, food availability and preparation, and sanitation issues all become exceedingly difficult to manage in extreme weather conditions. Local government resources could be quickly overwhelmed. Mutual aid and state aid might be hard to receive due to the regional impact of this kind of event.

Values

Extended winter storms and cold can force the closure of businesses due to road closures and power outages. Depending on the length of the event, several days' worth of business revenue could be lost.

These storms can often lead to substantial livestock losses and impact the agricultural economy. Activities such as school and sporting events may be cancelled or postponed.

Future Development

Future development should have little to no impact from winter storms and extended cold weather. The most significant challenge may be, as homes go up in more remote parts of the county, to access those residents should sheltering or emergency services be needed in an extreme event. Future structures in Park County and Clyde Park are more vulnerable to structure collapses due to heavy snow loads since these jurisdiction lack building codes.

Vulnerabilities and Impacts

Table 4.18.4A Hazard Vulnerabilities and Impacts

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
All	Critical Facilities		▪ \$0 losses	Low
All	Critical Infrastructure	▪ Road closures	▪ \$1,000,000 losses ▪ Loss of electricity ▪ Loss of potable water ▪ Loss of sanitary sewers ▪ Loss of telephone service ▪ Loss of internet service ▪ Fuel/energy shortages	Moderate-High
All	Existing Structures		▪ \$500,000 losses ▪ Structural losses ▪ Contents losses ▪ Displacement/functional losses	Low-Moderate
All	Population	▪ Injuries ▪ Fatalities		Moderate
All	Values	▪ Business disruption losses ▪ Service industry losses ▪ Agricultural losses ▪ Cancellation of activities ▪ Restrictions on activities	▪ Emotional impacts	Moderate
Park County Clyde Park	Future Structures		▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Lacking building codes to minimize losses	Low-Moderate

Table 4.18.4A Hazard Vulnerabilities and Impacts (continued)

Jurisdiction(s)	Type	Probable (100-year) Impact	Extreme (500-year) Impact*	Rating
Livingston	Future Structures		<ul style="list-style-type: none"> ▪ Likely to occur in hazard areas ▪ Increases the total hazard exposure ▪ Enforces building codes to minimize losses 	Low

* in addition to probable (100-year) impacts

4.18.5 Data Limitations

Data limitations 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.
- The zone system of the historic winter weather events National Climatic Data Center does not allow for easy queries on a countywide basis.
- 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).

4.19 Risk Assessment Summary

The risk assessment represents an approximate history and estimated vulnerabilities to Park County, the City of Livingston, and the Town of Clyde Park from the hazards identified. Table 4.19A provides a summary of federal major disaster and emergency declarations. 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 of a “Disastrous”/High Impact Event
- Vulnerability (considers probable impacts to critical facilities, critical infrastructure, structures, the population, economic, ecologic, historic, and social values, and future development)

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

Table 4.19B shows the hazard prioritizations for Park County and Table 4.19C and Table 4.19D are specific to the City of Livingston and the Town of Clyde Park, respectively.

Table 4.19A Federal Major Disaster and Emergency Declarations Summary

Declaration	Year	Cause/Additional Information	Casualties	Damages/Assistance
FEMA-DR-1105	1996	Flood Public Assistance	None	\$146,379 state/local share (Park County) \$36,287 state/local share (Livingston) Total damages estimated over \$1,275,000
FEMA-DR-1183	1997	Flood Public Assistance	None	Total damages estimated over \$616,000
FEMA-DR-1340	2000	Wildfire Individual Assistance for nearly the entire state	None	\$11,579,000 federal assistance statewide
FEMA-FSA-2321	2000	Wildfire Fire Suppression Assistance	None	\$18,783 in federal assistance to Park and Gallatin Counties \$91,940 in federal assistance to MT DNRC
FEMA-DR-1996	2011	Flood Public Assistance Individual Assistance	None	Still being determined

Table 4.19B Park County Hazard Ratings

Hazard	Probability of High Impact Event	Vulnerability	Overall Hazard Rating
Flooding	Moderate-High	High	High
Wildfire	Moderate-High	Moderate-High	High
Earthquake	Moderate	High	High
Hazardous Materials Release	Moderate	Moderate-High	High
Wind	Moderate-High	Moderate	High
Winter Storms and Extended Cold	Moderate-High	Moderate	High
Severe Thunderstorms and Tornadoes	Moderate	Moderate-High	Moderate
Communicable Disease and Bioterrorism	Moderate	Moderate	Moderate
Drought	Moderate	Low-Moderate	Moderate
Ground Transportation Accident	Moderate	Low-Moderate	Moderate
Urban Fire	Moderate	Low-Moderate	Moderate
Dam Failure	Low-Moderate	Moderate	Moderate
Utility Outage	Low-Moderate	Low-Moderate	Low
Volcano	Low	Moderate	Low
Terrorism, Civil Unrest, and Violence	Low	Low-Moderate	Low
Aviation Accident	Low	Low	Low
Railroad Accident	Low	Low	Low
Avalanche and Landslide	Low	Low	Low

Table 4.19C City of Livingston Hazard Ratings

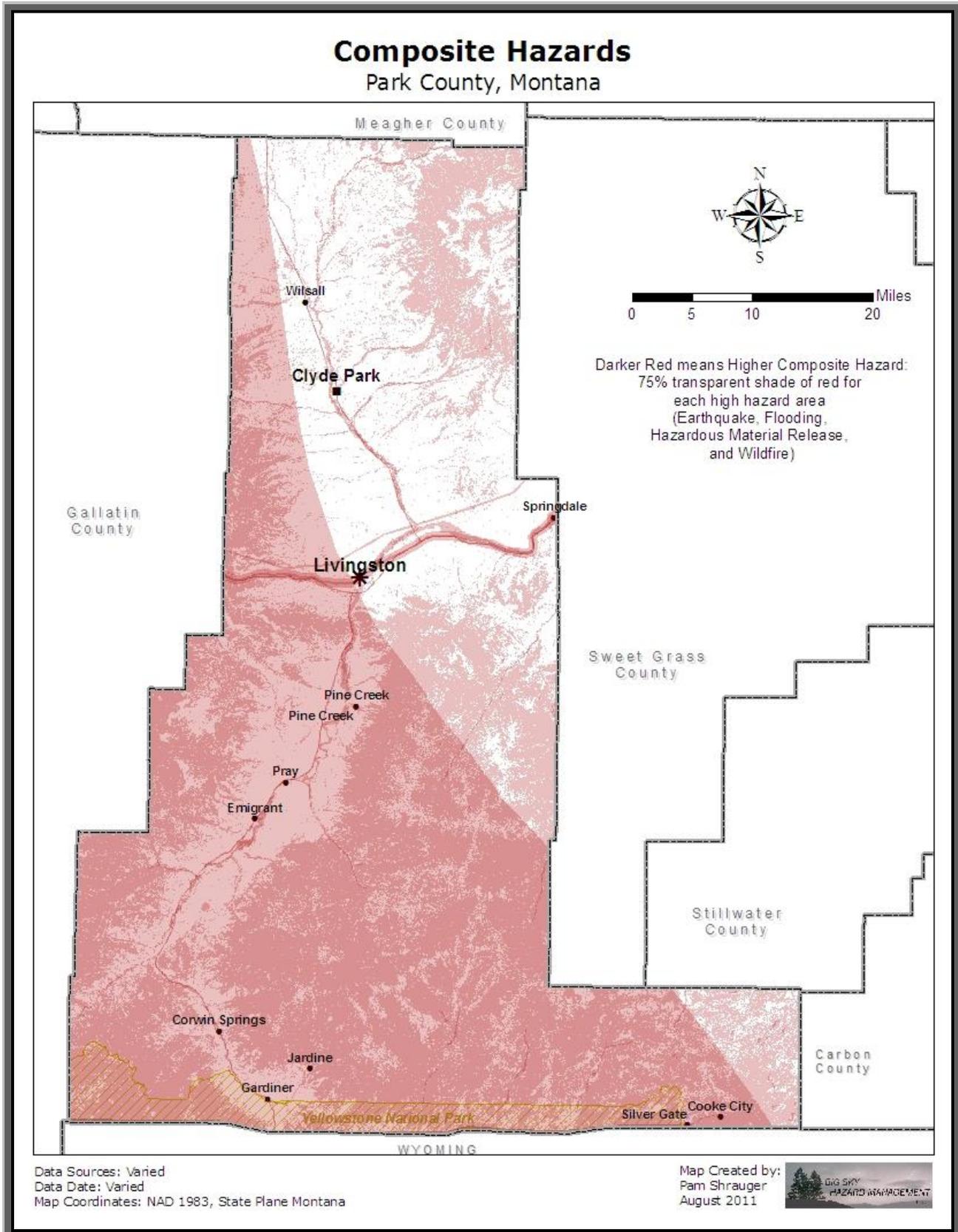
Hazard	Probability of High Impact Event	Vulnerability	Overall Hazard Rating
Flooding	Moderate-High	Moderate-High	High
Earthquake	Moderate	High	High
Hazardous Materials Release	Moderate	Moderate-High	High
Wind	Moderate-High	Moderate	High
Winter Storms and Extended Cold	Moderate-High	Moderate	High
Communicable Disease and Bioterrorism	Moderate	Moderate	Moderate
Severe Thunderstorms and Tornadoes	Moderate	Moderate	Moderate
Urban Fire	Moderate	Moderate	Moderate
Drought	Moderate	Low-Moderate	Moderate
Utility Outage	Low-Moderate	Moderate	Moderate
Ground Transportation Accident	Low-Moderate	Low-Moderate	Low
Wildfire	Low-Moderate	Low-Moderate	Low
Aviation Accident	Low	Moderate	Low
Terrorism, Civil Unrest, and Violence	Low	Moderate	Low
Railroad Accident	Low-Moderate	Low-Moderate	Low
Volcano	Low	Low-Moderate	Low
Avalanche and Landslide	Not Applicable	Not Applicable	Not Applicable
Dam Failure	Not Applicable	Not Applicable	Not Applicable

Table 4.19D Town of Clyde Park Hazard Ratings

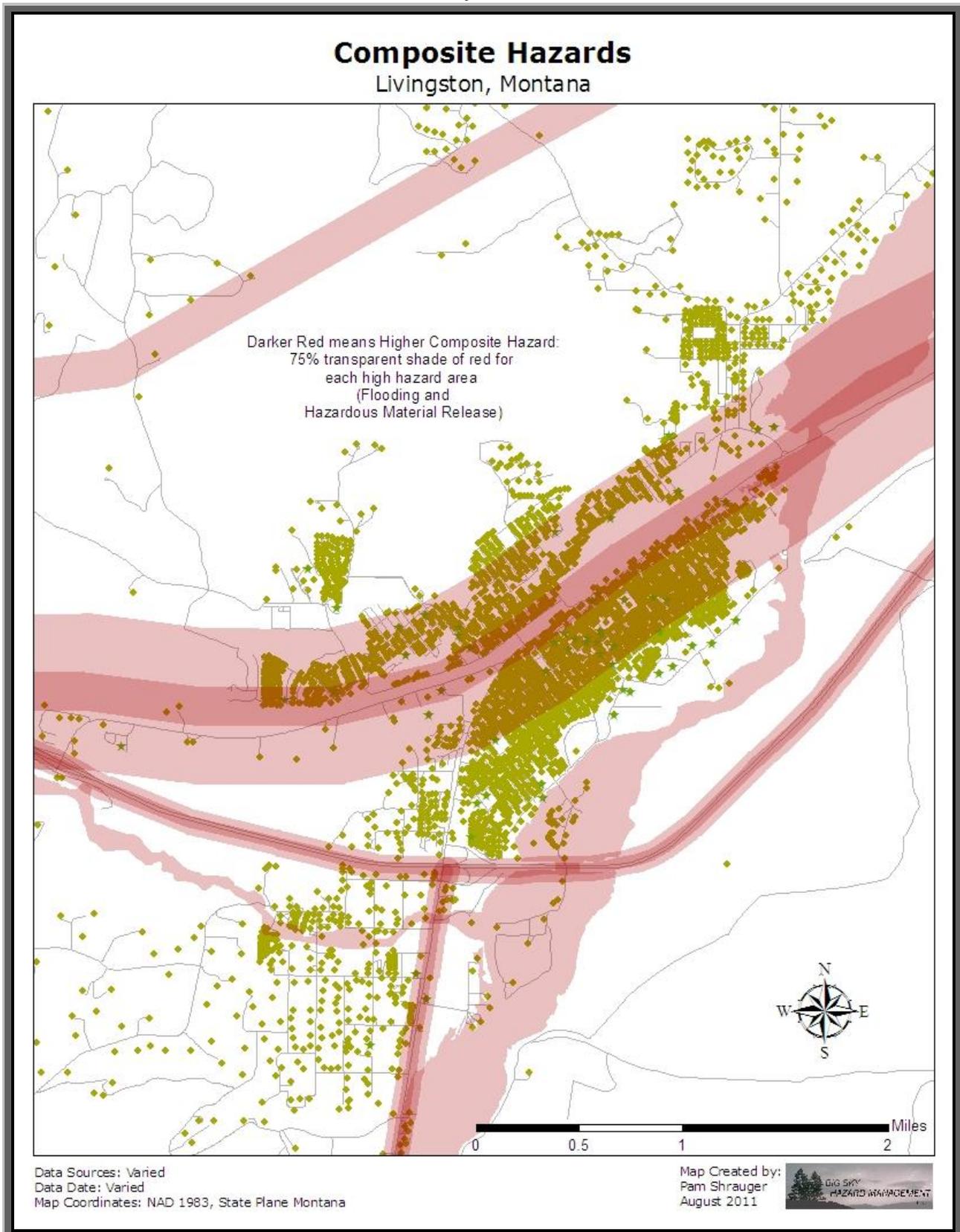
Hazard	Probability of High Impact Event	Vulnerability	Overall Hazard Rating
Severe Thunderstorms and Tornadoes	Moderate	Moderate-High	High
Flooding	Moderate	Moderate	High
Urban Fire	Moderate	Moderate	High
Wildfire	Moderate	Moderate	High
Wind	Moderate	Moderate	High
Winter Storms and Extended Cold	Moderate-High	Low-Moderate	Moderate
Hazardous Materials Release	Low-Moderate	Moderate-High	Moderate
Communicable Disease and Bioterrorism	Moderate	Moderate	Moderate
Drought	Moderate	Moderate	Moderate
Dam Failure	Low-Moderate	Moderate	Moderate
Earthquake	Low-Moderate	Moderate	Moderate
Ground Transportation Accident	Low-Moderate	Low-Moderate	Low
Utility Outage	Low-Moderate	Low-Moderate	Low
Aviation Accident	Low	Moderate	Low
Volcano	Low	Low-Moderate	Low
Terrorism, Civil Unrest, and Violence	Low	Low	Low
Avalanche and Landslide	Not Applicable	Not Applicable	Not Applicable
Railroad Accident	Not Applicable	Not Applicable	Not Applicable

Maps 4.19E, 4.19F, and 4.19G are composite maps showing the areas in the jurisdictions at high risk from multiple hazards, where such geographic delineations exist. These maps can help identify those areas that are vulnerable to more than one hazard and could be targeted for mitigation.

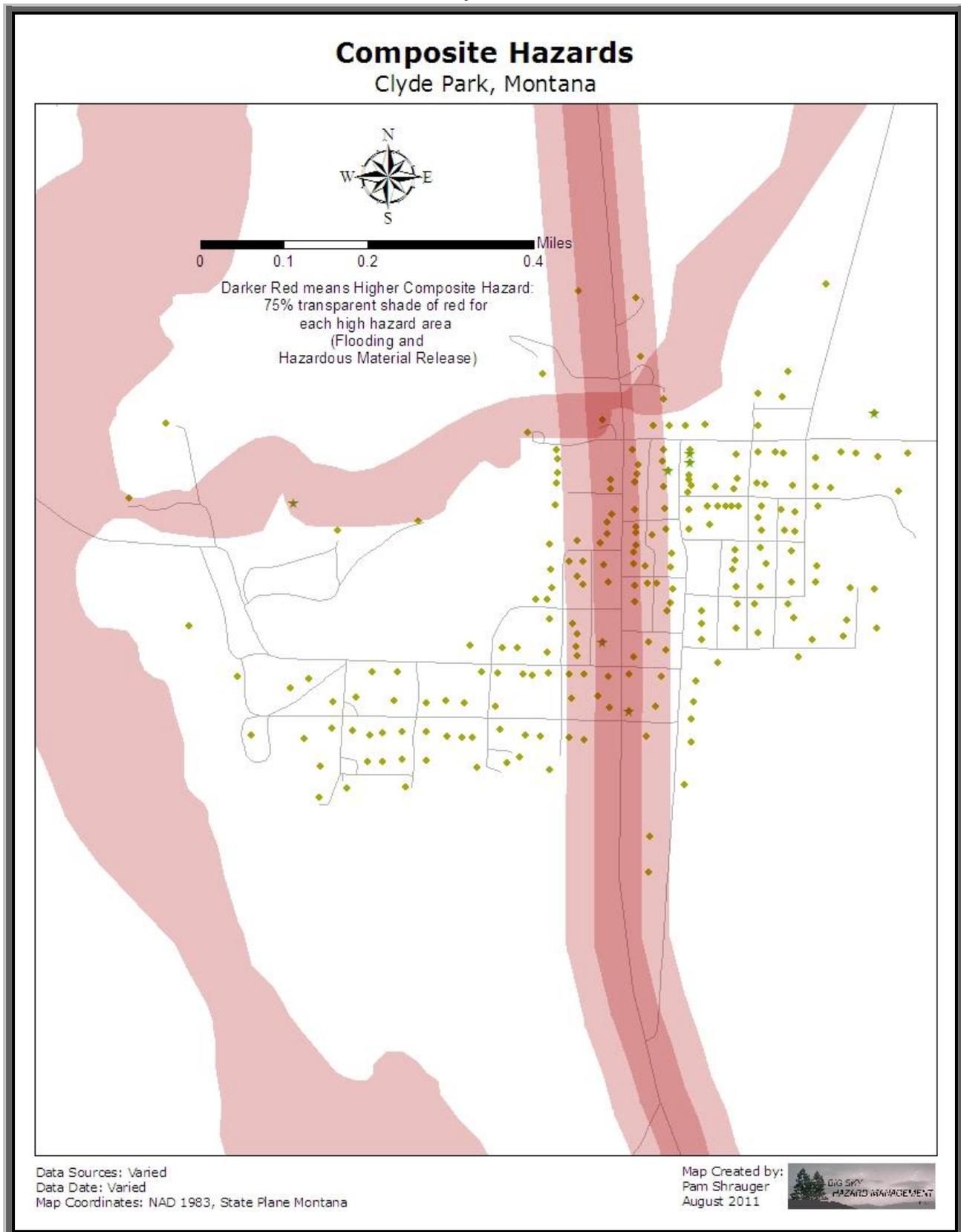
Map 4.19E



Map 4.19F



Map 4.19G



5. 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 Park County, the City of Livingston, and the Town of Clyde Park to create a vision for preventing future disasters, establish a common set of mitigation goals, prioritize projects, and evaluate the success of such projects. 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, city, and town would like to accomplish. Goals are usually not measurable or fully attainable but rather ideals to which the county, city, and town should strive for as they develop and implement mitigation projects.

Rather than wait until a disaster occurs, Park County, the City of Livingston, and the Town of Clyde Park 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.

Initially, the mitigation strategies were developed in 2005 based on the results of the risk assessment and recommendations by knowledgeable community members through the Local Emergency Planning Committee and public meetings and existing studies and plans. In 2011, those mitigation goals, objectives, and project ideas 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. Wildfire projects were incorporated from the Park County Community Wildfire Protection Plan and Northern Rocky Mountain Resources Conservation and Development Area Plan.

The overarching mission of this mitigation strategy is to:

Reduce or prevent losses from disasters.

Many of the mitigation actions were carried over from the 2005 plan and new ones were developed based on direct input from stakeholders; the projects were then prioritized. Some projects that were completed or considered no longer effective were removed. Those goals, objectives, and projects that remain are considered to be valid and effective mitigation strategies. More information on the specific changes to the mitigation strategy since 2005 can be found in Appendix J.

5.1 Goals, Objectives, and Proposed Projects

The mitigation goals, objectives, and proposed projects for Park County, the City of Livingston, and the Town of Clyde Park follow. Each of the projects specifies the jurisdiction or jurisdictions involved, the type of project, its priority, the responsible agencies and partners, resources needed, and the goal timeframe.

For clarification and prioritization purposes, each project is categorized by 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 projects often directly reduce future property losses through physical changes. Such changes can reduce or eliminate the threat to property.
- Infrastructure Protection: These projects often physically reduce losses to critical infrastructure. Hardening or improvements to infrastructure can reduce the likelihood of losses to important lifeline systems from the various hazards.
- 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.

GOAL 1: REDUCE DAMAGES FROM FLOODING.

Objective 1.1: Prevent flood damages to critical facilities, critical infrastructure, and future development through government resources, services, and authorities.

Project 1.1.1: River Crossing Improvements

- Lessen the hydraulic impacts when bridges crossing water bodies are replaced.
- Remove abandoned bridge abutments and piers.
- Consider zero backwater standards during bridge reconstruction.

Jurisdiction(s): Park County, City of Livingston

Project Type: Infrastructure Protection

Responsible Agencies and Partners: Montana Department of Transportation Planners and Engineers; Park County Road Foreman; Livingston Public Works Director

Resources Needed: Staff time and expertise

Potential Funding Sources: Montana Department of Transportation; County and City Budgets

Goal Timeframe: Ongoing: Already initiated and continuing; Post-Disaster: During bridge reconstruction/repairs

Priority: High

Project 1.1.2: Floodplain Ordinances

- Continue compliance with the National Flood Insurance Program and local flood ordinances.
- In Clyde Park, take action to adopt a National Flood Insurance Program compliant flood ordinance.
- Consider more restrictive floodplain development regulations, such as freeboard.
- Update flood ordinances to exclude school facilities as an appropriate floodplain use.
- Consider joining the Community Rating System volunteer incentive program.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Policy/Regulatory

Responsible Agencies and Partners: Park County Commission, Floodplain Administrator, and Planners; Livingston City Commission, Floodplain Administrator, and Planners; Clyde Park Town Council

Resources Needed: Staff time and expertise

Potential Funding Sources: None needed

Goal Timeframe: Near Term: Initiated within 0-3 years

Priority: High

Project 1.1.3: Conservation Easements

- Protect values along the rivers and streams through conservation easements.
- If necessary, consider a local bond to generate funds.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Policy/Regulatory

Responsible Agencies and Partners: Park County Commission, Floodplain Administrator, and Planners; Livingston City Commission, Floodplain Administrator, and Planners; Clyde Park Town Council; Private Conservation Groups

Resources Needed: Staff time and expertise; Funding for easement purchases (amount depends on the market and size of purchase)

Potential Funding Sources: Local Bonds; County, City, and Town Budgets; Private Conservation Organizations

Goal Timeframe: Ongoing: Already initiated and continuing; Post-Disaster: when landowners are most interested

Priority: Low

Project 1.1.4: Water Body and Ditch Maintenance

- Remove debris from water bodies, ditches, and storm drains, as needed, to protect public safety.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Infrastructure Protection

Responsible Agencies and Partners: Park County Road Foreman; Livingston Public Works Director; Clyde Park Public Works Director

Resources Needed: Staff time and expertise

Potential Funding Sources: County, City, and Town Budgets for staff and equipment time

Goal Timeframe: Ongoing: Already initiated and continuing

Priority: Medium

Project 1.1.5: Bridge, Culvert, and Road Improvements

- Upgrade bridges, culverts, and roads to allow sufficient passage of floodwaters.
- Install culverts in areas prone to washouts or drainage problems.
- Stabilize roadsides that are prone to mudslides and/or landslides.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Infrastructure Protection

Responsible Agencies and Partners: County, City, and Town Road/Street Foremen

Resources Needed: Staff time and expertise; Funding for projects (amount highly variable depending on the project)

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; County, City, and Town Budgets

Goal Timeframe: Near Term: Initiated within 0-3 years; Post-Disaster: During bridge, culvert, and/or road repairs

Priority: High

Project 1.1.6: Livingston Berm Alternatives

- Study the need for the temporary berm constructed during Yellowstone River flood threats to protect areas of Livingston.
- Evaluate possible alternatives that are more sustainable and cost-effective in the long term.
- Implement reasonable solutions that more permanently mitigate the threat.

Jurisdiction(s): Park County, City of Livingston

Project Type: Property Protection

Responsible Agencies and Partners: Park County Disaster and Emergency Services, County and City Road/Street Foremen

Resources Needed: Staff time and expertise; Funding for study and potential projects (amount highly variable depending on the project)

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; County and City Budgets

Goal Timeframe: Near Term: Initiated within 0-3 years

Priority: High

Objective 1.2: Provide the public with information and means to prevent private flood losses.

Project 1.2.1: River Bank Stabilization and Flood Mitigation Program

- Establish a Bank Stabilization Information Clearinghouse.
- Establish financial incentives for landowners to remove, modify, or replace obsolete and non-functioning flood control and bank stabilization structures.
- Continue studying project effectiveness and impacts on ecological health.
- Explore alternative flood mitigation measures for individual property owners.

Jurisdiction(s): Park County

Project Type: Property Protection

Responsible Agencies and Partners: Park County Commission, Floodplain Administrator, and Planners; US Army Corps of Engineers

Resources Needed: Staff time and expertise; Funding for bank stabilization projects

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; River Conservation groups

Goal Timeframe: Mid Term: Initiated within 3-6 years; Post-Disaster: during bank repairs

Priority: Medium

Project 1.2.2: Flood-prone Property Acquisition Program

- Generate interest in flood acquisition and/or relocation opportunities with property owners in flood-prone areas, especially those that have experienced repetitive losses such as Ninth Street Island.
- Pursue acquisitions and/or relocations as funding and interest allows.

Jurisdiction(s): Park County

Project Type: Property Protection

Responsible Agencies and Partners: Park County Commission, Floodplain Administrator, and Disaster and Emergency Services Coordinator; Montana Disaster and Emergency Services Hazard Mitigation Officer

Resources Needed: Staff time and expertise; Funding for acquisitions/relocations

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; Montana Department of Natural Resources Renewable Resource grant

Goal Timeframe: Mid Term: Initiated within 3-6 years; Post-Disaster: when landowners are most interested

Priority: Medium

Project 1.2.3: Flood Insurance Education

- Educate property owners and tenants on the availability and importance of flood insurance.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Educational/Informational

Responsible Agencies and Partners: Park County Commission, Floodplain Administrator, and Disaster and Emergency Services Coordinator

Resources Needed: Staff time and expertise

Potential Funding Sources: None needed

Goal Timeframe: Mid Term: Initiated within 3-6 years; Post Disaster: when property owners and tenants are most interested

Priority: Medium

GOAL 2: PREVENT LOSSES FROM WILDFIRES.

Objective 2.1: Increase understanding of the wildfire hazard areas.

Project 2.1.1: FireSafe Coalition

- Continue to develop and support a Park County FireSafe Coalition.
- Promote mitigation practices in the wildland urban interface.
- Coordinate wildfire preparedness planning and activities.
- Build partnerships with community leaders and businesses, such as insurance providers, for wildfire prevention and mitigation.

Jurisdiction(s): Park County, Town of Clyde Park

Project Type: Supportive

Responsible Agencies and Partners: Park County Fire Warden; Park County and Clyde Park Fire Chiefs; Northern Rocky Mountain Resources Conservation and Development Area Program Coordinator

Resources Needed: Staff time and expertise

Potential Funding Sources: None needed

Goal Timeframe: Ongoing: Already initiated and continuing

Priority: High

Project 2.1.2: Fuels and Fire Mapping

- Develop digital maps of wildfire hazard areas, such as fuels and condition classes.
- Use the mapping for land management and project development.
- Develop a centralized, countywide wildfire history database.
- Develop mapping of treatments conducted by all land management agencies.
- Develop an improved wildland urban interface map.

Jurisdiction(s): Park County

Project Type: Educational/Informational

Responsible Agencies and Partners: Park County Fire Warden; Park County Fire Chiefs; US Forest Service; US Bureau of Land Management; Montana DNRC; Park County GIS Coordinator

Resources Needed: Staff time and expertise; Funding for GIS services

Potential Funding Sources: US Forest Service; US Bureau of Land Management; Montana DNRC

Goal Timeframe: Ongoing: Already initiated and continuing

Priority: Medium

Objective 2.2: Reduce private losses in the wildland urban interface.

Project 2.2.1: Fuel Reductions

- Pursue wildland urban interface fuel reduction projects in high-risk areas around the county, including near structures, road right-of-ways, utility right-of ways, and along federal and state lands.

Jurisdiction(s): Park County

Project Type: Property Protection

Responsible Agencies and Partners: Northern Rocky Mountain Resources Conservation and Development Area Program Coordinator; Park County FireSafe Council; Park County Fire Warden; Park County Fire Chiefs; US Forest Service; US Bureau of Land Management; Montana DNRC

Resources Needed: Staff time and expertise; Funding for fuel reduction projects (about \$100-\$200 per acre)

Potential Funding Sources: Northern Rocky Mountain Resources Conservation and Development Area Hazardous Fuels Assistance Program; US Forest Service; US Bureau of Land Management; Montana DNRC Western States Wildland Urban Interface grant

Goal Timeframe: Ongoing; Already initiated and continuing

Priority: High

Project 2.2.2: Regional Water Sources

- Develop regional water sources within the wildland urban interface to supply substantial amounts of water within a reasonable distance for wildland firefighting efforts.

Jurisdiction(s): Park County

Project Type: Property Protection

Responsible Agencies and Partners: Park County FireSafe Council; Park County Fire Warden; Park County Fire Chiefs; Park County Commission

Resources Needed: Staff time and expertise; Funding for water source projects

Potential Funding Sources: Homeowners' Association Fees; Special Tax Districts

Goal Timeframe: Long Term: Initiated within 7-10 years

Priority: Low

Project 2.2.3: Ingress/Egress Road Improvements

- Improve critical ingress/egress roadways in the wildland urban interface with activities such as road widening and the addition of turnarounds, particularly in the Mountain Sky, West Boulder, and Main Boulder areas.
- Where feasible, construct a second access road into a subdivision.

Jurisdiction(s): Park County

Project Type: Population Protection

Responsible Agencies and Partners: Park County FireSafe Council; Park County Fire Warden; Park County Fire Chiefs; Park County Road Foreman; US Forest Service; US Bureau of Land Management; Montana DNRC; Homeowners Associations

Resources Needed: Staff time and expertise; Funding for projects

Potential Funding Sources: US Forest Service; US Bureau of Land Management; Montana DNRC Western States Wildland Urban Interface grant; Homeowners' Association Fees; Special Tax Districts

Goal Timeframe: Mid Term: Initiated within 3-6 years

Priority: Medium

GOAL 3: REDUCE POTENTIAL LOSSES FROM EARTHQUAKES.

Objective 3.1: Prevent earthquake losses to critical facilities, vulnerable populations, and infrastructure.

Project 3.1.1: Critical Facility Seismic Retrofits

- Conduct earthquake risk assessments at each critical facility.
- Perform simple mitigation activities such as filming windows and securing equipment and furniture that could fall during an earthquake.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Property Protection

Responsible Agencies and Partners: Park County Disaster and Emergency Services; County, City, and Town Department Directors and Facility Managers; Private Facility Managers

Resources Needed: Staff time and expertise; Funding for supplies

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; 4

Goal Timeframe: Near Term: Initiated within 0-3 years (Park County and Livingston); Mid Term: Initiated within 3-6 years (Clyde Park)

Priority: Medium-High

Project 3.1.2: Infrastructure Seismic Improvements

- Prioritize and make improvements to bring vulnerable infrastructure up to seismic code.
- Inspect key bridges for seismic stability and make improvements during upgrades.
- Anchor or stabilize electric transformers and generators for seismic motion during maintenance and new installations.
- Install expansion joints in underground utilities during new or replacement construction.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Infrastructure Protection

Responsible Agencies and Partners: Park County Disaster and Emergency Services; County, City, and Town Road and Public Works Directors; Private Utility Companies

Resources Needed: Staff time and expertise; Funding for improvements

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; County, City, and Town Budgets for staff and equipment time and supplies

Goal Timeframe: Near Term: Initiated within 0-3 years (Park County and Livingston); Mid Term: Initiated within 3-6 years (Clyde Park); Post Disaster: when making repairs

Priority: Medium-High

Objective 3.2: Minimize private earthquake losses.

Project 3.2.1: Earthquake Retrofit Education

- Educate home and business owners on simple earthquake retrofits.
- Survey commercial structures for earthquake stability and recommend retrofits.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Educational/Informational

Responsible Agencies and Partners: Park County Disaster and Emergency Services; Business Groups

Resources Needed: Staff time and expertise; Funding for engineers/specialists to conduct surveys

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; Small Business Administration Pre-Disaster Mitigation loans
Goal Timeframe: Mid Term: Initiated within 3-6 years (Park County and Livingston); Long Term: Initiated within 7-10 years (Clyde Park)
Priority: Low-Medium

Project 3.2.2: Earthquake Retrofit Program

- Create a financial incentive program for major earthquake retrofits in the priority hazard areas.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Educational/Informational

Responsible Agencies and Partners: Park County Disaster and Emergency Services

Resources Needed: Staff time and expertise; Funding for retrofits

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; Small Business Administration Pre-Disaster Mitigation loans

Goal Timeframe: Mid Term: Initiated within 3-6 years; Post Disaster: when most property owners are interested

Priority: Medium

GOAL 4: REDUCE LOSSES FROM A TRANSPORTATION OR HAZARDOUS MATERIALS ACCIDENT.

Objective 4.1: Allow for emergency traffic and evacuation routes during a hazardous materials or ground transportation incident.

Project 4.1.1: Railroad Crossing

- Construct an additional railroad crossing in Livingston.

Jurisdiction(s): City of Livingston

Project Type: Population Protection

Responsible Agencies and Partners: Livingston Public Works Director; Livingston Fire Chief; Montana Rail Link; Montana Department of Transportation

Resources Needed: Staff time and expertise; Funding for construction

Potential Funding Sources: Montana Department of Transportation; Montana Rail Link; City Budget

Goal Timeframe: Near Term: Initiated within 0-3 years

Priority: High

GOAL 5: PROMOTE EFFECTIVE MULTI-HAZARD MITIGATION MEASURES.

Objective 5.1: Improve warning capabilities.

Project 5.1.1: Storm Ready Community

- Become a National Weather Service Storm Ready Community through evaluation of and improvements to public weather warning capabilities.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Population Protection

Responsible Agencies and Partners: Park County Disaster and Emergency Services Coordinator; National Weather Service Warning Coordination Meteorologist

Resources Needed: Staff time and expertise

Potential Funding Sources: None needed

Goal Timeframe: Near Term: Initiated within 0-3 years

Priority: High

Objective 5.2: Increase emergency management and disaster service capabilities to prevent additional losses in a disaster.

Project 5.2.1: Generators

- Install generators at critical facilities and vulnerable population locations.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Population Protection

Responsible Agencies and Partners: Park County Disaster and Emergency Services Coordinator; County, City, and Town Department Heads and Facility Managers

Resources Needed: Staff time and expertise; Funding for generators (about \$5,000 - \$15,000 per site)

Potential Funding Sources: Unknown

Goal Timeframe: Near Term: Initiated within 0-3 years; Post Disaster: when funding may be available

Priority: High

Objective 5.3: Improve digital data for assessing all hazards.

Project 5.3.1: HAZUS-MH GIS Data

- Develop GIS data that can be used with FEMA's HAZUS loss estimated models.

Jurisdiction(s): Park County

Project Type: Educational/Informational

Responsible Agencies and Partners: Park County GIS Coordinator; Park County Disaster and Emergency Services Coordinator

Resources Needed: Staff time and expertise; Funding for education and data development

Potential Funding Sources: Federal Emergency Management Agency mitigation grants

Goal Timeframe: Long Term: Initiated within 7-10 years

Priority: Low

Objective 5.4: Mitigate the impact of hazards on future development through land use and building regulations.

Project 5.4.1: Building Codes

- Adopt and enforce the state building code.

Jurisdiction(s): Park County, Town of Clyde Park

Project Type: Policy/Regulatory

Responsible Agencies and Partners: Park County Commission; Clyde Park Town Council

Resources Needed: Staff time and expertise; Funding for education and program development

Potential Funding Sources: County and Town Budgets

Goal Timeframe: Near Term: Initiated within 0-3 years

Priority: High

Project 5.4.2: Growth Policies and Subdivision Regulations

- Update the growth policies to encourage growth in low hazard areas and continue to allow for the consideration of high hazard areas during subdivision reviews.
- Continue to make improvements to the subdivision regulations for disaster resistance.
- Ensure the new state requirements for wildfire considerations in growth policies are met.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Policy/Regulatory

Responsible Agencies and Partners: Park County Commission and Planners; Livingston City Commission and Planners; Clyde Park Town Council; Park County Fire Warden; Park County Fire Chiefs; County, City, and Town Attorneys

Resources Needed: Staff time and expertise

Potential Funding Sources: None needed

Goal Timeframe: Near Term: Initiated within 0-3 years (Park County and Clyde Park); Mid Term: Initiated within 3-6 years (Livingston)

Priority: Medium-High

Project 5.4.3: Capital Improvements Plans

- Develop and/or update Capital Improvements Plans to include relevant hazard mitigation projects and hazard considerations during improvements.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Policy/Regulatory

Responsible Agencies and Partners: Park County Commission and Planners; Livingston City Commission and Planners; Clyde Park Town Council

Resources Needed: Staff time and expertise

Potential Funding Sources: None needed

Goal Timeframe: Near Term: Initiated within 0-3 years

Priority: High

Objective 5.5: Educate businesses and the public on simple mitigation activities.

Project 5.5.1: Mitigation Education

- Develop a comprehensive public education program, including the use of social media as appropriate, that highlights a variety of mitigation topics including, but not limited to:
 - 72-Hour preparedness kits
 - Seasonal, hazard-specific information (avalanche, drought, flood, severe thunderstorms, wildfire, winter weather)
 - Smart building practices (specific to flood, wildfire, and/or wind)
 - Disease prevention

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Educational/Informational

Responsible Agencies and Partners: Park County Disaster and Emergency Services Coordinator and the relevant subject matter experts: Park County Fire Warden, Park County Fire Chiefs, National Weather Service Warning Coordination Meteorologist, Montana Disaster and Emergency Services, Park County Public Health Nurse

Resources Needed: Staff time and expertise; Funding for materials

Potential Funding Sources: FEMA; USFS, BLM, and/or DNRC (for wildfire); DES or DNRC (for flooding); DPHHS (for disease)

Goal Timeframe: Near Term: Initiated within 0-3 years; Post Disaster: when interest is greatest

Priority: High

Objective 5.6: Protect critical infrastructure from a variety of hazards.

Project 5.6.1: Electric and Communications Infrastructure Burying

- Bury electric and communications lines in hazardous areas (wildland urban interface, near trees, etc.).

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Infrastructure Protection

Responsible Agencies and Partners: Electric Companies, Communications Companies, Park County Disaster and Emergency Services Coordinator, Park County Fire Warden

Resources Needed: Staff time and expertise; Funding for burying (about \$1 million per mile)

Potential Funding Sources: Federal Emergency Management Agency mitigation grants

Goal Timeframe: Near Term: Initiated within 0-3 years; Post Disaster: when repairing infrastructure

Priority: High

Project 5.6.2: Snow Fences

- Install snow fences (living or artificial) along critical roadways prone to drifting snow and strong winds.

Jurisdiction(s): Park County, City of Livingston, Town of Clyde Park

Project Type: Infrastructure Protection

Responsible Agencies and Partners: Montana Department of Transportation; County, City, and Town Road/Street Foremen

Resources Needed: Staff time and expertise; Funding for fences and installation

Potential Funding Sources: Federal Emergency Management Agency mitigation grants; Montana Department of Transportation

Goal Timeframe: Near Term: Initiated within 0-3 years (Park County and Livingston); Mid Term: Initiated within 3-6 years (Clyde Park); Post Disaster: when funding may be available

Priority: Medium-High

5.2 Project Prioritization

Each of the proposed projects has value and is important enough to be included in the strategy; however, time and financial constraints and competition with other community priorities 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 5.2A 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

Table 5.2A FEMA’s STAPLEE Criteria (continued)

Criteria	Considerations
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 factor was 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 4.19), and 3 of 30 points account for project feasibility.

The projects were prioritized by comparing the scores of projects of similar type. This method allows for more even prioritization of a variety of projects. In order for a project to receive a “high” priority, it also needed to mitigate a “high” rated hazard for the jurisdiction. When evaluating projects for grant applications, established cost-benefit analyses requiring detailed project-specific data should be used.

Note that all projects listed in the strategy have value and are worthy of inclusion in this plan. A low priority does not mean the project is not important, rather, compared to the other projects, its score using the described methodology was lower. Even low priority projects are encouraged immediately should funding, resources, and opportunities allow.

Table 5.2B Prioritization Criteria

Factor	Threshold	Rating	Score
Cost <i>Range: 1-5</i>	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 <i>Range: 1-3</i>	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 <i>Range: 1-3</i>	Positive support for the project	High	3
	Neutral support for the project	Moderate	2
	Negative support for the project	Low	1
Population Benefit <i>Range: 1-4</i>	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 <i>Range: 1-4</i>	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 <i>Range: 1-3</i>	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 <i>Range: 1-3</i>	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 <i>Range: 1-5</i>	see Section 4.19	High	5
	see Section 4.19	Moderate	3
	see Section 4.19	Low	1

Table 5.2C Hazards and Development Mitigated by Each Proposed Project

	Avalanche and Landslide	Aviation Accident	Communicable Disease and Bioterrorism	Dam Failure	Drought	Earthquake	Flooding	Ground Transportation Accident	Hazardous Materials Release	Railroad Accident	Severe Thunderstorms and Tornadoes	Terrorism, Civil Unrest, and Violence	Urban Fire	Utility Outage	Volcano	Wildfire	Wind	Winter Storms and Extended Cold	Existing Development	Future Development
Project 1.1.1: River Crossing Improvements				X			X												X	
Project 1.1.2: Floodplain Ordinances				X			X													X
Project 1.1.3: Conservation Easements				X			X													X
Project 1.1.4: Water Body and Ditch Maintenance				X			X												X	
Project 1.1.5: Bridge, Culvert, and Road Improvements	X			X			X	X											X	
Project 1.1.6: Livingston Berm Alternatives							X												X	
Project 1.2.1: River Bank Stabilization and Flood Mitigation Program	X			X			X												X	
Project 1.2.2: Flood-prone Property Acquisition Program				X			X												X	
Project 1.2.3: Flood Insurance Education							X												X	
Project 2.1.1: FireSafe Coalition																X			X	X
Project 2.1.2: Fuels and Fire Mapping																X				X
Project 2.2.1: Fuel Reductions																X			X	
Project 2.2.2: Regional Water Sources																X			X	
Project 2.2.3: Ingress/Egress Road Improvements								X								X			X	
Project 3.1.1: Critical Facility Seismic Retrofits						X													X	
Project 3.1.2: Infrastructure Seismic Improvements					X														X	X

Table 5.2C Hazards and Development Mitigated by Each Proposed Project (continued)

	Avalanche and Landslide	Aviation Accident	Communicable Disease and Bioterrorism	Dam Failure	Drought	Earthquake	Flooding	Ground Transportation Accident	Hazardous Materials Release	Railroad Accident	Severe Thunderstorms and Tornadoes	Terrorism, Civil Unrest, and Violence	Urban Fire	Utility Outage	Volcano	Wildfire	Wind	Winter Storms and Extended Cold	Existing Development	Future Development
Project 3.2.1: Earthquake Retrofit Education						X														X
Project 3.2.2: Earthquake Retrofit Program						X														X
Project 4.1.1: Railroad Crossing								X	X	X										
Project 5.1.1: Storm Ready Community	X			X			X		X		X	X		X	X	X	X	X		
Project 5.2.1: Generators			X		X	X	X				X	X		X	X		X	X		
Project 5.3.1: HAZUS-MH GIS Data						X	X										X			
Project 5.4.1: Building Codes						X					X		X		X	X	X	X		X
Project 5.4.2: Growth Policies and Subdivision Regulations	X			X			X	X	X							X				X
Project 5.4.3: Capital Improvements Plans	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project 5.5.1: Mitigation Education	X		X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X
Project 5.6.1: Electric and Communications Infrastructure Burying	X	X		X			X	X		X	X	X	X	X	X	X	X	X	X	X
Project 5.6.2: Snow Fences	X							X	X								X	X	X	

Table 5.2D Mitigation Prioritization Scores

	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	TOTAL SCORE
<i>Supportive</i>									
Project 2.1.1: FireSafe Coalition	5	1	3	2	3	2	1	5	22
<i>Educational/Informational</i>									
Project 1.2.3: Flood Insurance Education	5	2	2	1	3	2	1	5	21
Project 2.1.2: Fuels and Fire Mapping	3	2	3	1	3	3	1	5	21
Project 3.2.1: Earthquake Retrofit Education	5	1	2	2	2	2	1	5	20
Project 5.3.1: HAZUS-MH GIS Data	3	2	3	1	1	2	2	5	19
Project 5.5.1: Mitigation Education	5	1	2	3	2	2	1	5	21
<i>Policy/Regulatory</i>									
Project 1.1.2: Floodplain Ordinances	5	1	2	2	3	3	2	5	23
Project 1.1.3: Conservation Easements	1	2	2	2	3	3	3	5	21
Project 5.4.1: Building Codes	5	1	1	3	3	2	1	5	21
Project 5.4.2: Growth Policies and Subdivision Regulations	5	1	2	2	3	2	2	5	22
Project 5.4.3: Capital Improvements Plans	5	1	3	2	2	2	2	5	22
<i>Property Protection</i>									
Project 1.1.6: Livingston Berm Alternatives	2	2	3	2	3	2	3	5	22
Project 1.2.1: River Bank Stabilization and Flood Mitigation Program	2	1	3	2	2	3	2	5	20
Project 1.2.2: Flood-prone Property Acquisition Program	1	2	2	2	2	3	3	5	20
Project 2.2.1: Fuel Reductions	3	2	2	2	2	2	1	5	19
Project 2.2.2: Regional Water Sources	3	2	2	2	2	1	2	5	19
Project 3.1.1: Critical Facility Seismic Retrofits	4	2	3	2	2	2	3	5	23
Project 3.2.2: Earthquake Retrofit Program	2	2	2	2	2	2	3	5	20
<i>Infrastructure Protection</i>									
Project 1.1.1: River Crossing Improvements	1	2	3	2	2	3	3	5	21
Project 1.1.4: Water Body and Ditch Maintenance	4	1	3	2	2	2	1	5	20
Project 1.1.5: Bridge, Culvert, and Road Improvements	2	2	3	2	2	2	3	5	21
Project 3.1.2: Infrastructure Seismic Improvements	3	2	3	2	3	2	3	5	23
Project 5.6.1: Electric and Communications Infrastructure Burying	1	2	2	2	3	2	3	5	20
Project 5.6.2: Snow Fences	3	2	3	2	2	2	2	5	21
<i>Population Protection</i>									
Project 2.2.3: Ingress/Egress Road Improvements	2	2	2	3	1	1	2	5	18
Project 4.1.1: Railroad Crossing	1	2	2	3	1	2	3	5	19
Project 5.1.1: Storm Ready Community	5	1	3	2	1	2	2	5	21
Project 5.2.1: Generators	3	2	2	3	2	2	2	5	21

Following are the top priorities by hazard and jurisdiction. These priorities were established based on the high hazards for each jurisdiction and the basic review of cost versus benefit for that particular hazard and jurisdiction. The priorities were reviewed at open public meetings.

Park County

Flooding

- Project 1.1.2: Floodplain Ordinances
- Project 5.4.3: Capital Improvements Plans
- Project 1.1.6: Livingston Berm Alternatives
- Project 1.1.1: River Crossing Improvements
- Project 1.1.5: Bridge, Culvert, and Road Improvements

Wildfire

- Project 2.1.1: FireSafe Coalition
- Project 5.4.2: Growth Policies and Subdivision Regulations
- Project 2.2.1: Fuel Reductions

Earthquake

- Project 3.1.1: Critical Facility Seismic Retrofits
- Project 3.1.2: Infrastructure Seismic Improvements
- Project 5.4.3: Capital Improvements Plans

Hazardous Materials Release

- Project 5.1.1: Storm Ready Community

Wind

- Project 5.5.1: Mitigation Education
- Project 5.4.1: Building Codes
- Project 5.6.1: Electric and Communications Infrastructure Burying

Winter Storms and Extended Cold

- Project 5.5.1: Mitigation Education
- Project 5.4.1: Building Codes
- Project 5.6.2: Snow Fences
- Project 5.2.1: Generators

City of Livingston

Flooding

- Project 1.1.2: Floodplain Ordinances
- Project 5.4.3: Capital Improvements Plans
- Project 1.1.6: Livingston Berm Alternatives
- Project 1.1.1: River Crossing Improvements
- Project 1.1.5: Bridge, Culvert, and Road Improvements

Earthquake

- Project 3.1.1: Critical Facility Seismic Retrofits
- Project 3.1.2: Infrastructure Seismic Improvements
- Project 5.4.3: Capital Improvements Plans

Hazardous Materials Release

- Project 5.1.1: Storm Ready Community
- Project 4.1.1: Railroad Crossing

Wind

- Project 5.5.1: Mitigation Education
- Project 5.6.1: Electric and Communications Infrastructure Burying

Winter Storms and Extended Cold

- Project 5.5.1: Mitigation Education
- Project 5.6.2: Snow Fences
- Project 5.2.1: Generators

Town of Clyde Park

Severe Thunderstorms and Tornadoes

- Project 5.5.1: Mitigation Education
- Project 5.4.1: Building Codes
- Project 5.1.1: Storm Ready Community
- Project 5.6.1: Electric and Communications Infrastructure Burying

Flooding

- Project 1.1.2: Floodplain Ordinances
- Project 5.4.3: Capital Improvements Plans
- Project 1.1.5: Bridge, Culvert, and Road Improvements

Urban Fire

- Project 5.5.1: Mitigation Education
- Project 5.4.1: Building Codes
- Project 5.4.3: Capital Improvements Plans

Wildfire

- Project 2.1.1: FireSafe Coalition
- Project 5.4.2: Growth Policies and Subdivision Regulations

Wind

- Project 5.5.1: Mitigation Education
- Project 5.6.1: Electric and Communications Infrastructure Burying

5.3 Project Implementation

A critical component of any mitigation program is the implementation of the mitigation projects. Maintenance of this Hazard Mitigation Plan is the responsibility of Park County Disaster and Emergency Services (DES) in coordination with other appropriate agencies. Once a mitigation project is identified, however, DES 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.

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
- Post Disaster: May best be initiated during the recovery process

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 due to financial, staff, or political limitations. This prioritized list, however, allows the county, city, and town to focus on the types of projects with the greatest benefits.

Table 5.3A Implementation Scheme for Mitigation Projects

Proposed Action	Jurisdiction(s)	Priority	Goal Timeframe
<i>Supportive</i>			
Project 2.1.1: FireSafe Coalition	Park County Clyde Park	High	Ongoing
<i>Educational/Informational</i>			
Project 5.5.1: Mitigation Education	All	High	Near Term Post Disaster
Project 1.2.3: Flood Insurance Education	All	Medium	Mid Term Post Disaster
Project 2.1.2: Fuels and Fire Mapping	Park County	Medium	Ongoing
Project 3.2.1: Earthquake Retrofit Education	Park County Livingston	Medium	Mid Term
Project 3.2.1: Earthquake Retrofit Education	Clyde Park	Low	Long Term
Project 5.3.1: HAZUS-MH GIS Data	Park County	Low	Long Term
<i>Policy/Regulatory</i>			
Project 1.1.2: Floodplain Ordinances	All	High	Near Term
Project 5.4.3: Capital Improvements Plans	All	High	Near Term
Project 5.4.1: Building Codes	Park County Clyde Park	High	Near Term

Table 5.3A Implementation Scheme for Mitigation Projects (continued)

Proposed Action	Jurisdiction(s)	Priority	Goal Timeframe
Project 5.4.2: Growth Policies and Subdivision Regulations	Park County Clyde Park	High	Near Term
Project 5.4.2: Growth Policies and Subdivision Regulations	Livingston	Medium	Mid Term
Project 1.1.3: Conservation Easements	All	Low	Ongoing Post Disaster
<i>Property Protection</i>			
Project 2.2.1: Fuel Reductions	Park County	High	Ongoing
Project 3.1.1: Critical Facility Seismic Retrofits	Park County Livingston	High	Near Term
Project 1.1.6: Livingston Berm Alternatives	Park County Livingston	High	Near Term
Project 1.2.1: River Bank Stabilization and Flood Mitigation Program	Park County	Medium	Mid Term Post Disaster
Project 1.2.2: Flood-prone Property Acquisition Program	Park County	Medium	Mid Term Post Disaster
Project 3.1.1: Critical Facility Seismic Retrofits	Clyde Park	Medium	Mid Term
Project 3.2.2: Earthquake Retrofit Program	All	Medium	Mid Term Post Disaster
Project 2.2.2: Regional Water Sources	Park County	Low	Long Term
<i>Infrastructure Protection</i>			
Project 3.1.2: Infrastructure Seismic Improvements	Park County Livingston	High	Near Term Post Disaster
Project 1.1.1: River Crossing Improvements	Park County Livingston	High	Ongoing Post Disaster
Project 1.1.5: Bridge, Culvert, and Road Improvements	All	High	Near Term Post Disaster
Project 5.6.2: Snow Fences	Park County Livingston	High	Near Term Post Disaster
Project 5.6.1: Electric and Communications Infrastructure Burying	All	High	Near Term Post Disaster
Project 3.1.2: Infrastructure Seismic Improvements	Clyde Park	Medium	Mid Term Post Disaster
Project 5.6.2: Snow Fences	Clyde Park	Medium	Mid Term Post Disaster
Project 1.1.4: Water Body and Ditch Maintenance	All	Medium	Ongoing
<i>Population Protection</i>			
Project 5.1.1: Storm Ready Community	All	High	Near Term
Project 5.2.1: Generators	All	High	Near Term Post Disaster
Project 4.1.1: Railroad Crossing	Livingston	High	Near Term
Project 2.2.3: Ingress/Egress Road Improvements	Park County	Medium	Mid Term

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 Park County, the City of Livingston, and the Town of Clyde Park. The traditional mitigation programs that are especially relevant for the county, city, and town are shown in bold. Note that many of the grant programs have a cash or in-kind match requirement.

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.

Table 5.4A Mitigation Funding Sources

Name	Description	Managing Agencies
AmeriCorps	Provides funding for volunteers to serve communities, including disaster prevention.	<ul style="list-style-type: none"> ▪ Corporation for National & Community Service
Assistance to Firefighters Grants	Provides funding for fire prevention and safety activities and firefighting equipment.	<ul style="list-style-type: none"> ▪ US 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.	<ul style="list-style-type: none"> ▪ US Environmental Protection Agency
Community Development Block Grant (CDBG)	Provides funding for sustainable community development, including disaster mitigation projects.	<ul style="list-style-type: none"> ▪ US Housing and Urban Development
Conservation District "HB 223" Grants	Provides funding for projects sponsored by conservation districts	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation
Economic Development Administration (EDA) Grants and Investments	Invests and provides grants for community construction projects, including mitigation activities.	<ul style="list-style-type: none"> ▪ US Economic Development Administration

Table 5.4A Mitigation Funding Sources (continued)

Name	Description	Managing Agencies
Education Mini-Grants	Provides grants to conservation districts for projects that focus on water and other natural resources	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation
Emergency Watershed Protection	Provides funding and technical assistance for emergency measures such as floodplain easements in impaired watersheds.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ 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).	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation ▪ FEMA – Region VIII
Hazard Mitigation Grant Program (HMGP)	Provides post-disaster mitigation funding statewide.	<ul style="list-style-type: none"> ▪ Montana Disaster & Emergency Services ▪ FEMA – Region VIII
Hazardous Fuels Mitigation Program	Provides funding for the reduction of hazardous wildfire fuels.	<ul style="list-style-type: none"> ▪ US Bureau of Land Management
Hazardous Materials Planning and Training Grants	Provides funding for planning and training for hazardous materials releases.	<ul style="list-style-type: none"> ▪ Montana Disaster & Emergency Services
Homeland Security Grants	Through multiple grants, provides funding for homeland security activities. Some projects can be considered mitigation.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ US Housing and Urban Development
Individual Assistance (IA)	Following a disaster, funds can mitigate hazards when repairing individual and family homes.	<ul style="list-style-type: none"> ▪ Montana Disaster & Emergency Services ▪ FEMA – Region VIII

Table 5.4A Mitigation Funding Sources (continued)

Name	Description	Managing Agencies
Jumpstart Grants	Provides grants for forest stewardship and fuel reduction projects.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation
Law Enforcement Support Office 1033 Program	Provides surplus military property to local law enforcement agencies.	<ul style="list-style-type: none"> ▪ Montana Public Safety Service Bureau
Map Modernization Program	Provides funding to establish or update floodplain mapping.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation ▪ FEMA – Region VIII
National Wildlife Wetland Refuge System	Provides funding for the acquisition of lands into the federal wildlife refuge system.	<ul style="list-style-type: none"> ▪ US Fish and Wildlife Service
North American Wetland Conservation Fund	Provides funding for wetland conservation projects.	<ul style="list-style-type: none"> ▪ US Fish and Wildlife Service
NRCS Conservation Programs	Provides funding through a number of programs for the conservation of natural resources.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ US Fish and Wildlife Service
PPL Montana Community Fund	Provides grants to Montana organizations in the areas of education, environment, and economic development.	<ul style="list-style-type: none"> ▪ PPL Montana
Pre-Disaster Mitigation (PDM) Grants	Provides grants through a competitive process for specific mitigation projects, including planning.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation

Table 5.4A Mitigation Funding Sources (continued)

Name	Description	Managing Agencies
Renewable Resource Development Grant	Provides funding to protect, conserve, or develop renewable resources, including water.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ US Department of Agriculture, Rural Development
Rural Fire Assistance (RFA) Grant	Funds fire mitigation activities in rural communities.	<ul style="list-style-type: none"> ▪ National Interagency Fire Center
SBA Pre-Disaster Mitigation Loan Program	Provides low-interest loans to small businesses for mitigation projects.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation ▪ FEMA – Region VIII
Small Flood Control Projects	Authority of USACE to construct small flood control projects.	<ul style="list-style-type: none"> ▪ US Army Corps of Engineers (USACE)
Streambank & Shoreline Protection	Authority of USACE to construct streambank stabilization projects.	<ul style="list-style-type: none"> ▪ US Army Corps of Engineers (USACE)
Volunteer Fire Assistance (VFA) Grants	Provides funding for wildfire prevention and suppression projects.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation
Watershed Planning Assistance	Provides funding for watershed planning activities through conservation districts.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation
Western States Wildland Urban Interface Grant	Provides funding for pre-disaster wildfire mitigation.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation
Wetland Program Development Grants (WPDGs)	Provides funding for studies related to water pollution prevention.	<ul style="list-style-type: none"> ▪ US Environmental Protection Agency
Woody Biomass Utilization and Fuels for Schools and Beyond Programs	Facilitates and promotes the beneficial use of woody biomass created by forest management treatments.	<ul style="list-style-type: none"> ▪ Montana Department of Natural Resources and Conservation

5.5 Existing Planning 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.

Recent economic slowdowns may have tempered growth in the county, city, and town but this slowdown also provides the opportunity to look at existing policies and regulations so that future development may be better protected as economic conditions improve.

Park County primarily consists of rural areas and has a relatively small tax base that limits the number of resources and amount of time that can be devoted to mitigation, or even planning and emergency management for that matter. Similarly, the City of Livingston, although more developed, is still a relatively small community with the Town of Clyde Park being very small in comparison. These jurisdictions may require additional assistance and support in order to perform the most basic mitigation activities such as grant applications or community outreach. Park County has one full-time coordinator, assisted by a part-time deputy, to manage Disaster and Emergency Services activities for the county, city, and town. Each jurisdiction participates or will be participating in the National Flood Insurance Program (NFIP) and has a designated floodplain administrator, however, floodplain administration is only one of many responsibilities for these individuals. The Town of Clyde Park is new to the NFIP and will likely be joining in the spring of 2012 with maps effective October 2011.

In general, the county, city, and town have only a few planning mechanisms through which mitigation concepts can be integrated. Table 5.5A lists the existing local plans and development mechanisms.

Table 5.5A Existing Local Plans and Development Mechanisms

Plan Name	Date
City of Livingston Growth Policy	October 2004
City of Livingston Subdivision Regulations	December 2007
City of Livingston Zoning Ordinance	September 2008
Park County Comprehensive Economic Development Strategy	November 2002
Park County Growth Policy	August 2006
Park County Community Wildfire Protection Plan	December 2009
Park County Subdivision Regulations	June 2010
Town of Clyde Park Growth Policy	October 2009

A variety of legislation enables the implementation of mitigation activities including, but not limited to:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act
- Presidential Executive Order 12898, Environmental Justice
- Presidential Executive Order 11988, Floodplain Management
- Presidential Executive Order 11990, Protection of Wetlands

- Montana Code Annotated, Title 10, Chapter 3, Disaster and Emergency Services
- Montana Code Annotated, Title 76, Chapter 5, Flood Plain and Floodway Management
- Montana Code Annotated, Title 50, Chapter 60, Building Construction Standards
- Montana Code Annotated, Title 76, Chapter 2, Planning and Zoning
- Park County Floodplain Ordinance
- Park County Subdivision Regulations
- City of Livingston Building Code
- City of Livingston Floodplain Ordinance
- City of Livingston Subdivision Regulations
- City of Livingston Zoning Ordinance

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, city, and town, 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 local planning departments and/or boards as the plans are updated or created, 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 due to the staff, technical expertise, political, and financial resources needed to implement the program.

Table 5.5B Incorporation into Existing and Future Plans

Existing or Anticipated Plan	Mitigation Strategies
Building Codes	<ul style="list-style-type: none"> ▪ Adopt and enforce the state building code. This activity will reduce the risks to future development from hazards such as earthquakes, tornadoes, strong winds, heavy snow, terrorism, urban fire, and volcanic ashfall.
Capital Improvement Plans	<ul style="list-style-type: none"> ▪ When developed or updated, consider and include projects related to hazard mitigation, such as transportation and public utility infrastructure and building improvements, in the capital improvements schedule.
Community Wildfire Protection Plan	<ul style="list-style-type: none"> ▪ When updated, continue to emphasize mitigation activities in the strategy portion of the plan.
Economic Development Strategies	<ul style="list-style-type: none"> ▪ When developed or updated, include elements of the risk assessment and mitigation strategy into the strategy, considering sustainability and disaster resistance a top priority since disasters often lead to economic problems.
Emergency Operations Plans	<ul style="list-style-type: none"> ▪ Integrate the operational, response, training, and preparedness needs that are not directly tied to mitigation into the county’s emergency operation plan or Local Emergency Planning Committee strategic plan.

Table 5.5B Incorporation into Existing and Future Plans (continued)

Existing or Anticipated Plan	Mitigation Strategies
Growth Policies	<ul style="list-style-type: none"> ▪ When updated, include elements of the risk assessment and mitigation strategy into the growth policy, considering sustainability and disaster resistance a top priority.
Subdivision Regulations	<ul style="list-style-type: none"> ▪ When updated, incorporate elements of the risk assessment and mitigation strategy into the subdivision regulations, considering sustainability and disaster resistance a top priority.
Zoning / Ordinances / Municipal Codes	<ul style="list-style-type: none"> ▪ 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. PLAN MAINTENANCE

An important aspect of any useable plan is the maintenance and upkeep of the document. The Park County Commission, Livingston City Commission, and Clyde Park Town Council are ultimately responsible for ensuring this plan is kept up to date. To facilitate and ensure the plan will remain viable for jurisdictions for many years, the plan maintenance responsibilities are delegated to the Park County Disaster and Emergency Services (DES) Coordinator and the Local Emergency Planning Committee (LEPC) Chairperson as co-leads. The LEPC meets regularly and is responsible for coordinating emergency planning issues for the county and communities. Given the broad representation of agencies and jurisdictions, this committee is a good fit, has many members that participated in the plan development, and eliminates the need for an additional committee. All Local Emergency Planning Committee meetings are open to the public.

From the time when the 2005 plan was originally developed to the 2011 update, very little direct review of the plan occurred. Projects were implemented and mitigation progressed, but formal changes to the plan and specific review meetings were not conducted. Therefore, in 2011, changes were made to the plan maintenance to reflect a more realistic approach to plan maintenance.

6.1 Plan Monitoring

The plan will be monitored by the Park County DES Coordinator and the Park County LEPC, and mitigation progress will be discussed through agency/department reports at each LEPC meeting, usually monthly. The status of projects will be reported on and new projects will be initiated during this time.

The Park County DES Coordinator and the Park County LEPC will review the goals, objectives, and projects, as needed, such as when a mitigation grant application opportunity exists, to determine if the actions for which funding exist are proceeding as planned and if new projects should be initiated. The DES Coordinator and LEPC will review any new risk information and modify the plan as indicated by the emergence of new vulnerabilities. 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 and/or relevant state or federal program specialists will be invited to speak to the LEPC and local officials regarding mitigation opportunities. Reporting requirement for federal mitigation grants and such are the responsibility of the jurisdiction and agency applying for and receiving the grant, unless other arrangements have been made. Also, land use, comprehensive, and strategic plans will be monitored as related to the Hazard Mitigation Plan, and similarly, local planning boards and departments will be encouraged to participate in all plan review and updates.

Available resources working on mitigation activities will be evaluated periodically by the Park County DES Coordinator and Park County LEPC to determine if a mitigation or project subcommittee or additional resources are needed to apply for and implement a particular project. Additional resources will be requested, as applicable.

6.2 Plan Evaluation

The evaluation of the plan will be conducted by the Park County DES Coordinator and the Park County LEPC, possibly with assistance from contractors, as needed and at a minimum of once every five years, at LEPC and other public meetings. At these meetings, 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 Park County DES Coordinator and the Park County LEPC maintain a contact list of mitigation stakeholders. Should a hazard event have occurred 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 Park County Hazard 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 2016. 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 2014
- Pre-Disaster Mitigation Planning Grant Application: early 2015
- Contracting for Professional or Technical Services (if needed): July-August 2015
- Plan Reviews and Modifications: September 2015 - May 2016
- Montana DES and FEMA Reviews: June-July 2016
- Final Revisions and Adoption: August 2016
- Final Plan Approval: September 2016

To facilitate the update process, annual updates to the plan are recommended. Table 6.3A shows the schedule of plan updates. All jurisdictions must participate in the plan update process for the plan to remain approvable for each jurisdiction.

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
Recent Development		X	X
Future Development			X
Hazard Profiles	X		X
Risk Assessment Summary			X
Mitigation Strategy	X	X	X
Plan Maintenance			X
Appendices	X	X	X

6.4 Public Involvement

Park County, the City of Livingston, and the Town of Clyde Park are dedicated to involving the public directly in the review and updates of the Hazard Mitigation Plan. A copy of the Hazard Mitigation Plan will be available for review at the Park County Disaster and Emergency Services’ Office, the Park County Commissioners’ Office, Livingston City Manager’s Office, and the Town of Clyde Park Office. The public is also invited to attend all Local Emergency Planning Committee meetings to provide input and feedback. In an effort to solicit involvement, appropriate public notices will be distributed prior to public meetings for plan updates, encouraging the public to attend and provide comment. Written comments may also be submitted at any time to the Park County Local Emergency Planning Committee at:

Park County Local Emergency Planning Committee
 c/o Park County Disaster and Emergency Services
 414 East Callender Street
 Livingston, MT 59047
 406-222-4190
 des@parkcounty.org

Received comments will be reviewed and integrated where applicable during the five-year plan updates, or sooner if necessary.

Appendix A. INVITED STAKEHOLDERS

Table A1. Invited Stakeholders

Name	Organization	Participation
Scott Bosse	American Rivers, Northern Rockies	
Pam Shrauger	Big Sky Hazard Management LLC	Consultant Meetings Data Plan Review
Cindy Good	Clyde Park Clerk	Meeting Data
Ernie MacCracken	Clyde Park Community Service Officer	Meeting
Cameron Lakes	Clyde Park Fire Department	
Bev McLealand	Clyde Park Fire Department	Meeting
Jeff Sarrazin	Clyde Park Fire Department	Meeting
Alice Hartman	Clyde Park Mayor	Meetings Data
Quita Myrstol	Clyde Park Resident	Meeting
Denise Sarrazin	Clyde Park Resident	Meeting
Tony Bailey	Clyde Park Rural Fire District	
Gayle Muggli	Clyde Park Town Council	Meeting
Edith Mundell	Clyde Park Town Council	Meeting
Richard O’Haire	Clyde Park Town Council	Meeting
Nick Levy	Cooke City / Silvergate Fire District	
Donna Rowland	Cooke City, Colter Pass, and Silver Gate Chamber of Commerce	
Carlene Uhler	Gardiner Chamber of Commerce	
Bob Koplund	Gateway Hose Company	
Laura Boise	Glastonbury Landowners Association	
	Greater Yellowstone Coalition	
	Livingston Area Chamber of Commerce	
Alan Davis	Livingston Fire and Rescue	
MaryEllen Szafranski	Livingston HealthCare Park County Local Emergency Planning Committee, Chairperson	Meetings Plan Review
Sandy Williams	Livingston HealthCare	Meetings
Peggy Glass	Livingston Park County 911 Dispatch Center	Meetings
Jim Woodhull	Livingston Planning, Zoning and Building Codes	
Darren Raney	Livingston Police Department	Meeting
Clint Tinsley	Livingston Public Works Livingston Planning Board	
Craig Hahn	Livingston Public Works, Streets and Solid Waste	
Tom Schweigert	Livingston Public Works, Water/Sewer	
Ed Meece	Livingston, City Manager	Meeting

Table A1. Invited Stakeholders (continued)

Name	Organization	Participation
Craig Campbell	Montana Department of Natural Resources and Conservation	Meeting
Kent Atwood	Montana Disaster and Emergency Services	
Bob Fry	Montana Disaster and Emergency Services Park County Fire Warden	Meeting
Jeff Adams	Montana Rail Link	
Linda Frost	Montana Rail Link	
Jack Gabrian	Montana Rail Link	
Tracy Mosley	Montana State University Extension	
Tom Frieders	National Weather Service, Billings	
Crystal Hagerman	Northern Rocky Mountain Resources Conservation and Development Area	Data
	Northwestern Energy	
	Park County Commission	
Jim Durgan	Park County Commission	Meetings
Phillip Fletcher	Park County Community Development Department	
Mike Inman	Park County Community Development Department	Data
Daryl Stutterheim	Park County Conservation District	
Greg Colman	Park County Disaster and Emergency Services Park County Deputy Fire Warden Paradise Valley Fire Service Area	Meetings Plan Review
Belinda Van Nurden	Park County Disaster and Emergency Services	Meetings
Barbara Woodbury	Park County Environmental Health	
Erica Hoffman	Park County Geographic Information Systems	Data
Suzanne Brown	Park County Health Department	Meeting Plan Review
Ed Hillman	Park County Road Department	
Dann Babcox	Park County Rural Fire District	Meeting
Ed Barich	Park County Schools	
Allan Lutes	Park County Sheriff's Office	
Tom Totland	Park County Sheriff's Office	Plan Review
John Mueller	Park County, Recording Secretary	Meetings
Tim Stephens	Park Electric Cooperative	
Matt Long	Upper Shields Watershed Association Southern Crazy Mountain Watershed Group	
Amy Miller	Upper Shields Watershed Association Southern Crazy Mountain Watershed Group	
Todd Tillinger	US Army Corps of Engineers	
Terina Mullen	US Bureau of Land Management	
Mike Gagen	US Forest Service, Gallatin National Forest	

Table A1. Invited Stakeholders (continued)

Name	Organization	Participation
Bill Avey	US Forest Service, Gallatin National Forest, Big Timber Ranger District	
Tina Lanier	US Forest Service, Gallatin National Forest, Gardiner Ranger District	
JoLynn Sharrow	US Forest Service, Gallatin National Forest, Gardiner Ranger District	
Lauren Oswald	US Forest Service, Gallatin National Forest, Livingston Ranger District	
Ashley Sites	US Forest Service, Gallatin National Forest, Livingston Ranger District	
Ronald Hoagland	US Natural Resources Conservation Service	
Calvin Sarver	Wilsall Fire District	
Joe Krish	Yellowstone National Park	
Nicole McClain	Yellowstone River Conservation District Council	

Appendix B. PUBLIC INFORMATION

Sent to the Livingston Enterprise, March 11, 2004

Park County to Develop Hazard Mitigation Plan

The Park County Local Emergency Planning Committee (LEPC) is trying to make the community safer. The county has received a grant from the Federal Emergency Management Agency (FEMA), now part of the Department of Homeland Security, and Montana Disaster and Emergency Services to create a Hazard Mitigation Plan. The plan will address major hazards such as earthquakes, wildfires, and flooding and list possible measures that could be taken to make the community more disaster resistant. Mitigation can take many different forms from construction projects to public education. This plan will also allow the county to be eligible for future federal and state mitigation grants.

“Public involvement is an extremely important part of this plan,” said Larry Akers, State Mitigation Officer with Montana Disaster and Emergency Services. “I would encourage anyone with ideas or an interest in helping make Park County less vulnerable to disasters to attend the public meetings. This plan will guide how the community deals with disaster prevention in the future.”

The first meeting is scheduled for 10AM on Thursday, March 18th in the Livingston City/County Complex, Community Room. The focus will be hazard identification.

##

Livingston Enterprise, March 15, 2004



Sent to the Livingston Enterprise, April 21, 2004

Park County Identifies Hazards

The Park County Local Emergency Planning Committee (LEPC) has identified the hazards it will assess in its Hazard Mitigation Plan currently under development. The county is writing this Hazard Mitigation Plan through a \$10,000 grant received from the Department of Homeland Security and Montana Disaster and Emergency Services. Through the planning process, the following hazards have been identified based on their potential to create a community disaster. These hazards have not yet been ranked.

- Avalanche & Landslide
- Aviation Accident
- Communicable Disease & Bioterrorism
- Dam Failure
- Drought
- Earthquake
- Flooding
- Ground Transportation Accident
- Hazardous Materials Incident
- Railroad Accident
- Severe Thunderstorms & Tornadoes
- Terrorism, Civil Unrest, & Violence
- Urban Fire
- Utility Outage
- Volcano
- Wildfire
- Wind
- Winter Storms & Extended Cold

Public meetings will now be held in three Park County communities to solicit additional input from the public and local officials. The meetings are scheduled as follows:

- Monday, May 3, 2004 – 7PM – Clyde Park City Hall - In conjunction with the monthly City Council meeting
- Tuesday, May 11, 2004 – Brown Bag Lunch at Noon - Livingston City/County Complex, Community Room - Feel free to bring your lunch to this meeting
- Tuesday, May 11, 2004 – 7PM – Gardiner Community Center

The plan will assess the risks facing the county and list possible measures that could be taken to make the communities more disaster resistant. This plan will also allow the county to be eligible for future federal and state mitigation grants.

##

Livingston Enterprise, May 3, 2004

• Park County Local Emergency Planning Committee (LEPC) will hold a public meeting to solicit input for the Hazard Mitigation Plan on Monday at 7 p.m., at the Clyde Park City Hall. For more information contact DES Coordinator Belinda Van Nurden at 222-4190. 5-3-04

Gardiner Community Newsletter, April 28, 2004

Public Notices

The Montana Dept. of Transportation will be conducting street sweeping operations on Scott Street - US 89 from approx April 27 to May 2, 2004. Sweeping hours will be between 6 am & noon. The MDOT requests your cooperation with moving parked vehicles on Scott Street during this time. Thank you MDOT.

If we sweep our sidewalks onto Scott Street during this time, the street sweepers will sweep up the excess dirt!

School Board Candidate's Forum - Meet the Candidates Night. All Gardiner residence are invited to attend. It will be held in the Gardiner School Multi-purpose Room on Thursday, April 29th at 7:00 pm. Come and meet the candidates.

GARDINER SPRING CLEAN UP - The Gardiner Chamber of Commerce is organizing a "Take Pride in your Community Day" Saturday, 01 May 2004 from 9:00 am to noon. We invite all businesses, individuals, community, civic and church groups to join in cleaning up their store fronts, yards, streets and the Town.

Benefit Yard Sale - help us make it a great sale for several cancer victims who need our help. Drop items off at 114 Main - across from the K-Bar. Bake sales too. Sale will be the 15th of May - Thanks Erne Hoefer. For pick-up call 848-9462

It's almost Rodeo time again and that means Rodeo Parade! Our theme this year is "Celebrate the Great Outdoors!" If you, your children, your business, your non-profit organization, your band or even your dog would like to be in the parade, pick up an application at the Chamber Office - 222 Park Street, 848-7971 or contact Laura Clem at 848-7966.

Sincere thanks for the opportunity you have given me to serve our students, the school and the entire community for the past seven years. I would deeply appreciate your vote on May 4th. Candidate for school trustee, Hal Broadhead - paid for by Hal Broadhead.

Please vote for Sandy Karnes on the School Board election. I have an interest in our children & community. Their growing time now, is our future. Paid for by Sandy Karnes, Box 485, Gardiner.

YOUR VOTE IS IMPORTANT AND CAN MAKE A DIFFERENCE! Please vote in the upcoming school board election. Paid for by Scott Kremer, PO Box 492 Gardiner, MT.

VOTE FOR SHERRY (SOENNICHSEN) STEFFAN ON MAY 4TH. Supported and paid for by the Park County/Gardiner Tax Alliance. 550 Old Yellowstone Trail Gardiner, MT 59030 Machele Beede.

The Park County Local Emergency Planning Committee will be holding a public meeting on Tuesday, May 11 @ 7 pm in the Gardiner Community Center to solicit additional input from public and local officials for the Hazard Mitigation Plan. For more information call Belinda Van Nurden, DES Coordinator, Park County Disaster & Emergency Services @ 222-4190.

Hey Everybody...Don't forget about the **Big Horseshoe Tourney Sun, May 2nd @ 11:00 am at the Arch Park.** Food, drinks, fun & games. \$10.00 per person entry fee. For those of you who can't participate in the tournament, you're still welcome to come down, eat some food and join in the other games. Hope to see you all...Bring the kids too!

Saturday, May 29th 10:00 am - 8:30 pm - The Grizzly & Wolf Discovery Center would like to invite you to the Grand Opening of our new interactive exhibit - *BEARS: Imagination & Reality*. The only exhibit of it's kind in the country; this interactive experience compares the legend, life and true nature of bears in fantasy and reality. Take an "unforgettable" family picture on our 8-foot-high bear couch! So make tracks to see *live* grizzlies (and wolves) and learn about their past, present and future. 201 South Canyon St., West Yellowstone, MT 406 646-7001 or 800 257-2570.

The American Legion District Spring Meeting was held in Gardiner Montana at the Comfort Inn on 18 April 2004. The Gardiner Post 118 would like to thank the following businesses that donated for the door prizes. North Entrance Shopping Center, Two-Bit Saloon, Kellern's Saddle Shop, Flying Pig Camp Store, Yellowstone Raft Company, Yellowstone Quill Works (Jim Sweaney) and Off the Wall Creations.

Sent to the Livingston Enterprise, April 5, 2005

Park County Develops Hazard Mitigation Strategy

The Park County Local Emergency Planning Committee (LEPC) has analyzed the major hazards that threaten the community and is asking for the public's help in identifying strategies to mitigate those hazards. "The goals and strategies in this plan are only as good as the community support they receive," says Belinda Van Nurden, Park County Disaster and Emergency Services Coordinator, "We hope to develop a plan that will make Park County a safer place to live and work in the long term."

A public meeting is scheduled for Thursday, April 21 at 10AM in the Livingston City/County Complex Community Room, 414 East Callender Street. A presentation will be given on the draft hazard analysis results and attendees will then brainstorm recommendations that will help prevent future disaster losses.

The county is writing a Pre-Disaster Mitigation Plan through a \$10,000 grant received from the Department of Homeland Security and Montana Disaster and Emergency Services. All Park County areas, including the Livingston and Clyde Park jurisdictions, are part of this inclusive planning effort. The plan, once approved, will allow Park County and the incorporated communities to apply for future federal and state mitigation grants.

##

Sent to the Livingston Enterprise, August 4, 2005

Final Hazard Mitigation Plan Meeting Scheduled

The Park County Local Emergency Planning Committee invites the public to review and comment on their Hazard Mitigation Plan. This plan identifies and analyzes the major hazards, such as flood, earthquake, and wildfires, that threaten the community and prioritizes strategies to prevent future disaster losses.

Two public meetings are scheduled:

- Thursday, August 18th at 10:00AM in the Livingston City/County Complex, Community Room, 414 East Callender Street, Livingston
- Monday, September 12th at 7:00PM in the Clyde Park Town Hall, 516 Miles Avenue, Clyde Park

Copies of the draft plan can be found at the Park County Disaster and Emergency Services office, 414 East Callender Street, Livingston or on the Internet at: www.bigskyhazards.com/Park.htm. Comments can be submitted to Big Sky Hazard Management LLC at 406-581-4512 or pam@bigskyhazards.com. The deadline for comments is August 25, 2005.

This Pre-Disaster Mitigation Plan is being written through a grant received from the Department of Homeland Security and Montana Disaster and Emergency Services. The plan, once approved, will allow Park County, Livingston, and Clyde Park to apply for future federal and state mitigation grants.

##

Livingston Enterprise, August 17, 2005

Hazard plan includes history of local disasters, notable events

By Paula Clawson
Enterprise Staff Writer

Anyone interested in data and tidbits about natural and manmade disasters in Park County might want to take a look at the county's new Hazard Mitigation Plan.

For instance, twice in 1996 wind speeds of more than 100 mph were measured in the county; the lowest temperature on record in Livingston was -45 on Feb. 15, 1936; and the largest wildfire by acreage was the Storm Creek fire, at 107,347 acres, in June 1988.

But the plan, which is available for public review and comment until Aug. 25, wasn't written to be a trivia-buff's reference. Its purpose is to identify and analyze major hazards and develop

response strategies.

The plan is also required so Park County and its communities, including Livingston and Clyde Park, are eligible for Federal Emergency Management Agency financial assistance after a significant disaster.

Representatives from each community and its emergency response agencies have worked on the plan, according to Belinda Van Nurden, the county's disaster and emergency services director.

The final step is to accept public comment and get each government — the Park County Commission, Livingston City Commission and Clyde Park Town Council, to accept the plan.

About every possible disaster that could be reasonably foreseen in Park County is addressed in the plan, includ-

ing avalanches, airplane accidents, communicable diseases, drought, earthquakes, floods, rail accidents, thunderstorms, winds and volcanoes (thanks to Yellowstone National Park).

The plan can be read online at www.bigskyhazards.com/Park.htm. A paper copy is available for review in the county's Disaster and Emergency Services office in the City-County Complex, 414 E. Callender St.

Public meetings to accept comment and review the plan are scheduled for 10 a.m. Thursday in the Community Room of the City-County Complex; and 7 p.m. Sept. 12 at the Clyde Park Town Council Meeting in the Clyde Park Town Hall.

For more information, call Belinda Van Nurden at 222-4190.

Sent to the Livingston Enterprise and Bozeman Daily Chronicle, July 1, 2011

Planning to Prevent Disasters

With recent and ongoing flooding problems plaguing the state, many have wondered what could have been done to reduce the losses and what can be done to prevent similar problems in the future. Residents of Park County, Livingston, and Clyde Park now have the opportunity to explore possible disaster scenarios and take part in minimizing the impacts, before the disaster occurs. The countywide Hazard Mitigation Plan does just that. This plan, originally developed in 2005 and now being updated, identifies the major hazards threatening the communities and the values at risk. Based on the plan's risk assessment, long term, sustainable projects ranging from education programs to infrastructure retrofits to land use regulations are identified as possible solutions to reduce future losses. Once the plan is adopted and approved, the jurisdictions may be eligible for future grant funds and additional assistance before and following a disaster.

"We can't do this without the help of the residents," says Pam Shrauger of Big Sky Hazard Management LLC, an emergency management planning firm based in Bozeman hired to coordinate the plan's update. "We want a plan that is locally driven and useful, not something to stick on a shelf. Surely, residents have good ideas regarding what can be done to reduce future disaster losses in ways that are responsible and manageable."

A meeting, designed to involve the public in the plan update process, is scheduled for Tuesday, July 12th from 6:00 to 7:00 p.m. in the Livingston Civic Center Gym located at 229 River Drive, Livingston. A more in-depth planning meeting for those interested in increased involvement is scheduled for Thursday, July 14th from 10:00 to 11:00 a.m. in the Community Room of the City-County Complex, 414 East Callender Street, Livingston. If you cannot attend the meetings, but would still like to be involved, please contact Pam Shrauger at 406-581-4512.

Copies of the original plan developed in 2005 can be found online at:
<http://www.bigskyhazards.com/draftplans.asp>. Comments and updates related to the original plan are encouraged.

##

Livingston Enterprise, July 8, 2011



**Park County
Hazard Mitigation Plan Update**

*Learn about our local hazard mitigation plan at
an informational public meeting:*

**Tuesday, July 12
6:00 to 7:00 p.m.**

**Livingston Civic Center Gym
229 River Drive, Livingston**

**Park County • Livingston • Clyde Park
Hazard Mitigation Plan
...preventing disasters in our hometowns...**

*For more information, please call 406-581-4512.
www.bigskyhazards.com*

Sent to the Livingston Enterprise and Bozeman Daily Chronicle, August 23, 2011

Countywide Mitigation Plan Update Nearly Complete

Floods, earthquakes, hail storms, wildfires, and winter storms - just to name a few; these are all hazards profiled in the updated Park County Hazard Mitigation Plan. The concept of this plan is to identify potential hazards and mitigate losses, before the disasters occur.

“National studies have shown that for every dollar spent on mitigation, four dollars in future disaster losses are saved. So, it’s not just about doing the right thing, it’s also financially important,” advises Pam Shrauger, the consultant working on the plan.

The updated plan, originally developed in 2005, identifies eighteen major hazards and details each, including information on historical occurrence, probability, and impacts to critical facilities and the population. Mitigation strategies for Park County, the City of Livingston, and the Town of Clyde Park address some of the potential losses. Examples include reducing wildfire fuels around structures, upgrading bridges and culvert for floodwaters, retrofitting public buildings for earthquakes, and continuing to improve growth regulations to encourage smart development in hazardous areas. An approved mitigation plan is a federal requirement for hazard mitigation funding both before and immediately following a disaster.

Draft sections of the plan can be read and downloaded from the internet at: <http://www.bigskyhazards.com/draftplans.asp>. Comments are due by September 15, 2011 and can be submitted to Big Sky Hazard Management, 4855 South Third Avenue, Bozeman, MT 59715 or by calling 406-581-4512.

The public is also invited to get more information or provide comments at the following free, public meetings:

Tuesday, September 6, 2011 at 7:00 p.m.

Clyde Park Town Hall, 512 Miles Avenue, Clyde Park

Thursday, September 8, 2011 at 10:00 a.m.

Community Room, City-County Complex, 414 East Callender Street, Livingston

“We encourage the public to be involved every step of the way,” says Shrauger. “These are your communities being protected, and anyone with an interest has a spot at the table.”

##

Livingston Enterprise, September 1, 2011

**Park County
Hazard Mitigation Plan Update**

The public is invited to comment on the Hazard Mitigation Plan designed to minimize future disaster losses in Park County, Livingston, and Clyde Park.

Please join us:

Tuesday, September 6
7:00pm – Clyde Park Town Hall
516 Miles Avenue, Clyde Park

Thursday, September 8
10:00am – Community Room, City-County Complex
414 East Callender Street, Livingston

Or review the draft plan at:
www.bigskyhazards.com/draftplans.asp

For more information, please call 406-581-4512.

Livingston Enterprise, September 2, 2011

Meetings on managing disasters being planned

By Wes Venteicher
Enterprise Staff Writer

Meetings are scheduled next week in Livingston and Clyde Park to discuss Park County's new plan to handle local disasters.

Flooding and wildfires are priorities in the plan, but it also covers earthquakes, plane crashes, bioterrorism, volcanoes, extended cold and other possibilities.

The plan could impact development and land use regulations, insurance qualifications and other details for those living in identified high-risk areas, according to a plan draft.

By creating and following the plan, Park County qualifies to receive future assistance from the Federal Emergency Management Agency during disasters, the draft plan states.

It also sets requirements for those living in Clyde Park to get flood insurance under the National Flood Insurance Program.

The plan goes into great detail regarding the damage that could come from particular disasters.

A history of Yellowstone

flooding — including dollar amounts of damages — is included, dating to 1894. The plan includes dollar estimates for future floods of varying magnitudes. It identifies critical structures and infrastructure that could be damaged during floods and estimates potential losses to homes based on projected water levels. Maps of flood zones are included, many of which were recently completed. Information is included on how many homes are currently in flood zones, how many are insured and how much money has been paid for losses in recent decades.

Meetings to discuss the plan are scheduled for Tuesday, Sept. 6, at 7 p.m. in the Clyde Park Town Hall; and for Thursday, Sept. 8, at 10 a.m. in the Community Room of the Livingston City-County Complex.

The draft plan may be viewed at www.bigskyhazards.com/draftplans.asp, and comments may be submitted until Sept. 15.

For more information, contact Pam Shrauger, of Big Sky Hazard Management, at (406) 581-4512 or email her at pam@bigskyhazards.com.

Appendix C. MEETING ATTENDANCE RECORDS

LEPE / PPM	Sign up Sheet	10TH
	Kick off	3-18-04
Rebecca Van Norden	PDES	
Suzanne Brown	PCHD	
BOB FRY	PARK	
Miss Deaton	Asst PDES	
Bonita Roper	RCHA	
Jason Johnson	Lin. Engineer	
Roger Micromonks	Community	
Kathy Blair	Livingston	
Jim Masten	Livingston Fire	
Clark Carpenter	Park Co Sheriff	
Janet Clark	PCHD	
Randy Taylor	PCHD/Secretary	
Pam Pedersen	BSHM	

Clyde Park Mitigation Plan Meeting -- 05/03/04

Name	Title	Organization	Phone
John Myrstal	Water Department	Town of Clyde Park	[REDACTED]
Cindy Good	Clerk	Town of C P	[REDACTED]
Alan W. Skatman	Mayor	Town of Clyde Park	[REDACTED]
DANIELA SHANDY	Public Person	Town of Clyde Park	[REDACTED]
Bernard EBERT	"	"	[REDACTED]
Oliver Berger	"	"	[REDACTED]
MARK REIDER	Farmer	Town of Clyde Park	[REDACTED]
Joy Hesse	City Attorney	"	[REDACTED]
Tara M. Shuman	Land Property owner	Add'l.	[REDACTED]
Chris Stang	FIRE CHIEF	CLYDE Park Vol FIRE Dept	[REDACTED]
Rudolf Kellman	Citizen	"	[REDACTED]
Belinda Jean Pender	PCDES	Park Co - all of include etc	[REDACTED]
			[REDACTED]
			[REDACTED]
			[REDACTED]

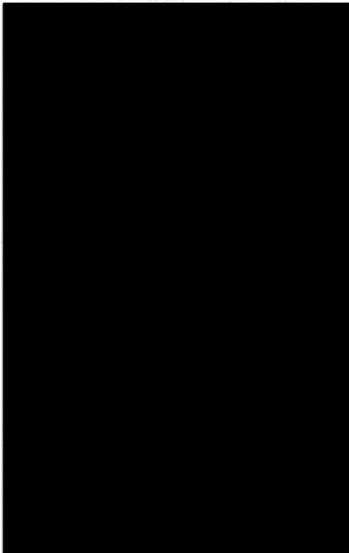
LEPC 1-20-05

Belinda VanNurden	RCES	4190
Suzanne Brown	PCPD	
Mary Ellen Szofranski	LMH	
Peggy Glass	911	
Gordon Rothe	PCRFD#1	
Alan Hanson	PCRFD#1	
MIKE GAGEN	USFS	
Pam Pedersen	BSHM	
FRANK SMITH	H.S.	
Randy Taylor R.S.	PCPD	
Darren Raney	CPD	

Park County Mitigation Plan Meeting – 4/21/05

Name	Title	Organization	Phone
FRANK SMITH	HOMELAND SECURITY DIRECTOR	PARK COUNTY	
Peggy Glass	911 Comm Coordinator	" "	
Garden Rotue	Training, Park Co. RFD#1	Park Co RFD#1	
MAYELLEN SZAFRANSKI	LMH - ER RN	LMH	
Jim MASTIN	liv. Fire & Rescue Fire Chief	LIVINGSTON Fire & Rescue	
Rebecca Berringer	Gardner Ambulance Director	Gardner Ambulance	
Clark Carpenter	Sheriff	Park Co. S.D.	
Debi Lanna	EastZone Env(Abuse)	USFS	
Jim Scarlett	Warning Coordination Meteorologist	National Weather Service	
Mike Gagen	US FOREST SERVICE	ZONE FIRE Mgt. OFFICER	
Ron Archuleta	District Ranger	USFS - Livingston	
Doaco Duars	Cour OFFICER R.D.E.S	ARRANGEMENT ROAD	
Suzanne Borum	Director Nursing Services	Park County Health Dept.	
Bolinda Van Nuden	Coordinator	R.D.E.S / Safety	
Debbie Vandersuire	Gardner Amb. Ass. dir	Gardner Ambulance	
Jim Dargson	Dr. Bernish		

NETC 7-21-05

Name	org/dept	Phone
Pam Shrauger	Big Sky Hazard mgmt	
Boque Miramonte	community Health-Partners	
Gordon Poole	Park Co. RFD #1	
Dave Duvall	PC DES/Iti Coworker Contacts	
FRANK SMITH	HOMELAND SECURITY	
Kris Denton	Asst DES	
Clark Carpenter	Park Co Sheriff	
Randy Taylor R.S.	Park Co. Sanitarian	
RON MARTIN	LIVINGSTON MEM. HOSP.	
Jim MASTON	LIVINGSTON FIRE	
Suzanne Brown	PCHO	
Belinda Van Norder	PCDES	

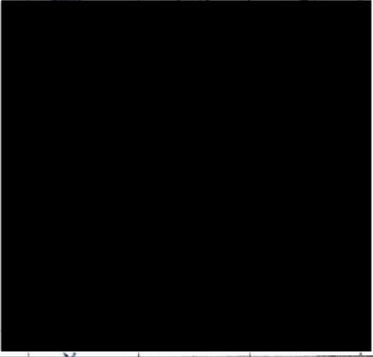
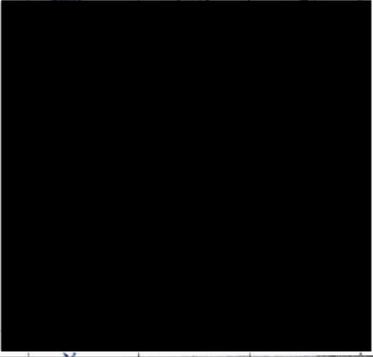
Park County Mitigation Plan Public Meeting – 08/18/05
 Livingston

Name	Title	Organization	Phone
Pam Shrauger	CONSULTANT	Big Sky Hazard Mgmt LLC	
FRANK SMITH	COORDINATOR	PARK COUNTY HOMELAND SECURITY	
RON MARTIN	R.N.	LIVINGSTON MEMORIAL HOSPITAL	
TIM MARTINI	FIRE CHIEF	LIV FIRE DEPT	
Peggy Glass	Park Co 911 Director	Park Co 911	
Clark Carpenter	Sheriff	Park Co Sheriff Office	
Kris Denton	Asst. PC DES	Park County Commissioners	
Belinda Van Norder	PC DES Coordinator	Park County Disaster + Emergency	
Jim Dargan	Commissioner	Park County	

Park County Mitigation Plan Public Meeting -- 09/06/12
 Clyde Park

Name	Title	Organization	Phone
Cindy Boel	Clerk	Town of CP	[REDACTED]
Alicia S. Hartman	Mayor	Town of Clyde Park	[REDACTED]
Bridgette Flannery	Council	Town of Clyde Park	[REDACTED]
Shirley Layer	Council	Town of Clyde Park	[REDACTED]
Betsy Stout	Council	Town of Clyde Park	[REDACTED]
Alicia J. Samoylik	Council	Town of Clyde Park	[REDACTED]
Jennifer	City Attorney	Town of Clyde Park	[REDACTED]
Darin M. Gaudet	Community Services Officer	Town of Clyde Park	[REDACTED]
Dustin McKeel	Assistant Fire Chief	CPVED	[REDACTED]
SE Ffery Bennett	President	Clyde Park Planning Board	[REDACTED]
Jason Shauger	Emergency Manager	Catalina County Emergency Mgmt	[REDACTED]

Park County / Livingston / Clyde Park Hazard Mitigation Plan Public Meeting
 July 12, 2011 • 6:00-7:00 p.m. • Livingston Civic Center

Name	Title(s) & Organization(s)	E-mail or Mailing Address	Salary-Federally Funded? Round Trip Miles Traveled
Pam Shrauger	Big Sky Hazard Management LLC		Yes or No (circle one) n/a miles
Rhonda Van Nulden	Park Co. DES		Yes or No (circle one) NA miles
Greg Coleman	Park Co Fire/DES		Yes or No (circle one) NA miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles

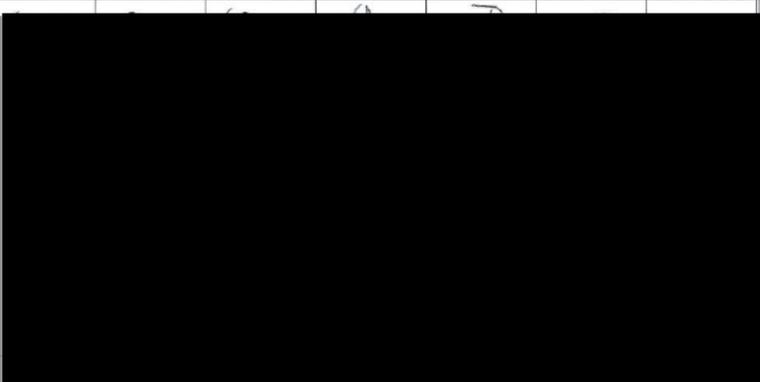
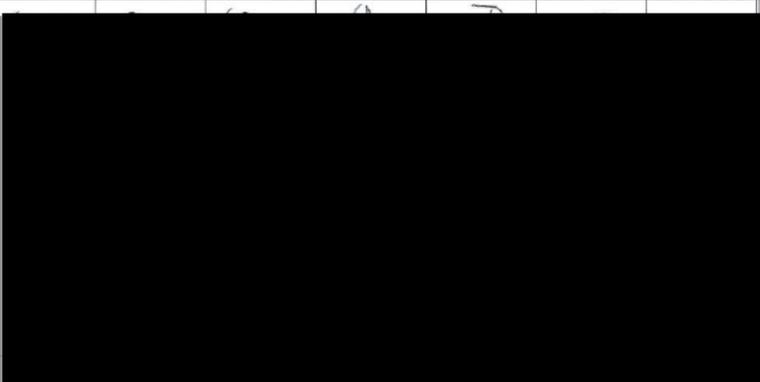
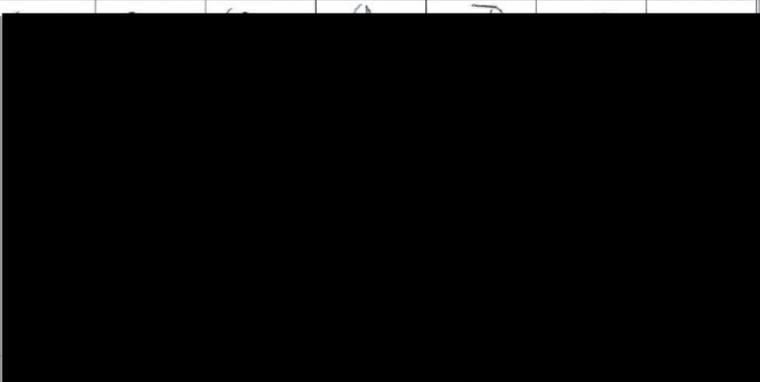
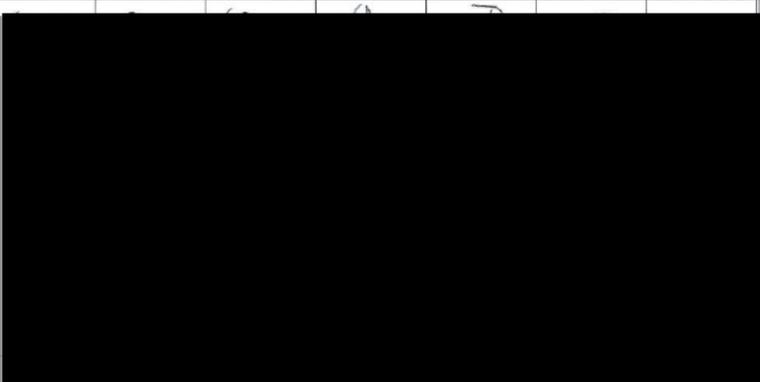
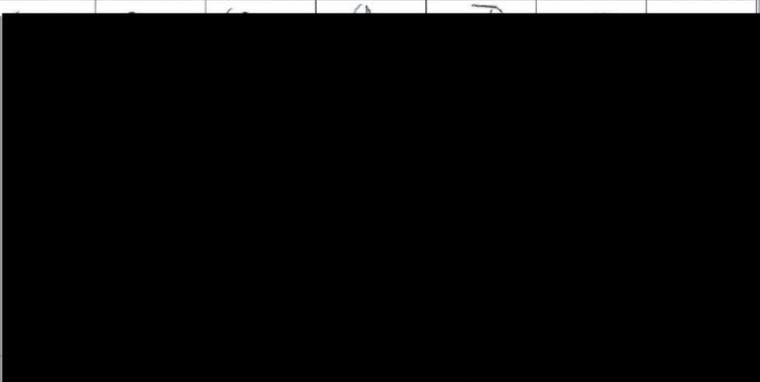
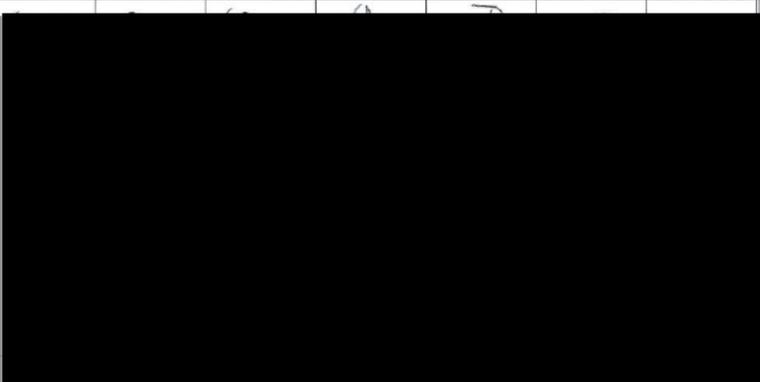
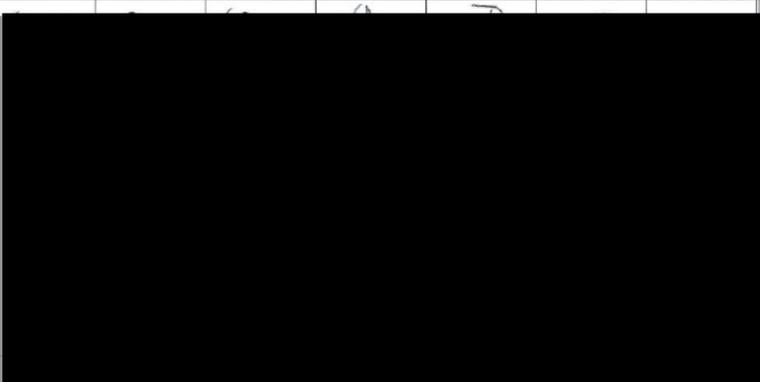
Park County / Livingston / Clyde Park Hazard Mitigation Planning Meeting
 July 14, 2011 • 10:00-11:00 a.m. • City-County Complex, Livingston

Name	Title(s) & Organization(s)	E-mail or Mailing Address	Salary-Federally Funded? Round Trip Miles Traveled
Pam Shrauger	Big Sky Hazard Management LLC	[REDACTED]	Yes or No (circle one) n/a miles
Suzanne Brown	RD Director Nursing Services Park Co. Health Dept.	[REDACTED]	Yes or No (circle one) A miles
Mary Ellen Szafranski	Livingston HealthCare Emergency Preparedness Coordinator LEPC Chair	[REDACTED]	Yes or No (circle one) 1 miles
Alice W. Hartman	Town of Clyde Park, Mayor.	[REDACTED]	Yes or No (circle one) miles
Dann Tabcox	Park County Rural Fire District #1	[REDACTED]	Yes or No (circle one) miles
Peggy Stevan	911 Director Liv Park & 911	[REDACTED]	Yes or No (circle one) miles
Ed Meece	CIT Manager City of Livingston	[REDACTED]	Yes or No (circle one) miles
John Mueller	Recording Secretary Park County	[REDACTED]	Yes or No (circle one) 0 miles
Darren Rahey	Police Chief City of Livingston	[REDACTED]	Yes or No (circle one) miles

Park County / Livingston / Clyde Park Hazard Mitigation Planning Meeting
 July 14, 2011 • 10:00-11:00 a.m. • City-County Complex, Livingston

Name	Title(s) & Organization(s)	E-mail or Mailing Address	Salary-Federally Funded? Round Trip Miles Traveled
Jim DURRAN	Park County Commission		Yes or <input checked="" type="radio"/> No (circle one) 25 miles
BOB FRY	DIST. REP. D3 - MT DES		<input checked="" type="radio"/> Yes or No (circle one) miles
Greg Coleman	Park County Fire Ranchette Valley Fire		<input checked="" type="radio"/> Yes or No (circle one) miles
Belinda Van Norder	Park Co. Disaster Emergency Svc		<input checked="" type="radio"/> Yes or No (circle one) miles
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			Yes or No (circle one) miles
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			Yes or No (circle one) miles

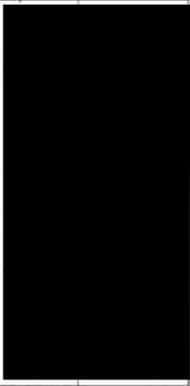
Park County / Livingston / Clyde Park Hazard Mitigation Planning Meeting
 August 11, 2011 • 10:00-11:00 a.m. • City-County Complex, Livingston

Name	Title(s) & Organization(s)	E-mail or Mailing Address	Salary-Federally Funded? Round Trip Miles Traveled
Pam Shrauger	Big Sky Hazard Management LLC		Yes or No (circle one) <u>N/A</u> miles
Alice W. Hartman	Mayor of Clyde Park.		Yes or No (circle one) _____ miles
Peggy Glass	Liv Park & 911		Yes or No (circle one) _____ miles
Sandy Williams	ASPM / CKE		Yes or No (circle one) _____ miles
Greg Coleman	County Fire / RVED		Yes or No (circle one) _____ miles
Belinda Van Norden	PC DES		Yes or No (circle one) _____ miles
John Mueller	Park County - Recording Secretary		Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles

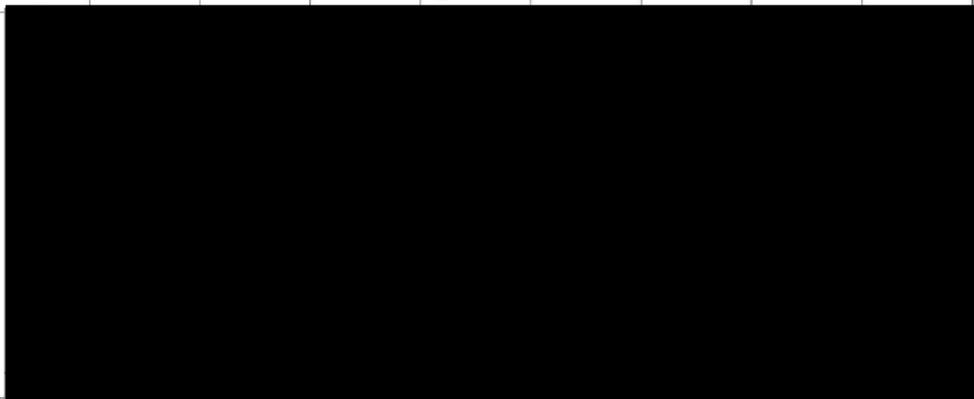
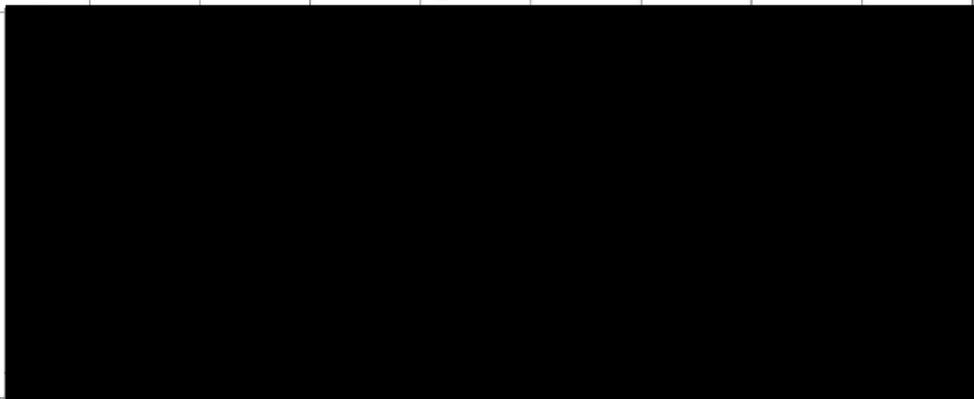
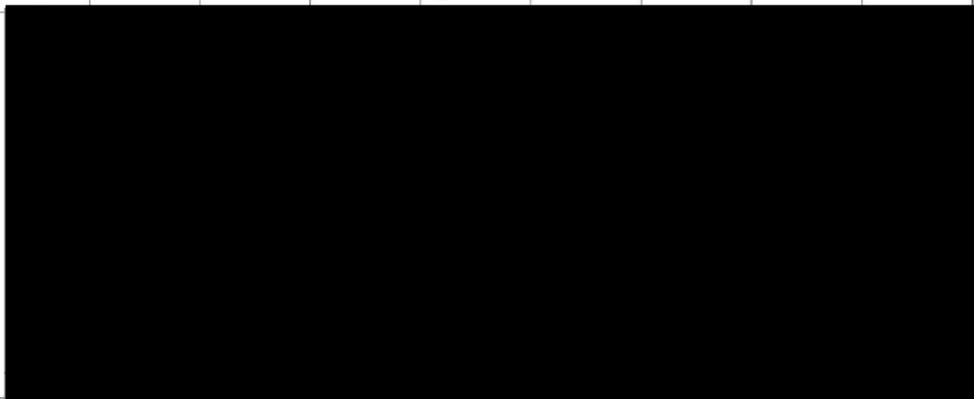
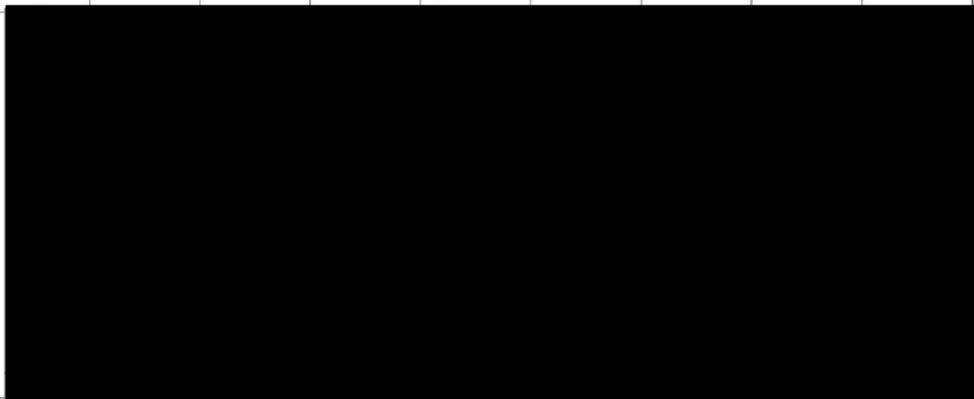
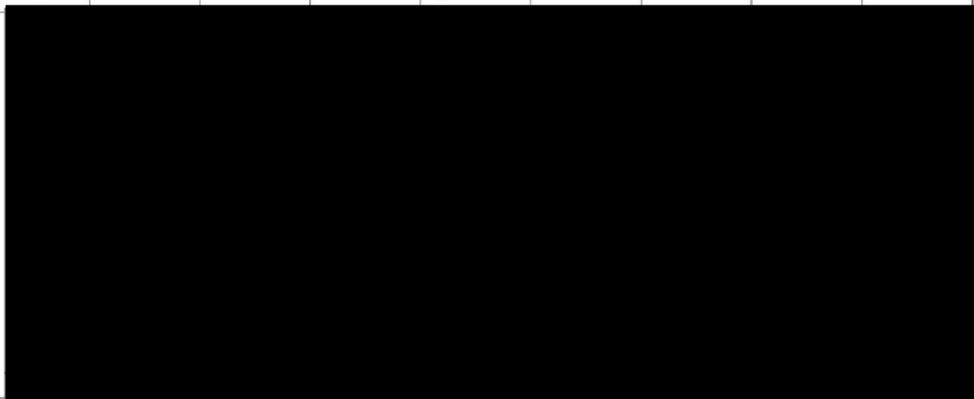
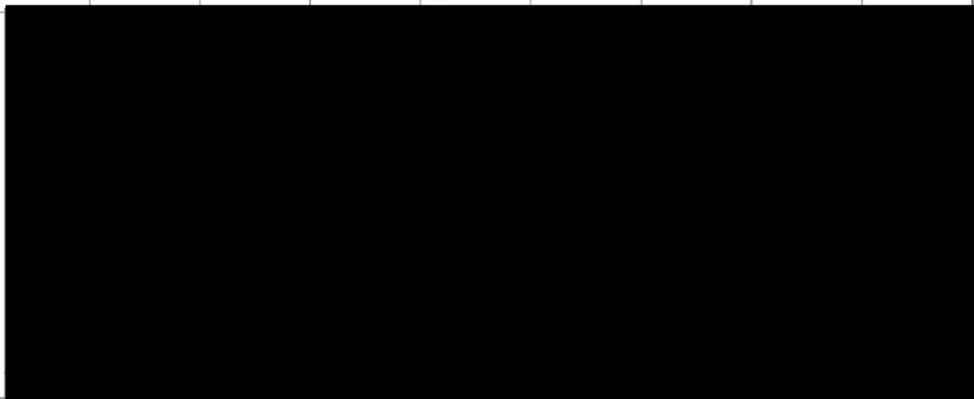
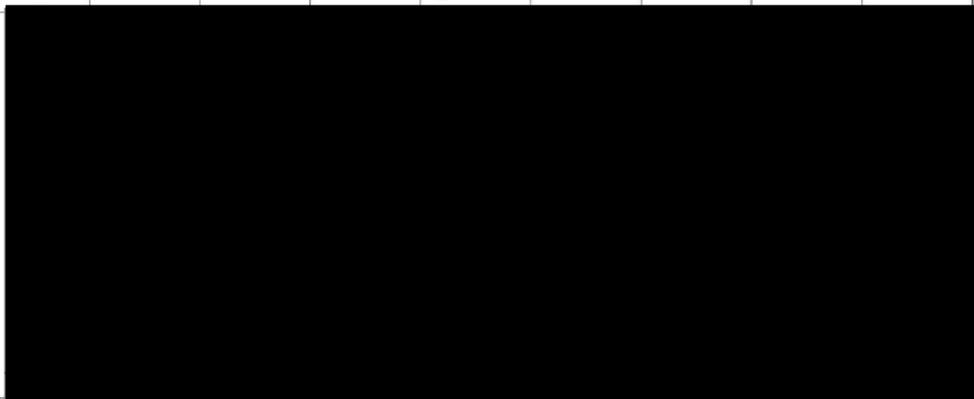
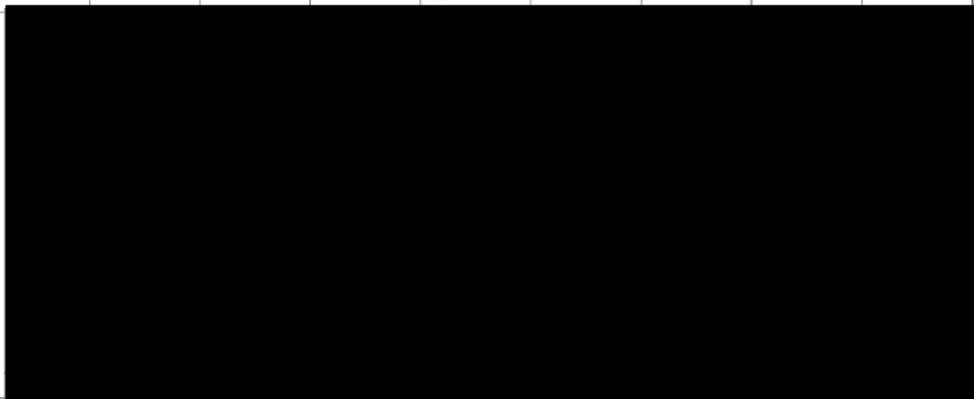
Park County / Livingston / Clyde Park Hazard Mitigation Plan Public Meeting
 September 6, 2011 • 7 p.m. • Clyde Park

Name	Title(s) & Organization(s)	E-mail or Mailing Address	Salary-Federally Funded? Round Trip Miles Traveled
Hayle Mueggli	C.P. Town Council		Yes or <u>No</u> (circle one) 14 miles
Eric Munday	C.P. Town Council		Yes or <u>No</u> (circle one) 2 Miles
Doris W. Stanton	Mayor - Town of Clyde Park		Yes or <u>No</u> (circle one) _____ miles
Lindsay Hoel	Clerk - Town of CP		Yes or <u>No</u> (circle one) _____ miles
D	RESIDENT		Yes or <u>No</u> (circle one) _____ miles
Jest Samra Denise Samra	Fire Chief Wife		Yes or <u>No</u> (circle one) _____ miles
DENNE Leeland	Fire/EMS		Yes or <u>No</u> (circle one) _____ miles
Aisha Myrsted	Resident		Yes or <u>No</u> (circle one) _____ miles
Lynn MacEachern	Community Service Officer		Yes or <u>No</u> (circle one) _____ miles

Park County / Livingston / Clyde Park Hazard Mitigation Plan Public Meeting
 September 6, 2011 • 7 p.m. • Clyde Park

Name	Title(s) & Organization(s)	E-mail or Mailing Address	Salary-Federally Funded? Round Trip Miles Traveled
Richard Austin	Town Council		Yes or <input checked="" type="radio"/> No (circle one) 1/2 miles
Pam Shrauger	Big Sky Hazard Management		<input checked="" type="radio"/> Yes or No (circle one) n/a miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles
			Yes or No (circle one) _____ miles

Park County / Livingston / Clyde Park Hazard Mitigation Plan Public Meeting
 September 8, 2011 • 10:00 – 11:00 a.m. • City-County Complex, Livingston

Name	Title(s) & Organization(s)	E-mail or Mailing Address	Salary-Federally Funded? Round Trip Miles Traveled
Bridgette Van Norden	PC DES		Yes or No (circle one) _____ miles
MaryEllen Szofanski	Livingston Health Care		Yes or No (circle one) _____ miles
Pam Shrauger	Big Sky Hazard Management LLC		Yes or No (circle one) _____ miles
Craig Campbell	DNR		Yes or No (circle one) 40 miles
John Mueller	Park Co. Commission - Recording Secretary		Yes or No (circle one) _____ miles
Greg Coleman	DES County Fire Ranchette Valley Fire		Yes or No (circle one) _____ miles
Sandy Williams	ASIM/LHA		Yes or No (circle one) _____ miles
Tim Duran	Commissioner		Yes or No (circle one) _____ miles

Appendix D. MEETING NOTES

Park County Hazard Mitigation Plan Public Meeting Notes July 12, 2011, 6:00-7:00 p.m. in Livingston, Montana

Attendees:

- Greg Colman Paradise Valley Rural Fire District
 Park County Disaster and Emergency Services
 Park County Fire Warden's Office
- Pam Shrauger Big Sky Hazard Management LLC, Consultant
- Belinda Van Nurden Park County Disaster and Emergency Services

Handout Contents:

Hazard Mitigation Information Sheet

What is mitigation?

Hazard mitigation prevents a potentially hazardous event from developing into a disaster or reduces the losses incurred when a disaster does occur. Mitigation focuses on *long-term, sustainable measures* that reduce or eliminate the risk to the community. Examples of mitigation include land use regulations, floodplain ordinances, seismic retrofits, flood-prone property acquisitions, living snow fences, culvert upgrades, and wildfire fuel reductions. Note that mitigation is different in many respects from the other phases of emergency management: preparedness, response, and recovery. Mitigation is not about getting the community ready to respond to a disaster that has occurred or is imminent, rather taking steps to reduce the impacts well before the threat.

Why mitigate?

Mitigation is an investment. Studies have shown that for every dollar spent on mitigation activities, four dollars are saved in disaster losses, plus countless lives have probably been saved. For example, the Federal Emergency Management Agency (FEMA) estimates that the rigorous building standards adopted by 20,000 communities across the country are saving the nation more than \$1.1 billion per year in prevented flood damages.

Why plan for mitigation?

Disasters cause significant damages, threaten lives, and disrupt the way of life and economy. By conducting a complete, all-hazard risk assessment, we can objectively analyze what potential losses could be incurred in the future and develop a strategy for reducing such losses. Often, financial assistance for mitigation in the form of federal grants is available following a disaster, but if the community is too busy focusing on the disaster recovery, valuable mitigation opportunities can be lost. By planning, we set up our communities with effective ways to use mitigation funding following a disaster, plus each year, disaster or not, competitive grant funding is available nationally for mitigation projects. Growth and development also provide important mitigation opportunities. By taking the steps necessary to mitigate losses to future development, such as subdivision regulations, building code adoption, zoning, etc., our communities can be better prepared for future growth by protecting citizens before they live in harm's way. Considering mitigation before construction begins can save taxpayers' money since mitigation often costs more after construction is completed than during the planning phase.

Park County Hazard Mitigation Plan Information Sheet

WHAT: Hazard Mitigation Plans (also known as Pre-Disaster Mitigation Plans) generally have five major elements:

1. Planning Process Documentation
2. Assets and Community Inventory
3. Risk Assessment
4. Mitigation Strategy
5. Implementation/Plan Maintenance

The basic definition of hazard mitigation is “any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.” Mitigation can take many different forms from construction projects to public education. Examples from other communities include creating or strengthening regulations in hazard areas, reducing fuels around homes in the wildland urban interface, putting fences around drinking water supplies, enlarging culverts, elevating or purchasing property in the floodplain, and educating the public on insurance. Of course, every community is different, but the basic idea is to make your community safer and more disaster resistant.

WHY: By taking action before disaster strikes, the impact to your community during a hazard event can be minimized. More specifically, this plan (to be approved by MT DES and FEMA) is a requirement under the Disaster Mitigation Act of 2000 in order for communities to receive Hazard Mitigation Grant Program and Pre-Disaster Mitigation funds and other types of disaster assistance. More importantly, though, this plan outlines and clarifies the hazards that face the communities and what actions can be taken to minimize their effects.

WHEN: A series of two public meetings will be held to facilitate the plan’s update, originally developed in 2005. The first meeting focuses on educating attendees on the definition and purpose of mitigation planning and reviewing the hazards and mitigation strategies. The second meeting solicits comments on the draft plan and educates attendees on moving the plan forward. A complete plan is expected in September 2011. All meetings, including monthly planning meetings, are free and open to the public. Comments are welcome and encouraged at any time in this process.

WHERE: Park County, the City of Livingston, and the Town of Clyde Park are required to be involved in the planning process and adopt the finished plan. If a community decides not to participate, this will be documented, and they will not be eligible for certain types of federal funding.

HOW: An emergency management consultant, Big Sky Hazard Management LLC, will update the plan; however, public and local government participation is required. The public meetings will encourage participation, and residents and officials will be used to generate ideas and review specific sections of the plan. Newspaper notices will promote citizen involvement and comment on the draft plan. The Big Sky Hazard Management website (www.bigskyhazards.com) will post elements of the plan and the final plan as they are developed.

Park County Hazard Assessment 2005

In the existing plan developed in 2005, each hazard has its own profile consisting of a hazard description, history, probability, mapping, associated hazards and other factors, vulnerabilities to critical facilities, potential losses, potential population impacts, impact of future development, and data limitations. This information was used to rank the hazards and develop mitigation strategies.

Overall hazard ratings (high, moderate, low) were determined based on:

- Probability of Major Disaster
- Property Impact
- Population Impact
- Economic Impact
- Future Development Impact

High Hazards:

- Flooding
- Wildfire
- Earthquake
- Hazardous Materials Release

Moderate Hazards:

- Communicable Disease and Bioterrorism
- Wind
- Drought
- Winter Storms and Extended Cold
- Utility Outage
- Severe Thunderstorms and Tornadoes
- Ground Transportation Accident
- Urban Fire

Low Hazards:

- Dam Failure
- Aviation Accident
- Terrorism, Civil Unrest, and Violence
- Railroad Accident
- Volcano
- Avalanche and Landslide

Park County Mitigation Strategy 2005

Goal 1: Reduce damages from flooding.

Objective 1.1: *Prevent damages from bridges and to critical facilities during flood events.*

- Lessen hydraulic impacts when the following bridges are replaced: Emigrant Bridge, Carter's Bridge, Interstate 90 Bridge, Railroad Bridge at Highway 10/89 South, Highway 10/89 South Bridge, Highway 89 North Bridge (near the Shields River), Railroad Bridge at Highway 89 North (near the Shields River), and Springdale Bridge.
- Remove abandoned bridge abutments and piers.
- Consider zero backwater standards during bridge reconstruction, particularly at the Highway 10/89 South Bridge and the railroad bridge just downstream.
- Require future school facilities be constructed outside the floodplain.

Objective 1.2: *Maximize the protection of life and property through government resources and services.*

- Propose to the public a Park County Bond Issue for conservation easements and promote the use of state, federal, and private funds to protect values along the Yellowstone River.

- Remove woody debris, as needed to protect public safety, but not excessively as such debris is important to ecological health.
- Consider more restrictive regulations or prohibition of development in the floodplain.
- Map floodplain areas and join the National Flood Insurance Program in the Town of Clyde Park.
- Join and obtain points for the Community Rating System of the National Flood Insurance Program in Park County and the City of Livingston.

Objective 1.3: *Provide the public with information and means to prevent private flood losses.*

- Establish a Bank Stabilization Information Clearinghouse.
- Establish financial incentives for landowners to remove, modify, or replace obsolete and non-functioning flood control and bank stabilization structures.
- Conduct an analysis on the feasibility of a floodplain and floodway buyout and/or relocation program.
- Educate the public on flood insurance.

Objective 1.4: *Improve understanding of the flood hazard and mitigation measures.*

- Conduct a US Army Corps of Engineers Section 205 Flood Control Study.
- Conduct Bank Stabilization studies on project effectiveness and ecological health.
- Study alternative flood mitigation measures.
- Conduct a river migration study to measure the potential for river channel avulsion between the Livingston Ditch headgate and Interstate 90.
- Investigate widening the channel near the City of Livingston levee by resloping the north bank in a terraced fashion in the area of the preliminary floodplain map cross sections #55,000 and #56,000.

Goal 2: Prevent losses from wildfires.

Objective 2.1: *Reduce private losses in the wildland/urban interface.*

- Promote Firewise type programs.
- Require defensible space and inspection of new development in the wildland urban interface.
- Revise subdivision regulations with a better focus on defensible space/maintenance and water supply requirements in the wildland/urban interface.
- Reduce fuels along ingress and egress roadways.
- Conduct fuels reduction along utility right-of-ways.

Objective 2.2: *Increase understanding of the wildfire hazard areas.*

- Develop fuels mapping for public and private lands.
- Develop and maintain a Community Wildfire Protection Plan.
- Develop a centralized, countywide wildfire history database.

Goal 3: Reduce potential losses from earthquakes.

Objective 3.1: *Prevent earthquake losses to critical facilities, vulnerable populations, and infrastructure.*

- Tie down/secure objects in critical facilities and vulnerable population locations that could fall during an earthquake.
- Retrofit critical government facilities for earthquakes.
- Inspect key bridges for seismic stability.
- Anchor or stabilize electric transformers and generators for seismic motion during maintenance and new installations.
- Install expansion joints in underground utilities during new or replacement construction.

Objective 3.2: Minimize private earthquake losses.

- Educate home and business owners on simple earthquake retrofits.
- Survey commercial structures for earthquake stability and recommend retrofits.
- Create a financial incentive program for major earthquake retrofits in the priority hazard areas.

Goal 4: Reduce losses from a transportation or hazardous materials accident.

Objective 4.1: Allow for emergency traffic and evacuation routes during a hazardous materials or ground transportation incident.

- Develop an emergency transportation plan that considers key roadways and intersections.
- Study and construction of an additional railroad crossing.

Goal 5: Prevent significant loss of life from communicable disease and bioterrorism.

Objective 5.1: Reduce the rapid spread of communicable diseases.

- Conduct a public education campaign on how to prevent the spread of disease.
- Establish a group made of area medical stakeholders to discuss disaster management and prevention issues.
- Install a new ventilation system in the City/County Complex and other critical facilities.

Goal 6: Promote all-hazard mitigation measures.

Objective 6.1: Ensure critical infrastructure is operational during disasters.

- Identify, prioritize, and harden infrastructure from damages during disasters.
- Install or designate back-up systems for critical infrastructure, including emergency communications systems.
- Develop a dispatch function mutual aid system with Gallatin County.
- Install an uninterruptible power supply for Park County Dispatch.
- Protect North Repeater from vandals through bulletproof casing.

Objective 6.2: Improve warning capabilities.

- Become a National Weather Service Storm Ready Community.
- Develop an Emergency Alert System plan.
- Put NOAA Weather Radios in critical facilities and schools.

Objective 6.3: Increase emergency management and disaster service capabilities to prevent additional losses in a disaster.

- Create a finite, hardened Emergency Operations Center and alternate location.
- Develop a sheltering plan specific to utility failures.
- Install generators at critical facilities and vulnerable population locations.

Objective 6.4: Improve digital data for assessing all hazards.

- Develop GIS data that can be used with FEMA's HAZUS loss estimated models.

Discussion Items:

Past, ongoing, and potential mitigation activities were discussed. Specifically, efforts related to the newly established FireSafe Coalition were described. This coalition is building upon public-private partnerships with representatives from the fire services, landscapers, construction contractors, real estate, and insurance companies. This group hopes to achieve some fuel reductions and other related mitigation, prevention, and preparedness activities. Subdivision regulations are again being updated with respect to wildfire (previously updated in 2006) with proposed subdivisions being reviewed by the Park County Community Development Office with approval by the jurisdictional fire department. Past efforts to acquire floodprone properties on Ninth Street Island were discussed.

**Park County Hazard Mitigation Plan Planning Meeting Notes
July 14, 2011, 10:00-11:15 a.m. in Livingston, Montana**

Attendees:

- Dann Babcox Park County Rural Fire District #1
- Suzanne Brown Park County Health Department
- Greg Colman Paradise Valley Rural Fire District
 Park County Disaster and Emergency Services
 Park County Fire Warden's Office
- Jim Durgan Park County Commission
- Bob Fry Montana Disaster and Emergency Services
- Peggy Glass Livingston-Park County 911 Director
- Alice Hartman Town of Clyde Park Mayor
- Ed Meece Livingston City Manager
- John Mueller Park County Recording Secretary
- Darren Raney Livingston Police Chief
- Pam Shrauger Big Sky Hazard Management LLC, Consultant
- Mary Ellen Szafranski Livingston HealthCare
 Park County Local Emergency Planning Committee Chairperson
- Belinda Van Nurden Park County Disaster and Emergency Services

Introduction:

What is mitigation?

Hazard mitigation prevents a potentially hazardous event from developing into a disaster or reduces the losses incurred when a disaster does occur. Mitigation focuses on long-term, sustainable measures that reduce or eliminate the risk to the community. Examples of mitigation include land use regulations, floodplain ordinances, seismic retrofits, flood-prone property acquisitions, living snow fences, culvert upgrades, and wildfire fuel reductions. Note that mitigation is different in many respects from the other phases of emergency management: preparedness, response, and recovery. Mitigation is not about getting the community ready to respond to a disaster that has occurred or is imminent, rather taking steps to reduce the impacts well before the threat.

Why mitigate?

Mitigation is an investment. Studies have shown that for every dollar spent on mitigation activities, four dollars are saved in disaster losses, plus countless lives have probably been saved. For example, the Federal Emergency Management Agency (FEMA) estimates that the rigorous building standards adopted by 20,000 communities across the country are saving the nation more than \$1.1 billion per year in prevented flood damages.

Why plan for mitigation?

Disasters, especially in Montana, don't come along all that frequently, however, when they do, they can cause significant damages disrupting our way of life and economy. By conducting a complete, all-hazard risk assessment, we can objectively analyze what potential losses could be incurred in the future and develop a strategy for reducing such losses. Often, financial assistance for mitigation in the form of federal grants is available following a disaster, but if the community is too busy focusing on the disaster recovery, valuable mitigation opportunities can be lost. By planning, we set up our communities with effective ways to use mitigation funding following a disaster, plus each year, disaster or not, competitive grant funding is available nationally for mitigation projects. Growth and development also provide important mitigation opportunities. By

taking the steps necessary to mitigate losses to future development, such as subdivision regulations, building code adoption, zoning, etc., our communities can be better prepared for future growth by protecting citizens before they live in harm's way. Considering mitigation before construction begins can save taxpayers' money since mitigation often costs more after construction is completed than during the planning phase.

Discussion Items:

1. Are we missing any important participants or organizations that should be represented when updating this mitigation plan?
 - None identified.
2. Should the title of the plan continue to be "Park County Hazard Mitigation Plan"? If not, what would be more appropriate?
 - Yes, continue with "Park County Hazard Mitigation Plan"
3. Have you attended any mitigation specific meetings or plan updates since 2005? If so, was the general public involved?
 - The Park County website now has an all-hazard mitigation interactive educational tool.
 - FireSafe Coalition has been represented at the local farmer's market.
 - The Fleshman Creek improvement project has had an extensive public process.
4. Hazards included in the 2005 plan were:

<ul style="list-style-type: none">- Avalanche and Landslide- Aviation Accident- Communicable Disease and Bioterrorism- Dam Failure- Drought- Earthquake- Flooding- Ground Transportation Accident- Hazardous Materials Release	<ul style="list-style-type: none">- Railroad Accident- Severe Thunderstorms and Tornadoes- Terrorism, Civil Unrest, and Violence- Urban Fire- Utility Outage- Volcano- Wildfire- Wind- Winter Storms and Extended Cold
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Should we make any changes?

- No
5. Are there any new studies, data, or information that may be valuable when re-analyzing the hazards?
 - 2011 flood losses included \$108,000 to construct an emergency flood berm (\$63,000 paid for by Park County and \$45,000 paid for by the City of Livingston)
 - Park County Community Wildfire Protection Plan
 - US Army Corps of Engineers Special Area Management Plan
 6. Has growth/development occurred since 2005 in a location or way that makes it more vulnerable to any of the identified hazards? Do you have development concerns?
 - With the new floodplain mapping, less people live in the floodplain now.
 - Some floodplain areas have been annexed into the City of Livingston.

7. As you read through the mitigation strategies listed in the 2005 plan, please make note of the following:
 - a. Progress made or projects completed since 2005 related to any of the listed strategies.
 - b. Updates or changes needed to the strategies.
 - c. New ideas, goals, or objectives for the updated plan.
 - Montana Department of Transportation, Bozeman Engineering Office could provide information on improvements made to bridges during recent replacements.
 - Improvements to bridges and culverts crossing the Shields and Boulder Rivers are needed.
 - The newly reconstructed Ninth Street Island Bridge has better water flow.
 - The City of Livingston conducted a floodplain study costing \$270,000 after the US Army Corps of Engineers findings were disputed.
 - The Fleshman Creek improvements project is an ongoing mitigation project using a mitigation grant and funding from several other organizations.
 - Park County developed and updated a Community Wildfire Protection Plan.
 - A study on an additional railroad crossing was completed and funding is now needed for construction.
 - Communicable disease public education is a continuous ongoing project.
 - A medical stakeholder group has been established.
 - The ventilation system in the City-County Complex was upgraded in 2010.
 - Back-up systems are in place for most emergency communications systems.
 - A NOAA weather radio transmitter was put in Livingston.
 - The State of Montana developed a statewide Emergency Alert System plan.
 - Social networking needs to be incorporated into public information and warning systems.
 - NOAA weather radios were distributed to each of the schools.
 - Park County GIS data has improved significantly since 2005.
8. Send any updates to the critical facilities tables to Pam Shrauger.

**Park County Hazard Mitigation Plan Planning Meeting Notes
August 11, 2011, 10:00-11:15 a.m. in Livingston, Montana**

Attendees:

- Greg Colman Paradise Valley Rural Fire District
 Park County Disaster and Emergency Services
 Park County Fire Warden's Office
- Peggy Glass Livingston-Park County 911 Director
- Alice Hartman Town of Clyde Park Mayor
- John Mueller Park County Recording Secretary
- Pam Shrauger Big Sky Hazard Management LLC, Consultant
- Mary Ellen Szafranski Livingston HealthCare
 Park County Local Emergency Planning Committee Chairperson
- Belinda Van Nurden Park County Disaster and Emergency Services
- Sandy Williams Livingston HealthCare, Critical Incident Stress Management

Discussion Items:

Mitigation Project Changes:

- Remove the concept of prohibition of development in the floodplain – not realistic.
- Consolidate ideas for flood ordinance improvements.
- Change the flood buyout and relocation project to: Investigate and pursue acquisition in places like Ninth Street Island.
- Consolidate fuels reduction ideas into one project.

New Mitigation Project Ideas:

- Road infrastructure improvements for flood: culverts, roadside stabilization/mudslide prevention, etc.
- Regional water sources for wildfire firefighting
- FireSafe Coalition
- Window films for earthquakes

Most Significant Hazards to the Town of Clyde Park (based on the Mayor's perspective):

- Flood
- Wildfire
- Hazardous Materials Release

Park County Hazard Mitigation Plan Meeting Notes
September 6, 2011, 7:00-8:00 p.m. in Clyde Park, Montana

Attendees:

- Cindy Good Clyde Park Clerk
- Alice Hartman Clyde Park Mayor
- Ernie MacCracken Clyde Park Community Service Officer
- Bev McLealand Clyde Park Fire/EMS
- Gayle Muggli Clyde Park Town Council
- Edith Mundell Clyde Park Town Council
- Quita Myrstol Clyde Park Resident
- Richard O’Haire Clyde Park Town Council
- Denise Sarrazin Clyde Park Resident
- Jeff Sarrazin Clyde Park Fire Chief
- Pam Shrauger Big Sky Hazard Management LLC, Consultant
- *Illegible* Clyde Park Resident

Plan Review:

The draft plan is available online at <http://www.bigskyhazards.com/draftplans.asp> and sections can be read, downloaded, or printed. The comments deadline is September 15, 2011. Comments can be sent to: Pam Shrauger, pam@bigskyhazards.com, 406-581-4512, 4855 S. 3rd Avenue, Bozeman, MT 59715.

Plan Highlights:

A hazard mitigation plan is a federal requirement, through the Federal Emergency Management Agency, for each incorporated jurisdiction. Without an adopted and approved plan, the jurisdiction is not eligible to receive certain types of federal disaster mitigation assistance following a disaster. As additional incentive, each jurisdiction with an adopted and approved plan is eligible to apply for nationally competitive pre-disaster mitigation funds.

The Park County Hazard Mitigation Plan consists of five major components:

1. Planning Process
2. Assets and Community Inventory
3. Risk Assessment
4. Mitigation Strategy
5. Plan Implementation/Maintenance

Risk Assessment Overview Comments/Discussion Items:

- Floodplain mapping for the Town of Clyde Park was discussed, as the community has never been mapped before. An application for entry into the National Flood Insurance Program is due during the spring of 2012.
- The listing of flooding as the highest hazard was questioned. Wind (thunderstorm and non-thunderstorm) seems to be more frequent and damaging. The ratings will be re-evaluated.
- The potential for dam failure damages was discussed.
- Wildfire and urban fire are listed separately, but for the Town of Clyde Park, they could essentially become the same event if the wind is blowing. The ratings will be re-evaluated in light of this.

Mitigation Strategy Overview Comments/Discussion Items:

None

Next Steps:

Following the public comment period, any comments received will be incorporated into the plan where applicable. Each jurisdiction will receive a mailing with a hard copy of the final plan and a CD containing electronic versions of the plan and other useful tools and information. The final plan will be sent to Montana Disaster and Emergency Services and then the Federal Emergency Management Agency for review and approval. During this time frame, the jurisdictions will be asked to adopt the plan by resolution (a sample resolution will be included on the CD). The jurisdictions are encouraged to apply for grants and to implement or continue many of the activities listed in the plan. Annually, each jurisdiction should create a record of any disasters or mitigation activities occurring over the past year. Every five years, the plan needs to be updated and resubmitted for approval.

Park County Hazard Mitigation Plan Meeting Notes
September 8, 2011, 10:00-11:15 a.m. in Livingston, Montana

Attendees:

- Craig Campbell Montana Department of Natural Resources and Conservation
- Greg Colman Paradise Valley Rural Fire District
 Park County Disaster and Emergency Services
 Park County Fire Warden's Office
- Jim Durgan Park County Commission
- John Mueller Park County Recording Secretary
- Pam Shrauger Big Sky Hazard Management LLC, Consultant
- Mary Ellen Szafranski Livingston HealthCare
 Park County Local Emergency Planning Committee Chairperson
- Belinda Van Nurden Park County Disaster and Emergency Services
- Sandy Williams Livingston HealthCare, Critical Incident Stress Management

Plan Review:

The draft plan is available online at <http://www.bigskyhazards.com/draftplans.asp> and sections can be read, downloaded, or printed. The comments deadline is September 15, 2011. Comments can be sent to: Pam Shrauger, pam@bigskyhazards.com, 406-581-4512, 4855 S. 3rd Avenue, Bozeman, MT 59715.

Plan Highlights:

A hazard mitigation plan is a federal requirement, through the Federal Emergency Management Agency, for each incorporated jurisdiction. Without an adopted and approved plan, the jurisdiction is not eligible to receive certain types of federal disaster mitigation assistance following a disaster. As additional incentive, each jurisdiction with an adopted and approved plan is eligible to apply for nationally competitive pre-disaster mitigation funds.

The Park County Hazard Mitigation Plan consists of five major components:

6. Planning Process
7. Assets and Community Inventory
8. Risk Assessment
9. Mitigation Strategy
10. Plan Implementation/Maintenance

Risk Assessment Overview Comments/Discussion Items:

- Risk of communicable disease may be greater due to the number of international travelers that visit Yellowstone National Park.
- Concerns regarding brucellosis in bison should be added to the Communicable Disease hazard profile due to the potential to be transmitted as undulant fever. Transmission to livestock also poses a high risk to economic values.
- Road kill in the Cooke City area is not being cleared and is posing a substantial risk to the population due to the grizzly bears attracted to the populated areas.
- The indirect impacts of wildfire are significant to Park County communities due to the dependency on tourism through Yellowstone National Park. Heavy smoke conditions, common in the valleys, can also increase health problems in those with respiratory problems.

Mitigation Strategy Overview Comments/Discussion Items:

- The importance of the mitigation strategy was discussed. Having a strategy in place demonstrates community initiative which may be especially important when money is tight, funding decisions are being made, and post-disaster.
- More long-term, sustainable measures should be considered and evaluated for flooding along the Yellowstone River at Livingston. The temporary berm constructed during flood threats and costing over \$100,000 in 2011 may not be the best solution.
- Ingress/egress road improvements, such as road widening, turnarounds, and secondary access roads, are needed in the wildland urban interface, particularly in the Mountain Sky, West Boulder, and Main Boulder areas.
- Fuels and Fire Mapping activities are ongoing so timeframe needs to be changed to reflect that.

Next Steps:

Following the public comment period, any comments received will be incorporated into the plan where applicable. Each jurisdiction will receive a mailing with a hard copy of the final plan and a CD containing electronic versions of the plan and other useful tools and information. The final plan will be sent to Montana Disaster and Emergency Services and then the Federal Emergency Management Agency for review and approval. During this time frame, the jurisdictions will be asked to adopt the plan by resolution (a sample resolution will be included on the CD). The jurisdictions are encouraged to apply for grants and to implement or continue many of the activities listed in the plan. Annually, each jurisdiction should create a record of any disasters or mitigation activities occurring over the past year. Every five years, the plan needs to be updated and resubmitted for approval.

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Appendix F. ACRONYMS

AD – Anno Domini
BFE – Base Flood Elevation
BLM – Bureau of Land Management
BNSF – Burlington Northern Santa Fe
CAMA – Computer Assisted Mass Appraisal
CDBG – Community Development Block Grant
CFR – Code of Federal Regulations
CFS – Cubic Feet Per Second
DEQ – Department of Environmental Quality
DES – Disaster and Emergency Services
DHS – Department of Homeland Security
DMA – Disaster Mitigation Act
DNRC – Department of Natural Resources and Conservation
DOT – Department of Transportation
DPHHS – Department of Public Health and Human Services
EDA – Economic Development Administration
EO – Executive Order
EOC – Emergency Operations Center
EMS – Emergency Medical Services
EPA – Environmental Protection Agency
EPCRA – Emergency Planning Community Right-to-Know Act
FBI – Federal Bureau of Investigation
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FIS – Flood Insurance Study
FMA – Flood Mitigation Assistance
FWS – Fish & Wildlife Service
FY – Fiscal Year
GIS – Geographic Information System
HAZUS-MH – Hazards United States Multi-Hazard
HMGP – Hazard Mitigation Grant Program
HUD – Housing and Urban Development
HVAC – Heating, Ventilating, and Air Conditioning
IA – Individual Assistance
KY – Thousand Years
LANDFIRE – Landscape Fire and Resource Management Planning Tools Project
LEPC – Local Emergency Planning Committee
LP – Liquefied Petroleum
MCA – Montana Code Annotated
MDT – Montana Department of Transportation
MR – Model Release

MRL – Montana Rail Link
MT - Montana
NCDC – National Climatic Data Center
NIFC – National Interagency Fire Center
NFIP – National Flood Insurance Program
NFP – National Fire Plan
NID – National Inventory of Dams
NOAA – National Oceanic and Atmospheric Administration
NP – National Park
NRCS – Natural Resources Conservation Service
NRMRC – Northern Rocky Mountain Resource Conservation and Development
NTSB – National Transportation Safety Board
NWS – National Weather Service
OPEC – Organization of Petroleum Exporting Countries
PA – Public Assistance
PC – Park County
PCB – Polychlorinated Biphenyls
PDM – Pre-Disaster Mitigation
PGA – Peak Ground Acceleration
RAWS – Remote Automated Weather Stations
RFA – Rural Fire Assistance
RFC – Repetitive Flood Claims
SARA – Superfund Amendment and Reauthorization Act
SARS – Severe Acute Respiratory Syndrome
SBA – Small Business Administration
SFHA – Special Flood Hazard Area
SHELDUS – Spatial Hazard Events and Losses Database for the United States
SRL – Severe Repetitive Loss
STAPLEE – Social, Technical, Administrative, Political, Legal, Economic, Environmental
US – United States
USACE – United States Army Corps of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey
USFA – United States Fire Administration
USFS – United States Forest Service
VFA – Volunteer Fire Assistance
WMD – Weapons of Mass Destruction
WPDG – Wetland Program Development Grant
WUI – Wildland Urban Interface
YNP – Yellowstone National Park
YVO – Yellowstone Volcano Observatory

Appendix G. PLAN COMMUNICATIONS

Table G1. Plan Communication Tracking

Name/Organization	Date	Type	Reason(s)
Belinda Van Nurden PC DES	06/21/2011	Email	Initial public meeting
Ed Meece Livingston City Manager	06/21/2011	Email	Initial public meeting
Ed Meece Livingston City Manager	06/24/2011	Email	Livingston point of contact
Belinda Van Nurden PC DES	06/27/2011	Email	Initial public meeting
Ed Meece Livingston City Manager	06/28/2011	Email	Initial public meeting
Belinda Van Nurden PC DES	07/01/2011	Email	Public information and invitations review
Livingston Enterprise	07/01/2011	Email	Press release
Cassie Pace Livingston Enterprise	07/01/2011	Email	Meeting advertising
All Stakeholders	07/01/2011	Email Mail	Invitation to the public and planning meetings
Tom Totland PC Sheriff's Office	07/04/2011	Email	Meeting and plan review
Kent Atwood Montana DES	07/05/2011	Email	Mitigation project ideas
Bozeman Daily Chronicle	07/09/2011	Email	Press release
All Stakeholders	07/12/2011	Email	Public and planning meetings reminder
Erica Hoffman PC GIS	07/12/2011	Email	GIS data
Phillip Fletcher PC Community Development	07/12/2011	Email	Community development data
Ed Meece Livingston City Manager	07/12/2011	Email	Community development data
Meeting Attendees	07/12/2011	Meeting	Initial public meeting
Ed Meece Livingston City Manager	07/13/2011	Email	Hazard analysis
Meeting Attendees	07/14/2011	Meeting	Initial planning meeting
Erica Hoffman PC GIS	07/14/2011	Meeting	GIS data
Cindy Good Town of Clyde Park	07/14/2011	Email	Town-specific plans and data
Belinda Van Nurden PC DES	07/14/2011	Email	Public information
Ed Meece Livingston City Manager	07/14/2011	Email	US Army Corps of Engineers Special Area Management Plan

Table G1. Plan Communication Tracking (continued)

Name/Organization	Date	Type	Reason(s)
Suzanne Brown PC Health Dept.	07/15/2011	Email	Critical facility list updates
Kent Atwood Montana DES	07/15/2011	Email	Mitigation project ideas
Belinda Van Nurden PC DES	07/15/2011	Email	Critical facility list updates
Ed Meece Livingston City Manager	07/15/2011	Email	Critical facility list updates
Krista Gindlesperger Taylor-Leavitt Insurance	07/15/2011	Phone	County replacement values
Belinda Van Nurden PC DES	07/19/2011	Email	Critical facility list updates
Mary Ellen Szafranski Livingston HealthCare	07/19/2011	Email	Public information
Kent Atwood Montana DES	07/25/2011	Email	Repetitive loss data
Belinda Van Nurden PC DES	07/25/2011	Email	Flood losses
Michael Inman PC Community Development	07/26/2011	Email	Community development data
Jeri Stevens PC Community Development	07/26/2011	Email	Community development data
Ed Meece Livingston City Manager	07/26/2011	Email	Community development data
Greg Colman PC Fire Warden	07/28/2011	Email	Urban fire data
Bob Fry Montana DES	07/28/2011	Email	Urban fire data
Ed Meece Livingston City Manager	08/01/2011	Email	Final public meeting
Greg Colman PC Fire Warden	08/02/2011	Email	Wildland Urban Interface GIS
Barbara Woodbury PC Environmental Health	08/03/2011	Email	Septic permit data
All Stakeholders	08/09/2011	Email	Planning meeting reminder
Meeting Attendees	08/11/2011	Meeting	Planning meeting
Jon Hesse Clyde Park Attorney	08/11/2011	Phone	Questions specific to mitigation in Clyde Park
Jon Hesse Clyde Park Attorney	08/12/2011	Email	Questions specific to mitigation in Clyde Park
Greg Colman PC Fire Warden	08/18/2011	Email	Wildland Urban Interface GIS
Krista Gindlesperger Taylor-Leavitt Insurance	08/18/2011	Email	County replacement values

Table G1. Plan Communication Tracking (continued)

Name/Organization	Date	Type	Reason(s)
Kent Atwood Montana DES	08/18/2011	Email	Scour critical bridge data
Erica Hoffman PC GIS	08/19/2011	Email	Wildland Urban Interface GIS
Belinda Van Nurden PC DES	08/23/2011	Email	Public information and invitations review
All Stakeholders	08/23/2011	Email Mail	Invitation to the final public meetings and plan review opportunity
Livingston Enterprise	08/23/2011	Email	Press release
Bozeman Daily Chronicle	08/23/2011	Email	Press release
Cindy Good Town of Clyde Park	08/23/2011	Email	Press release
Mary Ellen Szafranski Livingston HealthCare	08/24/2011	Email	Plan link posted on Livingston HealthCare website
Cindy Good Town of Clyde Park	08/24/2011	Phone	Press release correction
Belinda Van Nurden PC DES	08/26/2011	Email	Grant match
Cassie Pace Livingston Enterprise	08/30/2011	Email	Meeting advertising
Belinda Van Nurden PC DES	09/02/2011	Email	Public Information
Meeting Attendees	09/06/2011	Meeting	Clyde Park public meeting
Meeting Attendees	09/08/2011	Meeting	Livingston public meeting
Belinda Van Nurden PC DES	09/09/2011	Email	Grant management
All Stakeholders	09/14/2011	Email	Final comments reminder
Kent Atwood MT DES	09/14/2011	Email	Plan submission
Tom Totland PC Sheriff's Office	09/14/2011	Email	Plan review and comments incorporated

Appendix H. PLAN CHANGES

Table H1. 2011 Plan Changes

2005 Section	Changes	2011 Section
All	Improved the page numbering system for easier updating.	All
1	Moved the Adoption Documentation to an annex for easier referencing and reading.	P
1	Added the 2011 adoption documents.	P
2	Broke the Introduction Section into specific subsections for easier reading and the addition of relevant information. Extraneous information was removed.	1
2	Updated mapping and added a “features” map.	1.3
2	Updated climate data.	1.4
2	Moved some information from the Introduction to the Assets and Community Inventory section.	3
2	Hazard information was moved from the Introduction section to the relevant hazard profiles.	4
3	Added information regarding the 2011 planning process, including additional descriptions of the process, planning team, community changes, plan changes, jurisdiction participation, public participation, incorporation of existing information, and plan adoption.	2.2
4	Moved the Vulnerability Assessment Methodology section into the Planning Process and Methodologies section.	2.3
4	Added information regarding the methodologies used in the hazard profiles.	2.3
4	Moved the Hazard Identification section into the Planning Process and Methodologies section.	2.4
4	The Assets and Community Inventory section was put into its own section.	3
4	Updated the Critical Facilities list through internet research and stakeholder input.	3
4	Updated the Critical Facilities GIS and mapping.	3.1
4	Added information regarding Critical Infrastructure.	3.1
4	Incorporated HAZUS building information.	3.2
4	Added a section on Economic, Ecologic, Historic, and Social Values	3.3
4	Added a section on Recent Development	3.5
4	Updated the Future Development section to include updated plans and estimates.	3.6
4	Added mapping and analysis using private, undeveloped parcels.	3.6
4	Incorporated the Mapping and Associated Hazards and Other Factors sections into the Description section of the hazard profiles.	4
4	Added magnitude considerations to the hazard profiles.	4
4	Incorporated new studies and data into the hazard profiles.	4
4	Updated mapping in the hazard profiles.	4
4	Added a hazard summary for each jurisdiction for each hazard in the hazard profiles.	4
4	Added a summary table of federal major disaster and emergency declarations to each hazard profile.	4
4	Updated the hazard history in each hazard profile.	4
4	Added a Hazard Frequency and Impact Ranges table to each hazard profile.	4
4	Added a Methodology subsection to the Vulnerabilities in each hazard profile.	4

Table H1. 2011 Plan Changes (continued)

2005 Section	Changes	2011 Section
4	Added a Hazard Vulnerabilities and Impacts summary table to each hazard profile.	4
4	Added critical infrastructure and values subsections to the vulnerabilities in each hazard profile.	4
4	Conducted a new HAZUS run for earthquake.	4.6
4	Used the new floodplain mapping to assess flood vulnerabilities.	4.7
4	Used buffer zones more in line with the Emergency Transportation Guidelines for the hazardous materials release vulnerabilities.	4.9
4	Used fuels rather than crown fire potential to assess the wildfire vulnerabilities due to data improvements and availability.	4.16
4	Added a Federal Major Disaster and Emergency Declarations Summary table to the Risk Assessment Summary section.	4.19
4	Rated hazards by jurisdiction rather than just the county.	4.19
4	Added Composite Hazards mapping.	4.19
5	Described the mitigation strategy development process in more detail.	5
5	Updated the Mitigation Goals, Objectives, and Proposed Actions, as needed. See Appendix J for additional details.	5.1
5	Categorized each project by type.	5.1
5	Numbered each project and provided details on the jurisdiction(s), responsible agencies and partners, resources needed, potential funding sources, and goal timeframes specific to each project.	5.1
5	Added information on FEMA's STAPLEE Criteria.	5.2
5	Added a table on the Hazards and Development Mitigated by Each Proposed Project.	5.2
5	Prioritized the projects by jurisdiction.	5.2
5	Added a Funding Sources section.	5.4
5	Moved the Enabling Legislation and Existing Programs sections to the Existing Planning Mechanisms and Capabilities section.	5.5
6	Added details to the Plan Maintenance section specific to monitoring, evaluation, and updates.	6
6	Modified how the plan is maintained based on what worked and what didn't during the past six years.	6
A	Added 2011 public information documents.	B
B	Added 2011 meeting attendance records.	C
C	Updated the references used.	E
D	Updated the acronyms used.	F
E	Updated the FEMA Crosswalk Reference Document.	M
F	Added the 2011 state and FEMA approval letters	N
Appendices	Added an Invited Stakeholders appendix that also outlines individual participation.	A
Appendices	Added a Meeting Notes appendix.	D
Appendices	Added a Plan Communications appendix.	G
Appendices	Added a Plan Changes appendix.	H
Appendices	Added a Past Mitigation Strategies appendix.	J
Appendices	Added a Completed Mitigation Activities appendix.	K
Appendices	Added a Grant Program Information appendix.	L

Appendix J. PAST MITIGATION STRATEGIES

Table J1. Changes to the 2005 Mitigation Strategy

2005 Goal/Objective/Action	Status	Reason
GOALS		
Reduce damages from flooding.	No change	Remains an important goal.
Prevent losses from wildfires.	No change	Remains an important goal.
Reduce potential losses from earthquakes.	No change	Remains an important goal.
Reduce losses from a transportation or hazardous materials accident.	No change	Remains an important goal.
Prevent significant loss of life from communicable disease and bioterrorism.	Removed	All associated objectives or actions either completed or merged into other strategies.
Promote all-hazard mitigation measures.	Modified	Changed slightly, but still an important goal.
OBJECTIVES		
Prevent damages from bridges and to critical facilities during flood events.	Modified	Expanded to include other values.
Provide the public with information and means to prevent private flood losses.	No change	Remains an important objective.
Improve understanding of the flood hazard and mitigation measures.	Removed	Merged with the previous objective.
Reduce private losses in the wildland/urban interface.	No change	Remains an important objective.
Increase understanding of the wildfire hazard areas.	No change	Remains an important objective.
Prevent earthquake losses to critical facilities, vulnerable populations, and infrastructure.	No change	Remains an important objective.
Minimize private earthquake losses.	No change	Remains an important objective.
Allow for emergency traffic and evacuation routes during a hazardous materials or ground transportation incident.	No change	Remains an important objective.
Reduce the rapid spread of communicable diseases.	Removed	All associated actions either completed or merged into other strategies.
Ensure critical infrastructure is operational during disasters.	Removed	All associated actions either completed or removed.
Improve warning capabilities.	No change	Remains an important objective.

Table J1. Changes to the 2005 Mitigation Strategy (continued)

2005 Goal/Objective/Action	Status	Reason
Increase emergency management and disaster service capabilities to prevent additional losses in a disaster.	No change	Remains an important objective.
Improve digital data for assessing all hazards.	No change	Remains an important objective.
ACTIONS		
Lessen hydraulic impacts when the following bridges are replaced: Emigrant Bridge, Carter’s Bridge, Interstate 90 Bridge, Railroad Bridge at Highway 10/89 South, Highway 10/89 South Bridge, Highway 89 North Bridge (near the Shields River), Railroad Bridge at Highway 89 North (near the Shields River), and Springdale Bridge.	Modified	Some work completed, but still ongoing. Simplified to allow for more flexibility for other bridges.
Remove abandoned bridge abutments and piers.	No change	Not completed but still needed.
Consider zero backwater standards during bridge reconstruction, particularly at the Highway 10/89 South Bridge and the railroad bridge just downstream.	Modified	Not completed but still needed. Simplified to allow for more flexibility for other bridges.
Require future school facilities be constructed outside the floodplain.	Modified	Not completed but still needed. Added emphasis on ordinance changes.
Propose to the public a Park County Bond Issue for conservation easements and promote the use of state, federal, and private funds to protect values along the Yellowstone River.	Modified	Not completed but still needed. Language simplified.
Remove woody debris, as needed to protect public safety, but not excessively as such debris is important to ecological health.	Modified	Not completed but still needed. Language simplified.
Consider more restrictive regulations or prohibition of development in the floodplain.	Modified	Not completed but still needed. Removed the prohibition element due to lack of political support.
Map floodplain areas and join the National Flood Insurance Program in the Town of Clyde Park.	Modified	Nearly completed.
Join and obtain points for the Community Rating System of the National Flood Insurance Program in Park County and the City of Livingston.	Modified	Not completed but still needed. Changed to include Clyde Park.
Establish a Bank Stabilization Information Clearinghouse.	No change	Not completed but still needed.
Establish financial incentives for landowners to remove, modify, or replace obsolete and non-functioning flood control and bank stabilization structures.	No change	Not completed but still needed.
Conduct an analysis on the feasibility of a floodplain and floodway buyout and/or relocation program.	Modified	Not completed but still needed. Changed to include implementation.

Table J1. Changes to the 2005 Mitigation Strategy (continued)

2005 Goal/Objective/Action	Status	Reason
Educate the public on flood insurance.	Modified	Not completed but still needed. More details added.
Conduct a US Army Corps of Engineers Section 205 Flood Control Study.	Removed	Completed.
Conduct Bank Stabilization studies on project effectiveness and ecological health.	Modified	Some work completed, but still ongoing.
Study alternative flood mitigation measures.	Modified	Not completed but still needed. More details added.
Conduct a river migration study to measure the potential for river channel avulsion between the Livingston Ditch headgate and Interstate 90.	Removed	Completed to some extent.
Investigate widening the channel near the City of Livingston levee by resloping the north bank in a terraced fashion in the area of the preliminary floodplain map cross sections #55,000 and #56,000.	Removed	Floodplain mapping has changed and no longer considered a priority.
Promote Firewise type programs.	Modified	Some work completed, but still ongoing. More details added.
Require defensible space and inspection of new development in the wildland urban interface.	Modified	Some work completed, but still ongoing. Incorporated into the improvements to land use regulations.
Revise subdivision regulations with a better focus on defensible space/maintenance and water supply requirements in the wildland/urban interface.	Modified	Some work completed, but still ongoing. Incorporated into the improvements to land use regulations.
Reduce fuels along ingress and egress roadways.	Modified	Some work completed, but still ongoing. Incorporated into a comprehensive fuel reductions program.
Conduct fuels reduction along utility right-of-ways.	Modified	Some work completed, but still ongoing. Incorporated into a comprehensive fuel reductions program.
Develop fuels mapping for public and private lands.	Modified	Some work completed, but still ongoing. More details added.
Develop and maintain a Community Wildfire Protection Plan.	Removed	Completed but regular updates needed.

Table J1. Changes to the 2005 Mitigation Strategy (continued)

2005 Goal/Objective/Action	Status	Reason
Develop a centralized, countywide wildfire history database.	No change	Not completed but still needed.
Tie down/secure objects in critical facilities and vulnerable population locations that could fall during an earthquake.	Modified	Not completed but still needed. Language simplified.
Retrofit critical government facilities for earthquakes.	Modified	Not completed but still needed. Details added.
Inspect key bridges for seismic stability.	Modified	Not completed but still needed. Added language for implementation.
Anchor or stabilize electric transformers and generators for seismic motion during maintenance and new installations.	No change	Not completed but still needed.
Install expansion joints in underground utilities during new or replacement construction.	No change	Not completed but still needed.
Educate home and business owners on simple earthquake retrofits.	No change	Not completed but still needed.
Survey commercial structures for earthquake stability and recommend retrofits.	No change	Not completed but still needed.
Create a financial incentive program for major earthquake retrofits in the priority hazard areas.	No change	Not completed but still needed.
Develop an emergency transportation plan that considers key roadways and intersections.	Removed	Not mitigation.
Study and construction of an additional railroad crossing.	Modified	Study completed, but construction still needed.
Conduct a public education campaign on how to prevent the spread of disease.	Modified	Some work completed, but still ongoing. Incorporated into multi-hazard education.
Establish a group made of area medical stakeholders to discuss disaster management and prevention issues.	Removed	Completed.
Install a new ventilation system in the City/County Complex and other critical facilities.	Removed	Completed.
Identify, prioritize, and harden infrastructure from damages during disasters.	Modified	Not completed but still needed. Details added.
Install or designate back-up systems for critical infrastructure, including emergency communications systems.	Removed	Completed.
Develop a dispatch function mutual aid system with Gallatin County.	Removed	Completed.
Install an uninterruptible power supply for Park County Dispatch.	Removed	Completed.
Protect North Repeater from vandals through bulletproof casing.	Removed	Completed.
Become a National Weather Service Storm Ready Community.	Modified	Not completed but still needed. Details added.
Develop an Emergency Alert System plan.	Removed	Completed.
Put NOAA Weather Radios in critical facilities and schools.	Removed	Completed.

Table J1. Changes to the 2005 Mitigation Strategy (continued)

2005 Goal/Objective/Action	Status	Reason
Create a finite, hardened Emergency Operations Center and alternate location.	Removed	Not mitigation.
Develop a sheltering plan specific to utility failures.	Removed	Completed to some extent and not mitigation.
Install generators at critical facilities and vulnerable population locations.	No change	Not completed but still needed.
Develop GIS data that can be used with FEMA’s HAZUS loss estimated models.	No change	Not completed but still needed.

Additions to the 2005 mitigation strategy in 2011 include:

Objective 5.4: Mitigate the impact of hazards on future development through land use and building regulations.

Objective 5.5: Educate businesses and the public on simple mitigation activities.

Objective 5.6: Protect critical infrastructure from a variety of hazards.

Project 1.1.2: Floodplain Ordinances

- Continue compliance with the National Flood Insurance Program and local flood ordinances.
- In Clyde Park, take action to adopt a National Flood Insurance Program compliant flood ordinance.

Project 1.1.5: Bridge, Culvert, and Road Improvements

- Upgrade bridges, culverts, and roads to allow sufficient passage of floodwaters.
- Install culverts in areas prone to washouts or drainage problems.
- Stabilize roadsides that are prone to mudslides and/or landslides.

Project 1.1.6: Livingston Berm Alternatives

- Study the need for the temporary berm constructed during Yellowstone River flood threats to protect areas of Livingston.
- Evaluate possible alternatives that are more sustainable and cost-effective in the long term.
- Implement reasonable solutions that more permanently mitigate the threat.

Project 2.1.1: FireSafe Coalition

- Continue to develop and support a Park County FireSafe Coalition.
- Promote mitigation practices in the wildland urban interface.
- Coordinate wildfire preparedness planning and activities.
- Build partnerships with community leaders and businesses, such as insurance providers, for wildfire prevention and mitigation.

Project 2.1.2: Fuels and Fire Mapping

- Develop digital maps of wildfire hazard areas, such as fuels and condition classes.
- Use the mapping for land management and project development.
- Develop mapping of treatments conducted by all land management agencies.
- Develop an improved wildland urban interface map.

Project 2.2.2: Regional Water Sources

- Develop regional water sources within the wildland urban interface to supply substantial amounts of water within a reasonable distance for wildland firefighting efforts.

Project 2.2.3: Ingress/Egress Road Improvements

- Improve critical ingress/egress roadways in the wildland urban interface with activities such as road widening and the addition of turnarounds, particularly in the Mountain Sky, West Boulder, and Main Boulder areas.
- Where feasible, construct a second access road into a subdivision.

Project 5.4.1: Building Codes

- Adopt and enforce the state building code.

Project 5.4.2: Growth Policies and Subdivision Regulations

- Update the growth policies to encourage growth in low hazard areas and continue to allow for the consideration of high hazard areas during subdivision reviews.
- Continue to make improvements to the subdivision regulations for disaster resistance.
- Ensure the new state requirements for wildfire considerations in growth policies are met.

Project 5.4.3: Capital Improvements Plans

- Develop and/or update Capital Improvements Plans to include relevant hazard mitigation projects and hazard considerations during improvements.

Project 5.5.1: Mitigation Education

- Develop a comprehensive public education program, including the use of social media as appropriate, that highlights a variety of mitigation topics including, but not limited to:
 - 72-Hour preparedness kits
 - Seasonal, hazard-specific information (avalanche, drought, flood, severe thunderstorms, wildfire, winter weather)
 - Smart building practices (specific to flood, wildfire, and/or wind)
 - Disease prevention

Project 5.6.1: Electric and Communications Infrastructure Burying

- Bury electric and communications lines in hazardous areas (wildland urban interface, near trees, etc.).

Project 5.6.2: Snow Fences

- Install snow fences (living or artificial) along critical roadways prone to drifting snow and strong winds.

Appendix K. COMPLETED MITIGATION ACTIVITIES

August 2005 through August 2011

Mitigation Activities

Linked to 2005 Goal #1: Reduce damages from flooding.

- Fleshman Creek Improvement Project: This project will increase channel capacity of a two-mile stretch of Fleshman Creek through Livingston while rehabilitating the creek channel and riparian zone. Specifics include the upgrade of six culverts at street/road crossings, installation of hydrodynamic separators at storm water outfalls, creation of wetlands along the creek channels, and relocation of water main, sewer, and electric overhead utilities. The project is designed to protect areas threatened by the 25-year flood. To date, this project has brought together partners such as Trout Unlimited, National Fish and Wildlife Foundation, U.S. Fish and Wildlife Service, Bureau of Land Management, and U.S. Forest Service. Although construction on this project has not started, final design work is expected soon.
- The new Ninth Street Island Bridge, constructed in 2010, has much improved water flow and flood conveyance.
- Letters were sent to Ninth Street Island owners regarding acquisition opportunities and some interest was generated, but ultimate project implementation did not occur.
- The US Army Corps of Engineers and the City of Livingston conducted floodplain studies. The study and mapping performed by the City of Livingston will be effective in October 2011.
- The floodplain was mapped for the Town of Clyde Park and the town will be joining the National Flood Insurance Program in the spring of 2012 with mapping effective October 18, 2011.
- New floodplain maps were created for Park County and will be effective in October 2011.
- The Park County Floodplain Regulations were updated; these regulations were last updated in 1991.
- The US Army Corps of Engineers (USACE) created a Special Area Management Plan for the Upper Yellowstone River in April 2011. This plan addresses the cumulative effects of anthropogenic bank stabilization and flood confinement on the upper Yellowstone River. This plan will result in improvements to the USACE permitting process.
- In fiscal year 2009, the Yellowstone River Conservation District Council published a report entitled Yellowstone River Channel Migration Zone, created associated mapping, and conducted workshops throughout the basin. The Council followed up with two more workshops and a Best Management Practice example. The voluntary Best Management Practice encourages the use of the Channel Migration Zone maps to help landowners and local governments make informed decisions regarding future development and infrastructure maintenance within the Yellowstone River corridor.

Linked to 2005 Goal #2: Prevent losses from wildfires.

- A countywide Community Wildfire Protection Plan was completed in 2006 and updated in 2009.

- Wildfire improvements to the Park County Subdivision Regulations were made in 2007 and are now being updated again to have more oversight by the Park County Community Development office and approval by the jurisdictional fire department.
- Park County created a FireSafe Coalition that promoted wildfire mitigation strategies at public events such as Farmers Market and developed public-private partnerships with insurance, real estate, construction, landscapers, and firefighters.
- Through a cooperative effort between the Northern Rocky Mountain Resource Conservation & Development area (NRMRC) and Montana State University - Gallatin County Extension, over 39 fuels reduction projects were accomplished in Park County from 2006-2009, treating almost 97 acres. While mostly concentrated on residential parcels, these efforts also included larger-scale projects at Luccock Park Church Camp and the Yellowstone Bible Camp. (Park County, 2009)
- The Big Timber, Livingston, and Gardiner Ranger Districts of the Gallatin National Forest accomplished over 3,000 acres of fuels reductions projects from 2006-2009, using a variety of methods including mechanical thinning and prescribed fire. The Main Boulder River Canyon, identified as a high-risk area in the 2006 Community Wildfire Protection Plan, saw the largest effort, with the start of a multi-year project to treat 2,300 acres along the drainage. Other hazard areas saw fuels treatment successes including projects in Big Creek, Old Chico, and Gardiner in Park County and Smith Creek along the Meagher County border. (Park County, 2009)
- In the fall of 2009, the Park County Commissioners authorized the hire of a temporary fire planner to “raise community awareness of the issues and solutions of living in the wildland urban interface,” and with technical assistance from the Park County GIS department, the website (parkcounty.org/fireriskassessment.html) was deployed.

Linked to 2005 Goal #3: Reduce potential losses from earthquakes.

- As interstate and highway bridges have been and are being replaced, the Montana Department of Transportation is reconstructing the bridges to meet the earthquake standards of the region.

Linked to 2005 Goal #4: Reduce losses from a transportation or hazardous materials accident.

- An additional railroad crossing was studied by the City of Livingston and now funding is being generated for construction.

Linked to 2005 Goal #5: Prevent significant loss of life from communicable disease and bioterrorism.

- Disease public education is an ongoing project, but many several education campaigns have been conducted since 2005.
- Local and regional (Greater Yellowstone Group) healthcare groups were established.
- The City-County Complex ventilation system was upgraded in 2010.
-

Linked to 2005 Goal #6: Promote all-hazard mitigation measures.

- The Park County Fire Warden and GIS Department created a risk assessment tool for the Park County website. This tool was first developed for wildfire, but is going to become an all-hazard interactive education tool.
- Back-up systems were created for emergency communications.
- The North Repeater was protected from vandals.
- A NOAA Weather Radio transmitter was installed in Livingston.

- The State of Montana developed a statewide Emergency Alert System plan.
- All schools in the county received NOAA weather radios.
- GIS data has improved significantly since 2005 and was used in this plan update.

Plan Integration Opportunities

- Wildfire improvements to the Park County Subdivision Regulations were made in 2007 and are now being updated again to have more oversight by the Park County Community Development office and approval by the jurisdictional fire department. The 2007 improvements included significant strengthening of the fire protection standards for new rural subdivision development. Locally, the Park County Planning Department led this effort, with input from the Fire Council, other fire and planning professionals, developers, and residents--with the intent that the new subdivision regulations allow flexibility between developers and fire departments by allowing the most innovative and successful fire protection techniques, technologies, and systems to be utilized. (Park County, 2009)
- The mitigation plan has been used when developing emergency management planning grants and PDM grants.

Grant Funding

- Park County received a Pre-Disaster Mitigation grant in 2010 for the five-year update of the Hazard Mitigation Plan.
- Park County received several grants in 2009 and 2010 for the Fleshman Creek Improvement Project:
 - Pre-Disaster Mitigation Grant: \$2,280,000
 - Reclamation and Development Grant: \$300,000
 - Montana FWP Future Fisheries Grant: \$98,100
 - National Fish and Wildlife Foundation Grant: \$53,075

Appendix L.

GRANT PROGRAM INFORMATION

Appendix M.

FEMA CROSSWALK REFERENCE DOCUMENT

Appendix N.

STATE AND FEMA APPROVAL LETTERS

Appendix P.

ADOPTION DOCUMENTATION

RESOLUTION NO. 887

A RESOLUTION ADOPTING A HAZARD MITIGATION PLAN
FOR PARK COUNTY, MONTANA

WHEREAS, all citizens and property within Park County are at risk from a wide range of hazards such as, but not limited to, avalanche, aviation accidents, bioterrorism, civil unrest, communicable disease, dam failure, drought, earthquake, extended cold, flooding, ground transportation accidents, hazardous material release, landslide, railroad accidents, severe thunderstorms, terrorism, tornadoes, urban fire, utility outage, violence, volcano, wildfire, wind, and winter storms;

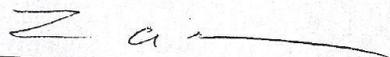
WHEREAS, Park County, pursuant to Section 322, Mitigation Planning of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and the Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201, is required to have an approved Hazard Mitigation Plan in order to receive future federal disaster mitigation funds; and

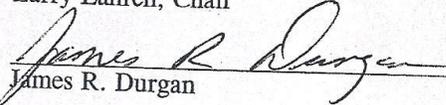
WHEREAS, a Hazard Mitigation Plan will guide Park County in making decisions for pre-disaster and post-disaster mitigation projects.

NOW, THEREFORE, it is hereby resolved that the Park County Commission does hereby adopt the hazard Mitigation Plan dated August 2005 and attached hereto as Exhibit A.

DATED AND PASSED this 12 day of September, 2005.

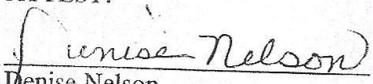
PARK COUNTY COMMISSION


Larry Lahren, Chair

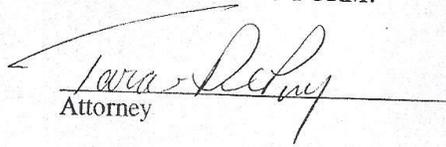

James R. Durgan


Dick Murphy

ATTEST:


Denise Nelson
Park County Clerk & Recorder

APPROVED AS TO FORM:


Attorney

RESOLUTION NO. 3681

RESOLUTION OF THE CITY COMMISSION OF THE CITY OF LIVINGSTON,
MONTANA, APPROVING HAZARD MITIGATION PLAN.

WHEREAS, all citizens and property within the City of Livingston are at risk from a wide range of hazards such as, but not limited to, aviation accidents, bioterrorism, civil unrest, communicable disease, drought, earthquake, extended cold, flooding, ground transportation accidents, hazardous materials release, railroad accidents, severe thunderstorms, terrorism, tornadoes, urban fire, utility outage, violence, volcano, wildfire, wind, and winter storms; and

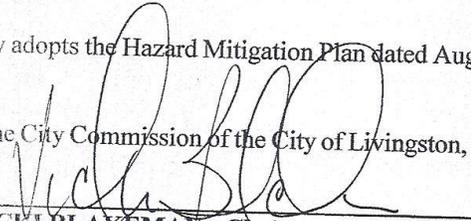
WHEREAS, the City of Livingston, pursuant to Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and the Interim Final Rule published in the Federal Register on February 26, 2002 at 44 CFR Part 201, is required to have an approved Hazard Mitigation Plan in order to receive future federal disaster mitigation funds.

WHEREAS, the Hazard Mitigation Plan dated August 2005 and attached hereto as Exhibit A and which is incorporated by this reference as though fully set forth herein, will guide the City of Livingston in making decisions for pre-disaster and post-disaster mitigation projects.

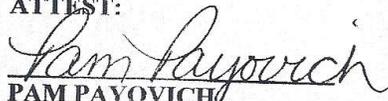
NOW, THEREFORE, BE IT RESOLVED, by the City Commission of the City of Livingston, Montana, as follows:

That the City Commission hereby adopts the Hazard Mitigation Plan dated August 2005 and attached hereto as Exhibit A.

PASSED AND ADOPTED by the City Commission of the City of Livingston, this 6th day of September, 2005.


VICKI BLAKEMAN - Chairman

ATTEST:


PAM PAYOVICH
Recording Secretary

APPROVED AS TO FORM:


BRUCE E. BECKER
City Attorney

Resolution No. 3681
Adopting Hazard Mitigation Plan
Page 1

STATE OF MONTANA
City of Livingston

I hereby certify that this instrument is a full, true and correct copy of the original now on file and of record in my office.

Witness my hand and Official Seal this 14th

day of September 05, 2005.
Pam Payovich, Recording Secretary

By: 
Recording Secretary

RESOLUTION NO. 389

**RESOLUTION TO APPROVE HAZARD MITIGATION PLAN
Town of Clyde Park, Montana**

WHEREAS, all citizens and property within the Town of Clyde Park are at risk from a wide range of hazards such as, but not limited to, aviation accidents, bioterrorism, civil unrest; communicable disease, dam failure, drought, earthquake, extended cold, flooding, ground transportation accidents, hazardous materials release, severe thunderstorms, terrorism, tornadoes, urban fire, utility outage, violence, volcano, wildfire, wind, and winter storms.

WHEREAS, the Town of Clyde Park, pursuant to Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and the Interim Final Rule published in the Federal Register on February 26, 2002 at 44 CFR Part 201, is required to have an approved Hazard Mitigation Plan in order to receive future federal disaster mitigation funds.

WHEREAS, a Hazard Mitigation Plan, will guide the Town of Clyde Park in making decisions for pre-disaster and post-disaster mitigation projects.

NOW, THEREFORE, BE IT RESOLVED, that the Town Council of Clyde Park, Montana, hereby adopts the Hazard Mitigation Plan dated August 2005.

PASSED AND ADOPTED, by the Town Council of the Town of Clyde Park this 12 day of September 2005.

BARBARA SHANDY
Councilperson

Yes No Absent

SHIRLEY SAGER
Councilperson

Yes No Absent

BERNARD EBERT
Councilperson

Yes No Absent

ALICE SARRAZIN
Councilperson

Yes No Absent

TERESA LEHMAN

Councilperson

Yes

No

✓
Absent

Approved:

Alice W. Hartman

Alice W. Hartman, Mayor

Approved as to Form and Content:

Jon M. Hesse

Jon M. Hesse, City Attorney

ATTEST:

Cynthia K. Good

Cynthia Good, Town Clerk