Glacier County
Pre-Disaster Mitigation Plan
February 2017

Encompassing the Jurisdictions of:

Glacier County
City of Cut Bank

Prepared By:

Fulton Wold, CBCP
Executive Officer
(615) 469-5558
fulton@boldplanning.com

Tony Gertz, AEM
Mitigation Planner
(615) 469-5558
tony@boldplanning.com

Executive Summary

The Glacier County Pre-Disaster Mitigation Plan is being developed to update and revise hazard mitigation activities for Glacier County. The Glacier County Mitigation Planning Committee will evaluate mitigation measures to be undertaken, and outline a strategy for implementation of mitigation projects. This plan covers two municipalities in Glacier County, including the governments of: Glacier County and the City of Cut Bank.

Formal adoption and implementation of a pre-disaster mitigation plan may present many benefits to Glacier County and Cut Bank. By identifying problems and possible solutions in advance of a disaster, Glacier County and Cut Bank will be in a better position to obtain pre and post-disaster funding.

This document aims to produce the following strategic outcomes:

1) Reduce loss of life and decrease property losses to Glacier County and its jurisdictions due to natural disasters; and

2) Provide the framework and coordination to encourage government, and both public and private organizations at all levels, to undertake mitigation in order to minimize potential disasters and to employ mitigation strategies in the recovery following disasters.

Specifically, these strategic outcomes will be brought about through the following planning process:

1) Identify, describe, and characterize the hazards to which Glacier County and its participating jurisdictions are susceptible

2) Assess the risk of each hazard, including probability, frequency, exposure, and vulnerability

3) Examine feasible mitigation opportunities appropriate for the identified hazards, and prioritize those opportunities

4) Implement mitigation actions to reduce loss of lives and property

5) Identify mitigation opportunities for long-term planning consideration

Contents

Section 4 – Hazard Risk Assessment 33

Glossary of Terms

BFE – Base Flood Elevation
BPS – Bold Planning Solutions
DFIRM – Digital Flood Insurance Rate Map
DMA 2000 – Disaster Mitigation Act of 2000
EMS – Emergency Medical Services
EMA – Emergency Management Agency
EOP – Emergency Operations Plan
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FMA – Flood Mitigation Assistance Grant Program
FP&S – Fire Prevention and Safety Grants
FOUO – For Official Use Only
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
MPC – Mitigation Planning Committee
ICS – Incident Command System
I/CFs – Infrastructure and Critical Facilities
LEPC – Local Emergency Planning Committee
MPC – Mitigation Planning Committee
MTDES – Montana Disaster and Emergency Services
MTDNRC – Montana Department of Natural Resources Conservation
NEHRP – National Earthquake Hazards Reduction Program
NEIC – National Earthquake Information Center
NFHL – National Flood Hazard Layer
NFIP – National Flood Insurance Program
OEM – Office of Emergency Management
PDM – Pre Disaster Mitigation Plan
PoC – Point of Contact
RFP – Request for Proposal
SS – Severe Storms
SOP – Standard Operating Procedure
SSURGO – Soil Survey Geographic Database
USACE – United States Army Corps. Of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WID – Watershed Improvement District
WS – Winter Storm
WUI – Wildland Urban Interface

Introduction to Mitigation

The Emergency Management Cycle & Mitigation
Understanding this cycle is the first step in effectively planning and operating in relation to all disaster related activities. The emergency management cycle is an open-ended and ongoing process. The four phases in the process are mitigation, preparedness, response, and recovery. Each phase of the cycle can last years or moments in length while different paths can exist simultaneously.

Mitigation planning is the process of determining how to reduce or eliminate the loss of life and property damage resulting from natural and human-caused hazards.

It is carried out as any sustained action to reduce or eliminate long-term risk to life and property from a hazard event. Mitigation encourages long-term reduction of hazard vulnerability. As is the goal of emergency management, the goal of mitigation is to save lives and reduce property damage.

The Disaster Mitigation Act of 2000 (DMA 2000)
In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 became law on October 30, 2000, and amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the “Stafford Act”) (Public Law 93-288, as amended). Regulations for this activity can be found in Title 44 of the Code of Federal Regulations Part 206, Subpart M.

This legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. This act establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program.

Section 322 of the act specifically addresses mitigation planning at the state, local, and tribal levels. It identifies new requirements that allow HMGP funds to be used for mitigation planning activities, and increases the amount of HMGP funds available to states that have developed a comprehensive, enhanced mitigation plan prior to a disaster. States and communities must have an approved mitigation plan in place prior to receiving post-disaster HMGP funds. Local and tribal mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to and the capabilities of the individual communities and identifiable gaps.

DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together. It encourages and rewards local and state pre-disaster planning and promotes sustainability as a strategy for disaster resistance. This enhanced planning network will better enable local and state governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects. To implement the new DMA 2000 requirements, FEMA prepared an interim final rule, published in the Federal Register on February 26, 2002, at 44 CFR Parts 201 and 206, which establishes planning and funding criteria for states and local communities.

On October 31, 2007, FEMA subsequently published an Interim Rule in the Federal Register, which ensures the Flood Mitigation Assistance (FMA) program planning requirements are consistent with the

mitigation planning regulations as cited in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201 (44 CFR Part 201).

This interim rule established that local communities must comply with mitigation planning requirements to be eligible to apply for FEMA mitigation project grant funding, including FMA and FEMA's Severe Repetitive Loss Program. Meeting the requirements of the regulations cited above ensures participating jurisdictions in the planning area will be eligible to receive disaster assistance, including hazard mitigation grants available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288, as amended.

Glacier County has the responsibility to coordinate activities relating to hazard evaluation and mitigation, and to prepare and submit to FEMA a local hazard mitigation plan, following the criteria established in 44 CFR 201.6 and Section 322 of the Disaster Mitigation Act of 2000 (Public Law 106-390).

Section 1 – Planning Process

Planning Process
- Plan Development
- Stakeholder Participation
- Community Involvement

Local Procedures & Resources

Planning Area

Hazard Risk Assessment

Mitigation Strategy

1.1 – Plan Introduction

This pre-disaster mitigation plan consists of two jurisdictions: one county, and one city. Each jurisdiction actively participated in the planning process from its inception. Each jurisdiction provided at least one representative to provide a locality-specific perspective.

Planning team members actively participated in meetings, solicited input from members of their communities, and ensured that all jurisdiction information was reflected in the plan.

If a planning team member could not attend a meeting they were called via telephone, and all documentation which was presented at the meeting was delivered to the team member. The phone call consisted of a brief overview of the meeting along with time for the planning team member to make his or her suggestions or comments. A detailed description of the planning process, including a list of contributions from each jurisdiction, is provided in Section 1.2.2 Jurisdictions while a complete list of planning team participation is in section 1.3 – Stakeholder Participation.

1.2 – Plan Development

1.2.1 – Plan Drafting Stage

Glacier County's revision process began in August of 2015, when the Glacier County OEM/DES and Pondera County DES applied for a dual PDM planning grant under FEMA PDMC-PL-08-MT-2015-003. The counties were awarded the grant to begin the process of updating their previously approved pre-disaster mitigation plans. Following the funding commitments, Glacier County hired BOLDplanning to facilitate their plan's development.

Glacier County's mitigation planning process was initiated on 1 December 2016 when BOLDplanning hosted a public kick-off planning meeting. At this meeting, an initial planning team comprised of representatives from each participating jurisdiction was organized. The initial team was instructed to solicit interested persons from their community to participate on the planning team. All participating jurisdictions actively participated in the planning process through soliciting input and participation in meetings.

Six planning events were held throughout the planning process. The final planning meeting was a public hearing held on 28 August 2017. The planning events included meetings with representation from each of the plan's participating jurisdictions as well as the public. Planning events also included conference phone calls with municipal and agency officials who could not attend scheduled meetings.

Throughout the process the public was given opportunities to review PDM drafts, ask questions, and provide input on hazards. They were invited to provide feedback on mitigation project prioritization, hazard identification, and hazard ranking. LEPC meeting addressed the plan's progress and purpose at each monthly meeting. Details and documentation of the LECP's and the public's participation can be found in Appendix C – Public Participation.

Planning Process Summary

1.) Each participating jurisdiction appointed a jurisdictional representative along with other stakeholders, Glacier County OEM/DES, and the BOLDplanning Mitigation Department.

2.) The Glacier County OEM/DES engaged BOLDplanning to provide staff support in facilitating the planning process and preparing the plan.

3.) Meetings were held with team members to understand and agree on planning processes and steps required, including organizing resources, assessing hazards, developing a mitigation plan, implementing the plan and monitoring progress.

BOLDplanning held subsequent discussions about the planning process with MTDES staff.

1.2.2 – Jurisdictions

The following table lists the participating jurisdictions of Glacier County, their lead representative contact during the PDM's development, and their MPC contributions by development phase.

Table 1 – Jurisdictional Contribution by Planning Phase

Jurisdiction & Representative	Planning Process	Risk Assessment	Mitigation Strategy	Plan Maintenance
Glacier County Charles Farmer, Office of Emergency Management, Director, Department of Emergency Services, Coordinator	Participated in MPC	Completed hazard history documentation	Provided mitigation projects and actions history.	Will participate in the LEPC as prescribed in Section 2 - Plan Maintenance
	Provided information on critical facilities, hazards, PoCs	Completed risk assessment questionnaire	Proposed mitigation projects	
	PoC and lead jurisdiction for the MPC	Reviewed risk assessment	Prioritizing mitigation projects using STAPLE+E	
Cut Bank Dan Raemaeker, City of Cut Bank, Mayor	Participated in MPC	Completed hazard history documentation	Provided mitigation projects and actions history.	Will participate in the LEPC as prescribed in Section 2 - Plan Maintenance
	Provided information on critical facilities, hazards, PoCs	Completed risk assessment questionnaire	Proposed mitigation projects	
	PoC and lead jurisdiction for the MPC	Reviewed risk assessment	Prioritizing mitigation projects using STAPLE+E	
		Reviewed risk assessment	Prioritizing mitigation projects using STAPLE+E	

1.2.3 – Major Mitigation Planning Meetings

The Glacier County MPC held various public meetings to discuss the mitigation plan process as well as gain public support and input for the plan. The following is a brief synopsis of those meetings. Proof of meetings, sign in sheets, and public notification documentation can be found in Appendix C – Public Participation.

Pre-Disaster Mitigation Plan Kick-Off and Public Information Meetings
1 December 2017
BOLDplanning was on-site in Glacier County to host a kick-off meeting in the City of Cut Bank. Public announcements ran for two weeks in the Pioneer Press and the Glacier Reporter newspapers. The public was invited to voice any concerns, ask questions, and provide input on the pre-disaster mitigation plan. The Glacier County MPC was formed during this meeting and they reviewed the planning process, asked questions, and were assigned roles. BOLDplanning worked with the MPC to collect contact information, hazard history, facility information, and other pertinent jurisdictional information. Documentation for this meeting is located in Appendix C – Public Participation.

Pre-Disaster Mitigation Plan – School Participation Meeting
21 February 2017
Charles Farmer, Glacier County OEM/DES Director met with municipal employees, elected officials, and citizens of the community to spread awareness, educate on, and garner input on the development of the pre-disaster mitigation plan. Documentation for this meeting is located in Appendix C – Public Participation.

Pre-Disaster Mitigation Plan – School Participation Meeting
5 April 2017
Charles Farmer, Glacier County OEM/DES Director met with municipal employees, elected officials, and citizens of the community to spread awareness, educate on, and garner input on the development of the pre-disaster mitigation plan. Documentation for this meeting is located in Appendix C – Public Participation.

Hazard Mitigation Plan Public Review Period
28 August 2017 to 14 August 2017
A public announcement ran for two weeks in local newspapers, The Pioneer Press and the Glacier Reporter, as well as the county's website. The draft plan was made available in the DES's office for a period of two weeks prior to the stakeholder review. The public was also invited to voice any concerns, ask questions, and review a draft copy of the Glacier County Pre-Disaster Mitigation Plan. Documentation for this meeting is located in Appendix C – Public Participation.

Hazard Mitigation Plan Final Review Meeting
28 August 2017
The Glacier County Pre-Disaster Mitigation Plan was reviewed by the MPC and any stakeholders, as requested, prior to MTDES submission.

Pre-Disaster Mitigation Plan Adoption Signing
To Be Determined
The Glacier County Pre-Disaster Mitigation Plan adoption letters will be disseminated and signed by the participating jurisdictions. The signing of these resolutions codifies the adoption of the PDM by the participating jurisdictions.

1.3 – Stakeholder Participation

The Glacier County MPC is made up of stakeholders working together for the development and ongoing maintenance of this plan. The participants are grouped into actively participating representatives from the participating communities within Glacier County.

- Mitigation Planning Committee – This group consists of the jurisdictional representatives from the planning area, the Montana Department of Emergency Services, supporting state and federal agencies, and BOLDplanning.

- Other Stakeholders – This group consists of interested parties from the local community, a hospital, museum, state university, American Red Cross, and a local bank. This plan was developed with the support and input from various commercial interests.

- Members from the public at large – FEMA requires this planning effort to be open to constant input from interested citizens in compliance with the Sunshine Laws. In Montana, public meetings must comply with the Montana Open Meetings Law, unless established by statutory exemption. Therefore, any individual citizens who wish to be involved in this effort to mitigate future disasters are encouraged to attend the MPC meetings and to solicit relevant comments to be included in the draft sections of the written plan.

The following table details the stakeholders and MPC members who participated in the hazard mitigation planning process. This list contains all relevant local and state agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, and any appropriate neighboring communities.

Table 2 – Stakeholders & MPC Members

Name	Organization	Position	Collaboration/Invitation
Principal Plan Developers			
Tony Gertz	BOLDplanning	Mitigation Planner	Project Manager and Mitigation Specialist
John Taylor	BOLDplanning	Project Coordinator	Public Process Facilitator
Local Governments			
Charles Farmer	Glacier County OEM/DES	Director/Coordinator	Represented jurisdiction and provided input
Patrick Stranad	Babb Volunteer Fire Dept./Glacier County	Firefighter/Deputy DES	Provided additional support and input
Tom McKay	Glacier County	County Commissioner	Provided additional support and input
Ron Anderson	Glacier County	Sanitarian	Provided additional support and input
Janine Scott	Glacier County Courts	Clerk of Court	
Carol McDivitt	Glacier County Dept. of Health	Director	Provided additional support and input
Betsy Seglem	Glacier County Community Health Center	Director of Operations	Provided additional support and input
John Evans	Glacier County Public Works	Director	Provided additional support and input
Shannon Pepion	Glacier County Maintenance Department	Director	Provided additional support and input
Cicily Calf Boss Ribs	Glacier County	Clerk	Provided additional support and input
Glenda Hall	Glacier County	Clerk and Recorder	Provided additional support and input
Dan Raemaeker	City of Cut Bank	Mayor	Represented jurisdiction and provided input
Timothy Curtis	City of Cut Bank	City Councilmember	Provided additional support and input
Linda Burley	City of Cut Bank Bank	Clerk and Recorder	Provided additional support and input
Donovan Grubb	City of Cut Bank	City Councilmember	Provided additional support and input
Tim Kipp	City of Cut Bank	City Councilmember	Provided additional support and input
Tyson Michaels	City of Cut Bank	City Councilmember	Provided additional support and input
James Suta	City of Cut Bank Public Works	City Superintendent	Provided additional support and input
Michael Schultz	City of Cut Bank Police Department	Chief of Police	Provided additional support and input, participated in the plan review
Robert A. Smith	City of Cut Bank	Attorney	Provided additional support and input
State & Federal Agencies			
Robert Lucas	US Customs and Border Patrol	Agent in Charge Port of Piegan	
Courtney Eberhardy	National Park Service, Glacier National Park	Ranger	Provided additional support and input
Academia, Neighboring Communities, Private Organizations, and NGOs			
Landis Meeks	American Red Cross	Local Point of Contact	Provided additional support and input
Dennis Seglem	Glacier Historical Museum	Curator	Provided additional support and input
Kari Lewis	MSU Extension Office	Director	Provided additional support and input
Michael Hoffman	Northern Rockies Medical Center	Quality and Risk Manager	Provided additional support and input

1.4 – Community Involvement

The Glacier County MPC provided the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process. The public was notified of open meetings via Glacier County's website, and two local newspapers. BOLDplanning and the Glacier County OEM/DES invited all non-covered or soon to expire jurisdictions, including school districts, to participate in the plan. Any jurisdiction or school district not covered in this PDM is either covered under another plan, or declined to participate.

Participating jurisdictions were notified of MPC meetings via e-mail, regular mail, and telephone. Emergency managers from neighboring counties were personally invited to attend the public draft review meeting. For two weeks prior to each public meeting an announcement was placed on the Glacier County OEM/DES's website. Please see Appendix C – Public Participation for documentation.

At the first public planning meeting attendees ranked and identified hazards, created a community profile, prioritized mitigation projects, and completed a risk assessment questionnaire. During this meeting, and the latter public review hearing, concerned citizens and other parties were invited to review the most current draft, provide any input of feedback, and ask any relevant questions of the Glacier County MPC and BOLDplanning.

Relevant federal, regional, state, local, and tribal governments, as well as any private and non-profit organizations were invited to provide input and technical expertise. The entities, who volunteered, either in person or by providing hazard data, are listed in the following table.

Table 3 – Partner Involvement by Entity

Entity Classification	Entity	Entity Input
Federal Agencies	National Parks, NOAA, USACE, USDA NRCS, USGS	Provided weather data, dam data, land use data, and geological data.
State Agencies	MTDES, State Courts	Provided oversight & technical assistance. Provided wildfire records. Provided RL/SRL data.
Local Governments	Glacier County OEM/DES, Participating Municipalities	MPC members, principle subjects. Provided input.
Private Organizations	ARC, BOLDplanning, Cut Bank Bank, Glacier Community Health Center, Glacier Historical Museum, Northern Rockies Medical Center	Directed planning effort, principle planners, provided input from various interests.
Academia	MSU	Planning team member, attended meetings, principle subjects. Provided input.

Section 2 – Local Procedures & Resources

Planning Process

Local Procedures & Resources

- Available Resources
- Continued Public involvement
- Plan Maintenance Process

Planning Area

Hazard Risk Assessment

Mitigation Strategy

2.1 – Available Resources

2.1.1 – Documentation Resources

The MPC conducted a comprehensive review of Glacier County and the participating jurisdictions to determine the availability of existing emergency management and preparedness information.

Glacier County Community Wildfire Protection Plan
Glacier County's latest CWPP (2007) provided the local perspective basis for this plan's wildfire hazard profile and direction for the wildfire portion of its mitigation strategy.

Glacier County Critical Facilities List
The MPC compiled a list of critical facilities and pertinent information on those facilities. This list is used throughout the plan and is the basis for the vulnerability assessments and loss estimates. The complete list is posted in Appendix D.

Glacier County Emergency Operations Plan
The Glacier County OEM/DES has developed a county-wide EOP. Using a commercial template to follow "best practices" methodology, this plan is a work in progress that is constantly being developed, tested, and updated. Relevant information regarding high hazard dams was pulled from the EOP and integrated into this plan.

Glacier County Pre-Disaster Mitigation Plan
Glacier County is currently covered by a FEMA approved local pre-disaster mitigation plan. The current plan has been reviewed and is incorporated throughout this plan per FEMA requirements.

Glacier County Planning Documents
Glacier County and its participating jurisdictions provided a host of planning, zoning, and development related documents. These documents were reviewed, assessed, and cataloged to compile each participating jurisdiction's capabilities profile in Section 5.1 and development profiles in 5.5.

2.1.2 – Fiscal Resources

The MPC conducted an assessment of their available funding options. The following is a list of federal, state, and local funding sources either available, or relevant to the Glacier County PDM.

Fire Prevention and Safety Grants (FP&S)
These grants are administered by FEMA to enhance safety of the public and firefighters from fire and related hazards. The primary goal is to target high-risk populations and reduce injury. Fire departments, local governments, and recognized community organizations are eligible to receive this funding.

Flood Mitigation Assistance Program (FMA)
The FMA program is designed to aid in the buyout of RL and SRL properties as well as assist in the funding of flood mitigation projects and activities.

Hazard Mitigation Grant Program (HMGP)
The HMGP is managed by FEMA and administered by MTDES. Glacier County does not have any HMGP funds available for mitigation planning.

Local Revenues & Budgets
Recognizing the importance of hazard mitigation planning, Glacier County and its participating jurisdictions have self-funded the 25% match required by the FEMA PDM grant.

Pre Disaster Mitigation Grant Program (PDM)
PDM is managed by FEMA and is a nationally competitive grant program. The development of this plan has been funded by a PDM grant at a 75% match.

2.1.3 – Technical Resources

The Glacier County MPC employed a variety of technical resources in its plan development. These technical resources were instrumental in completing an accurate vulnerability and risk assessment.

BOLDplanning
With over 11 years of experience in hazard mitigation planning, BOLDplanning's Mitigation Department was the principle plan writer.

ESRI ArcGIS v10
Each map developed for this plan, and the HAZUS models, were developed using ESRI's ArcGIS v10.

FEMA DFIRM – Map Data Center
FEMA's NFHL data was instrumental in mapping floodplain locations and estimating potential flood impacts and loss estimates.

NOAA NCDC
Weather data and historical events were primary provided by NOAA's NCDC.

University of Wisconsin – Madison SILVIS Labs
SILVIS Labs collects and distributes the raw WUI information used in calculating Glacier County and its participating jurisdictions' wildfire risk.

USACE
The USACE provided Glacier County and BOLDplanning with data from its national dam inventory containing their location and assessed hazard level.

2.2 – Continued Public Involvement

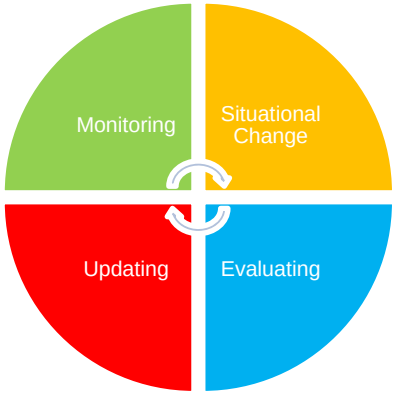
Glacier County is dedicated to involving the public in the continual shaping of its pre-disaster mitigation plan and development of its mitigation projects and activities.

The Glacier County MPC will continue to keep the public informed about its hazard mitigation projects and activities through its DES's website. Additionally, it will provide a "comments/suggestions" option for the public to submit their input through their website.

The public will also be invited to participate in annual MPC meetings to review and discuss the PDM events of the past year.

Copies of the Glacier County Pre-Disaster Mitigation Plan will be available on their website and distributed to each jurisdiction.

2.3 – Plan Maintenance Process

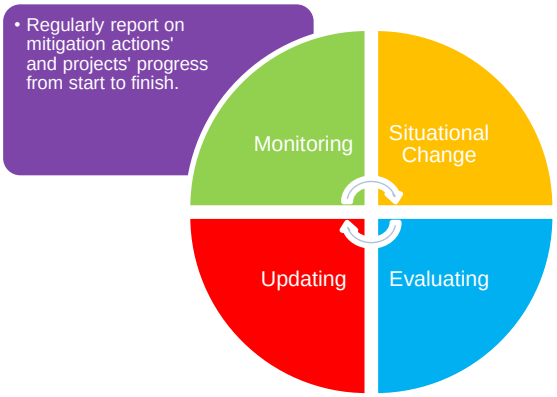


The Glacier County MPC has developed a method to ensure monitoring, evaluation, and updating of its PDM. Upon adoption of the Glacier County PDM, Glacier County OEM/DES will utilize its LEPC to provide PDM updates, revisions, and data collection for future PDM planning purposes. The LEPC Chair will form a subcommittee for proposed mitigation projects comprised of Glacier County's OEM/DES Director and jurisdictional representatives from the MPC. The chair of the subcommittee will be determined by a vote in the subcommittee. Additional members may be added based on necessity. The sub-committee will submit a quarterly report to the LEPC which in turn will submit an annual report to the OEM/DES.

Please see the Glacier County PDM Quarterly Report form at the end of this section.

The Glacier County OEM/DES may request a non-scheduled report on the monitoring, evaluation, or updating of any portion of the PDM due to irregular progress on mitigation actions and or projects, in the aftermath of a hazard event, or for any reason deemed appropriate.

2.3.1 – Plan Monitoring



Plan monitoring can be defined as the ongoing process by which stakeholders obtain regular feedback on the progress being made towards achieving their goals and objectives. In the more limited approach, monitoring may focus on tracking projects and the use of the agency's resources. In the broader approach, monitoring also involves tracking strategies and actions being taken by partners and non-partners, and figuring out what new strategies and actions need to be taken to ensure progress towards the most important results.

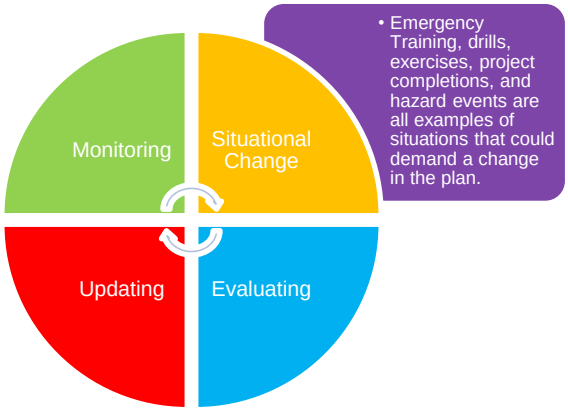
A monitoring report will be written and submitted for review to the LEPC and after the annual MPC meeting or when triggered by a situation change. The monitoring report will answer the following questions.

- Is the mitigation project under, over, or on budget?
- Is the mitigation project behind, ahead of, or on schedule?
- Are there any changes in Glacier County's capabilities which impact the PDM?
- Are there any changes in Glacier County's hazard risk?
- Has the mitigation action been initiated or its initiation planned?
- Is the current process of prioritizing mitigation actions and projects appropriate and accurate?
- Has the current method of incorporating mitigation actions and projects yielded a comprehensive action and project strategy to address seen and unforeseen hazards?
- If applicable, has participation in a mitigation action's collaboration been regular?
- Was a negative result caused directly or indirectly by insufficient levels of public outreach?
- If any, what plan updates occurred, why they occurred, and what is their impact?

The plan maintenance process is cyclical and maintenance items can operate simultaneously within the process.

2.3.2 – Plan Evaluating

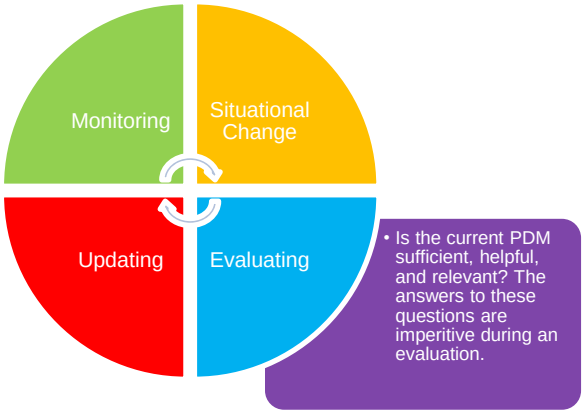
A plan evaluation is a rigorous and independent assessment of either completed or ongoing activities to determine the extent to which they are achieving stated objectives and contributing to decision making.



An evaluation report will be written and submitted to the LEPC when the situation dictates. The following situations are typical examples of when an evaluation will be necessary.

- Post hazard event
- Post training exercise
- Post tabletop or drill exercise
- Significant change or completion of a mitigation project
- Significant change or completion of a mitigation action

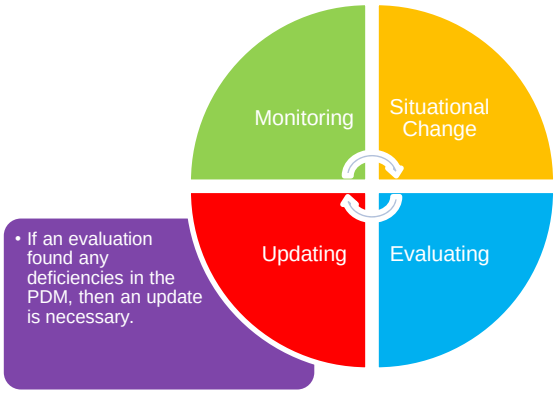
An evaluation report will ask the following questions in response to the previously listed events.



- Do the mitigation objectives and goals continue to address the current hazards?
- Are there new or previously unforeseen hazards?
- Does a change in hazard vulnerability demand a change of or addition of mitigation actions or projects?
- Does a change in the mitigation strategy demand a change of or addition of mitigation actions or projects?
- Are current resources appropriate for implementing a mitigation project?
- Was the outcome of a mitigation action/project expected?
- Are there implementation problems?
- Was the public engaged to the point where they were satisfied with current engagement strategies?
- Did the public participate in a number that produced a positive yield on the plan, action, or project?
- Are there coordination problems?

2.3.3 – Plan Updating

Typically, a PDM update is initiated upon the completion of a plan evaluation and even then, only when the evaluation determines an update is appropriate. Additionally, when new hazard data becomes available it will be added to the PDM. New data will be confirmed or denied at annual MPC meetings.



For whatever reason, a PDM update can be written anytime it is deemed necessary by the Glacier County OEM/DES.

Glacier County will begin their update process three years from this plan's adoption according to FEMA DMA 2000 guidelines on local mitigation plan updates under the direction of the Director of the Glacier County OEM/DES.

Glacier County Local Emergency Planning Committee
Glacier County Pre-Disaster Mitigation Plan
Quarterly Report

Pre-Disaster Mitigation Plan Sub Committee Chair:
Meeting Date:_____
Plan Approval Date:
Plan Expiration Date:

Have there been any disasters or training events since the last report? If so, list them below:

Disaster Number/Training Event	Hazard Type(s)	Was the hazard expected or unforeseen?	Is a plan update required?
Example: DR-1000	*Volcanic Eruption*	*Unforeseen*	*Yes*
Example: Annual Training	*Flash Flooding*	*Expected*	*No*

Mitigation Projects:

Mitigation Project	Participating Jurisdictions	Proposed/Schedules/In Progress/Completed	Behind/Ahead/On-Schedule	Estimated Completion Date
Example: Tornado Safe Room	*Cash*	*In Progress*	*On-Schedule*	*1/1/2016*

Public Engagement and Outreach Notes:

Miscellaneous Notes:

Section 3 – Planning Area

Planning Process

Local Prodedures & Resources

Planning Area

- Demographics
- Land Use & Development
- Critical Facilities & Infrastructure

Hazard Risk Assessment

Mitigation Strategy

The City of Cut Bank is the county seat for Glacier County. The majority of the county is owned by the Blackfeet Indian Reservation and the western most portion contains portions of Glacier National Park. The park is a national attraction and draws thousands of visitors each year.

The county encompasses 3,037 square miles and a 2016 estimated population of 13,694 throughout 3,324 residential units. The total estimate of structural property throughout the county is valued at $331,731,000.

Table 4 – Structural Summary

Jurisdiction	Agricultural	Commercial	Government	Industrial	Residential
Glacier County	$5,649,000	$13,119,000	$2,558,000	$4,793,000	$56,827,000
Cut Bank	$6,652,000	$86,412,000	$16,378,000	$14,235,000	$125,108,000
Total =	**$12,301,000**	**$99,531,000**	**$18,936,000**	**$19,028,000**	**$181,935,000**

**The data are from FEMA's HAZUS database.*

Table 5 – Populations Summary

Jurisdiction	Housing Units	Population
Glacier County	1,877	10,682
Cut Bank	1,447	3,012
Total =	**3,324**	**13,694**

**The data are from the U.S. Census Bureau.*

3.1 – Demographics

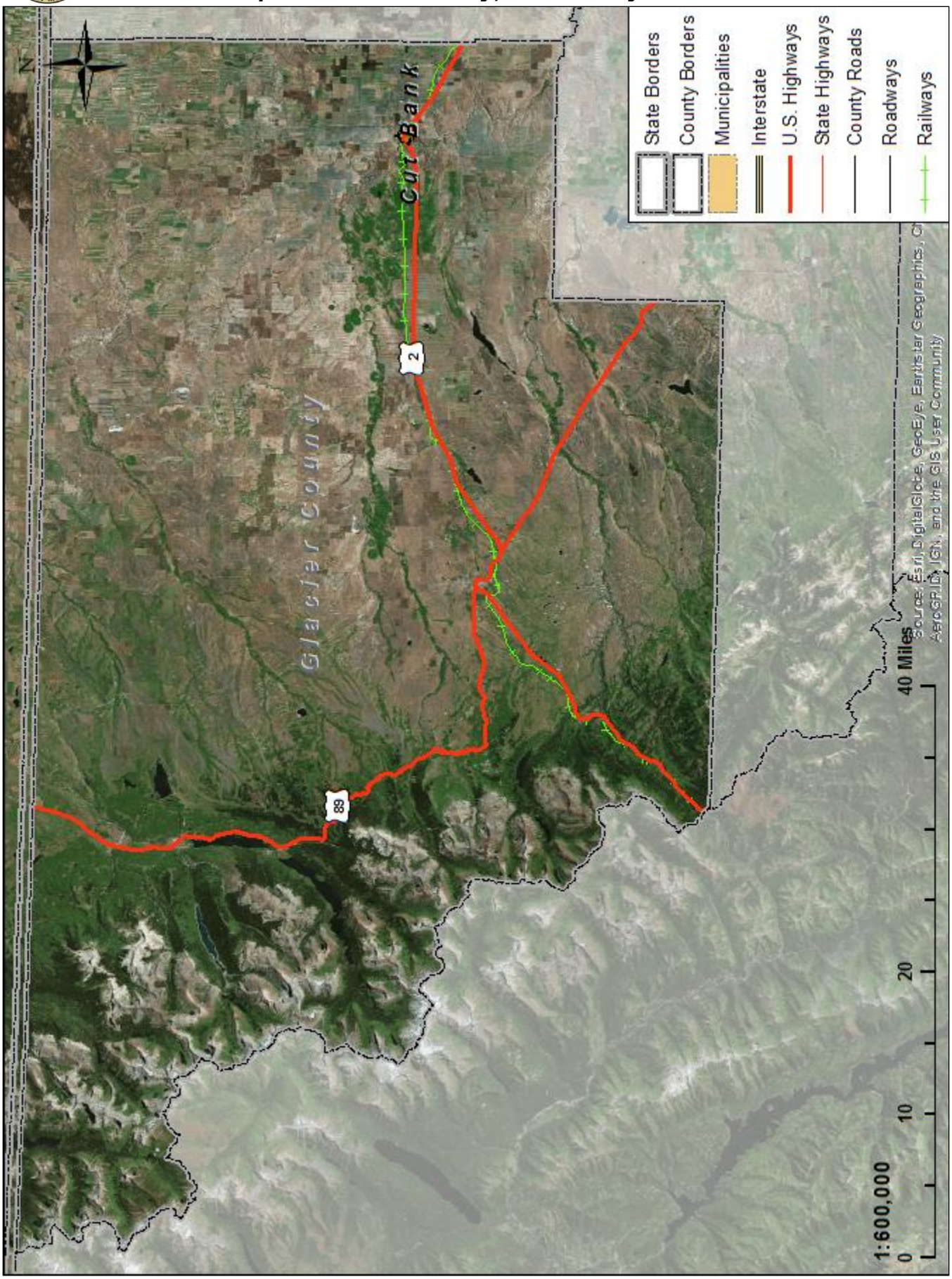
The population of Glacier County and its participating jurisdictions are on average slightly growing. Between 2000 and 2010 the total population of Glacier County and its participating jurisdictions increased by 1.39% and increased by 1.96% since the development of their last PDM. The U.S. Census Bureau estimates as of 2016, Glacier County has a total of 13,694 people residing within its boundaries 3,012 of which reside in incorporated cities and towns. Both the county and Cut Bank are growing, however not at a significant rate. The table below details the participating jurisdictions' demographic information.

Table 6 – Community Demographics

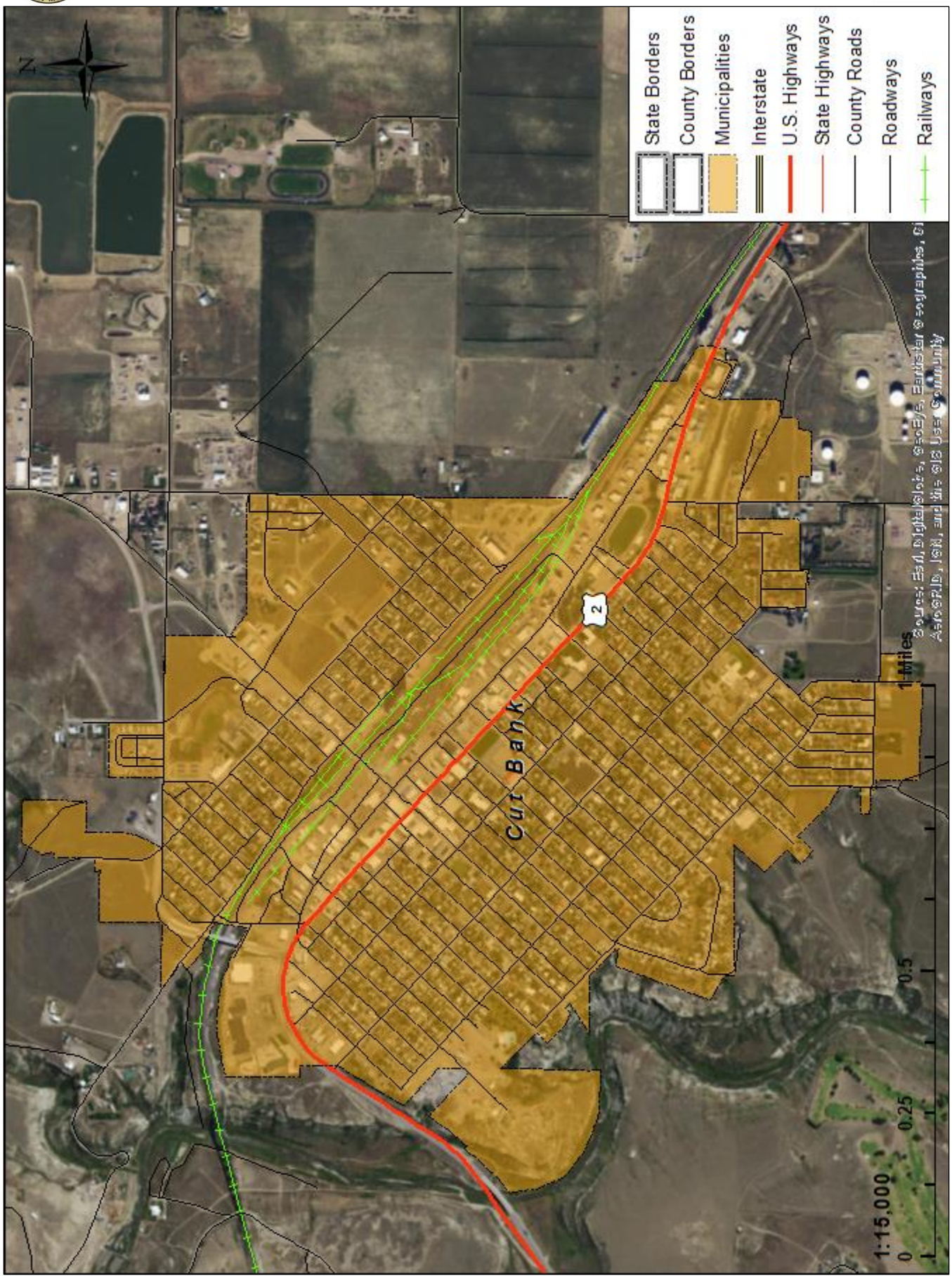
Jurisdiction	Size (Sq. Mi.)	Population			% Population Change		
		2000	2010	2016	2000 - 2010	2010 - 2016	2000 - 2016
Glacier County (Inclusive)	3,037.00	13,247	13,431	13,694	1.39%	1.96%	3.37%
Glacier County (Exclusive)	3,036.02	10,142	10,533	10,682	3.86%	1.41%	5.32%
Cut Bank	0.98	3,105	2,898	3,012	-6.67%	3.93%	-3.00%

**The data are from the U.S. Census Bureau.*

Map 1 – Glacier County, Community Profile



Map 2 – Glacier County, Community Profile



3.2 – Land Use & Development Trends

Although both participating jurisdictions in the planning area are growing, they are growing at a low and sustainable rate. Due to this, it is unlikely the planning area as a whole has a significantly changing hazard vulnerability. Municipalities with stagnant growth or low, sustainable growth can be an opportunity to focus its mitigation efforts on its current vulnerabilities by continuing to enforce and inspect its zoning, ordinances, and building codes. Similarly, these methods can be used in the growing communities to ensure hazard resiliency through new construction.

For hazards that affect the entire planning area, increased population growth increases a jurisdiction's overall vulnerability, while decreased population growth decreases it. It is difficult to quantify the exact change in vulnerability in either direction, but can be depicted as generally directly proportional to the population change itself. For more information on each hazard's effect the entire planning area, see Section 4 – Hazard Risk Assessment.

For hazards which have easily measured extents, changes in vulnerability are more difficult to calculate. Over the past 3 years, dramatic improvements in available geographic data and improvements in risk assessment methodology make this plan update's risk assessment far superior to the previous plan. However, the downside of utilizing improved methodologies and data is that they are incapable of being directly compared to the previous plans methods and data. For instance, the previous plan does not geographically and accurately depict the locations of the Wildland Urban Interface (WUI) or the WUI intermix. Without knowing where they existed in 2010, the current, improved methodology does not allow for a comparison of vulnerability.

For the sake of having a comparison, although not as accurate as desired, this plan considers any jurisdiction with a positive population growth rate, in this case all participating jurisdictions, to have increased vulnerability, while any with a decreasing population, none of the participating jurisdictions, have a decreased vulnerability.

A hazard specific analysis, as it pertains to land use and development trends, is covered under each hazard in Section 4 – Hazard Risk Assessment.

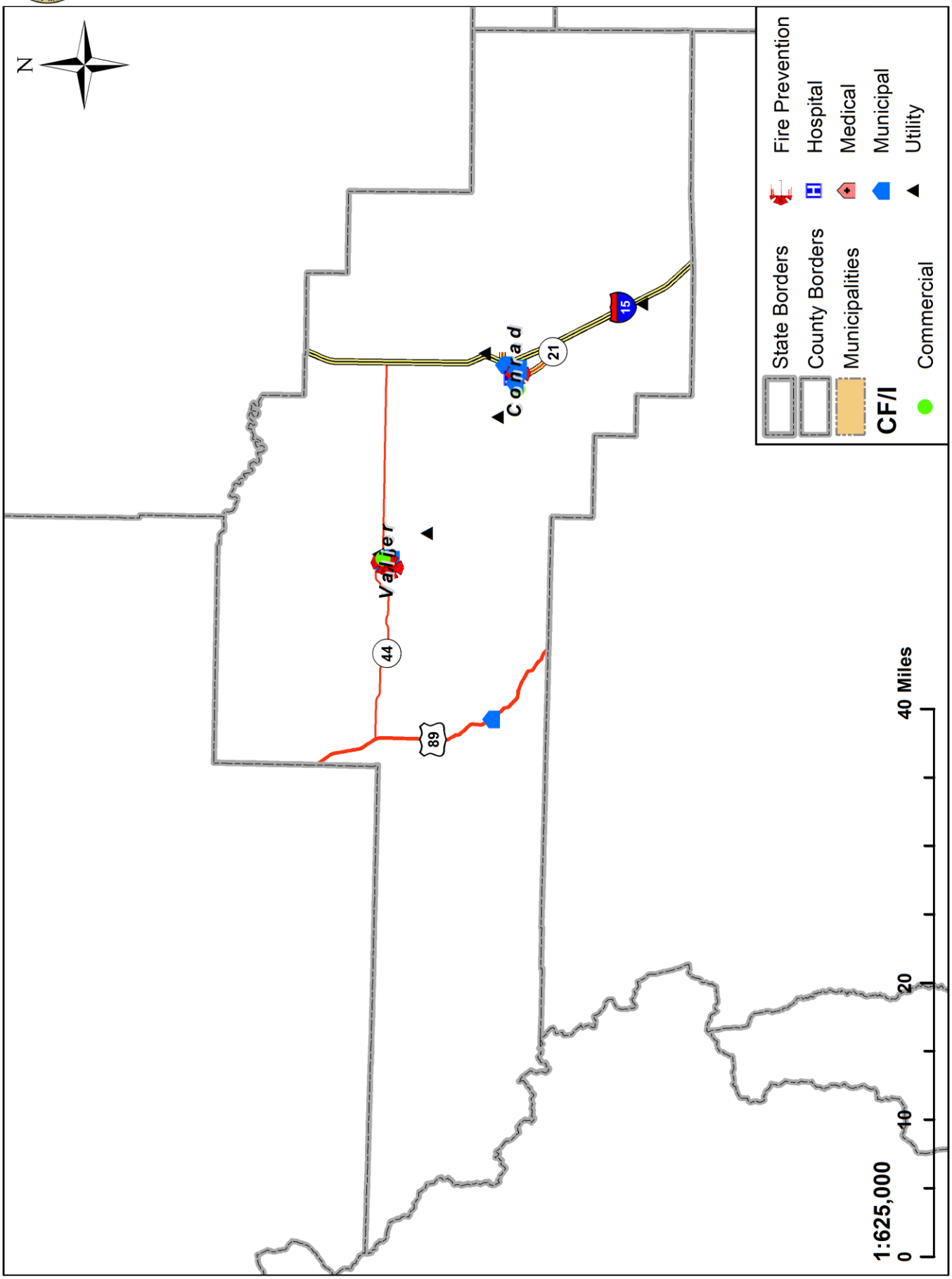
3.3 – Critical Facilities

Certain facilities have a net positive value on the community, that is, they contribute to the public good by facilitating the basic functions of society. These facilities maintain order, public health, education, and help the economy function. Additionally, there are infrastructure and facilities integral to disaster response and recovery operations. Conversely, some infrastructure and facilities are of extreme importance due to the negative externalities created when they are impacted by a disaster. What fits these definitions will vary slightly from community to community, but the definitions remain as a guideline for identifying infrastructure and critical facilities. For Glacier County and its participating jurisdictions, the table below summarized their identified infrastructure and critical facilities. A complete list can be found in Appendix D.

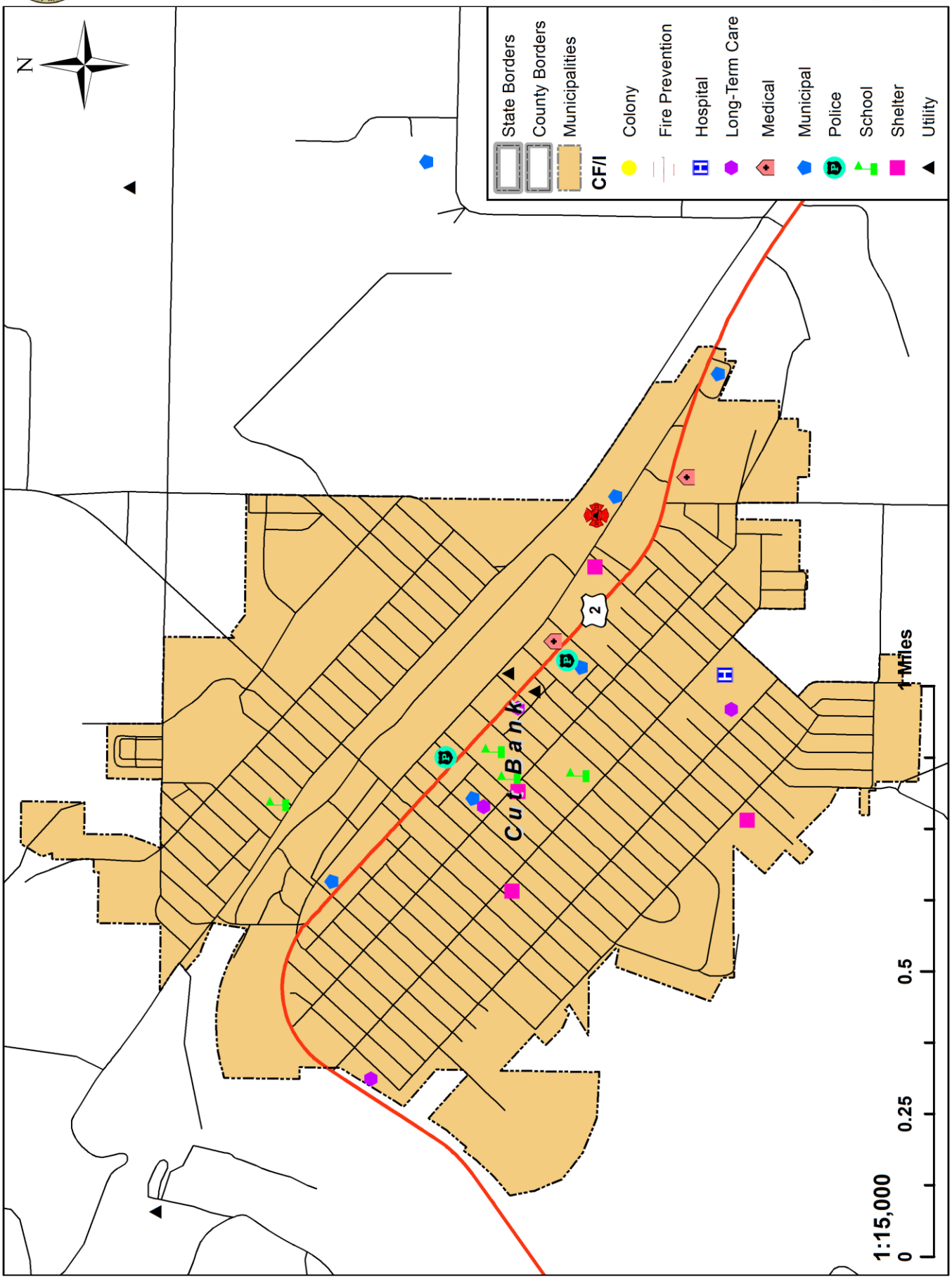
Table 7 – Critical Facilities Summary

Jurisdiction	Colony	Fire Prevention	Hospital	Long-Term Care	Medical	Municipal	Police	School	Shelter	Utility	Total
Glacier County	6	3	0	0	0	3	0	0	0	4	**16**
Cut Bank	0	1	1	4	2	5	2	4	4	2	**25**
Total =	**6**	**4**	**1**	**4**	**2**	**8**	**2**	**4**	**4**	**6**	**41**

Map 3 – Glacier County, Critical Facilities and Infrastructure



Map 4 – Cut Bank, Critical Facilities and Infrastructure



Section 4 – Hazard Risk Assessment

Planning Process

Local Procedures & Resources

Planning Area

Hazard Risk Assessment

- Identify Hazards
- Profiling Hazards
- Hazards
- Land Use & Development Trends
- Hazard Risk Summary
- Excluded Hazards

Mitigation Strategy

The goal of mitigation is to reduce the future impacts of hazards including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist recovery. To be done correctly, mitigation decision making should be based on risk assessment.

A risk assessment consists of three components: hazard profiling, exposure, and vulnerability assessment. The process entails past hazard events, probability of future events, asset lists, loss estimation, and other sections where appropriate.

A history of declared disasters helps capture an overview of the hazards facing Glacier County and its participating jurisdictions. Since 1974, Glacier County and its participating jurisdictions have suffered from 8 declared disasters. These disaster declarations were due to flooding, severe storms, wildland fires, and winter storms. A list of the declared disasters occurring in Glacier County and its participating jurisdictions since 1974 is presented in the table below. Smaller disasters are more frequent and are not reflected in the table, please see Appendix E for a full list of hazard records.

Table 8 – Presidential Disaster Declarations, Glacier County

Designation	Incident Period	Incident Type
DR-4271	04/15/2016 – 04/16/2016	Winter Storm
DR-1996	04/04/2011 – 06/22/2011	Flooding, Severe Storms
DR-1424	06/08/2002 – 06/21/2002	Flooding, Severe Storms
DR-1340	06/13/2000 – 09/25/2000	Wildland Fires
DR-761	02/24/1986 – 03/07/1986	Flooding
DR-472	06/28/1975	Flooding, Severe Storms
DR-417	01/29/1974	Flooding, Severe Storms
DR-172	06/09/1964	Flooding

4.1 – Identified Hazards

The first step in developing a hazard assessment is identifying the hazards with reasonable potential to strike Glacier County or Cut Bank. Identification allows appropriate and well planned action to mitigate the extent and impact of a hazard event as well as facilitating emergency response and recovery operations. Not all disaster contingencies can be planned for however, by using an all-hazards approach to planning, the mitigation process yields increased awareness and preparedness for unforeseen hazard events.

The table at the bottom of this page lists the hazards profiled in the State of Montana Pre-Disaster Mitigation Plan. Based on the research described above, 8 of these hazards pose a risk to at least one of the participating jurisdictions. These are: dam failure, droughts, floods, hazardous materials incidents, tornadoes, severe storms (includes hail, high winds, lightning, and thunderstorms), wildfires, and winter storms. Hail, high winds, lightning, and thunder storm winds are included under the severe storms profile.

Details for each hazard and their potential impact on Glacier County are located in Section 4.3. The following tables compare the identified and profiled hazards as they relate to their previous plan and to the state's plan. Any hazards which affect the State of Montana or were profiled in the previous plan, but do not affect any of Glacier County's jurisdictions are listed as 'excluded.' An analysis of why a hazard has been excluded can be found in Section 4.5 – Excluded Hazards.

Table 9 – State of Montana Identified Hazards

Hazards in State/Previous PDM	Previous Inclusions	Included/Excluded	Justification
Dam Failure	State Plan, Prior Plan	Excluded	No reasonable risk
Droughts	State Plan, Prior Plan	Included	Disaster History
Earthquakes	State Plan	Excluded	No reasonable risk
Flooding	State Plan, Prior Plan	Included	Disaster History
Landslides	State Plan	Excluded	No reasonable risk
Severe Summer Weather	State Plan, Prior Plan	Included – Severe Storms	Disaster History
Severe Winter Weather	State Plan, Prior Plan	Included	Disaster History
Tornadoes	No Prior Inclusion	Included	Potential Risk
Volcanic Eruptions	State Plan	Excluded	No reasonable risk
Wildland Fires	State Plan, Prior Plan	Included	Disaster History

4.2 – Profiling Hazards

4.3.1 – Description
This section describes the general characteristics of the hazard.

4.3.2 – Location & Extent
Contains information on location; the geographic areas in the planning area that affected by the hazard, and extent; the strength or magnitude of the hazard, for each hazard.

4.3.3 – Previous Occurrences
This section contains a history of previous hazard events for the profiled hazard.

Methodology: Most of the historical hazard data used in the risk assessment originates from NOAA. In most instances the hazard affects a large geographic area and thus the hazard data is reported at the county level. *This is the best available data for these hazards*. The calculations for Previous Occurrences and the Probability of Future Events are based on county level data.

4.3.3A – Probability of Future Events
Contains the likelihood of the hazard occurring.

Table 10 – Probability Categories

Category	Range (Per Year)
Rare	0% - 25%
Not Likely	25% - 50%
Likely	50% - 75%
Highly Likely	75% - 100%

4.3.4 – Vulnerability & Impact
Describes the potential impacts of the hazard for each participating jurisdiction and provides an overall summary of each jurisdiction's vulnerability to the hazard through structures, systems, populations, and community assets that are susceptible to damage and loss from the hazard.

4.3.4A – Infrastructure & Critical Facilities
When appropriate, this section details the infrastructure and facilities pertinent to the hazard.

4.3.4B – Land Use & Development Trends
Provides a general description of land use and development trends within the community.

4.3.4C – Unique or Varied Risk
Assesses each jurisdiction's risk where it varies from the risks facing the entire planning area.

4.3.4D – Repetitive Loss Structures
Describes the types of facilities and estimates the number of repetitive loss properties exposed to the hazard.

4.3.5 – HAZUS Models
If appropriate for the profiled hazard, HAZUS Models may be included in this section.

4.3D – Droughts

4.3.1 – Description

Drought is an abnormally dry period lasting months or years when an area has a deficiency of water and precipitation in its surface and or underground water supply. The hydrological imbalance can be grouped into the following non-exclusive categories.

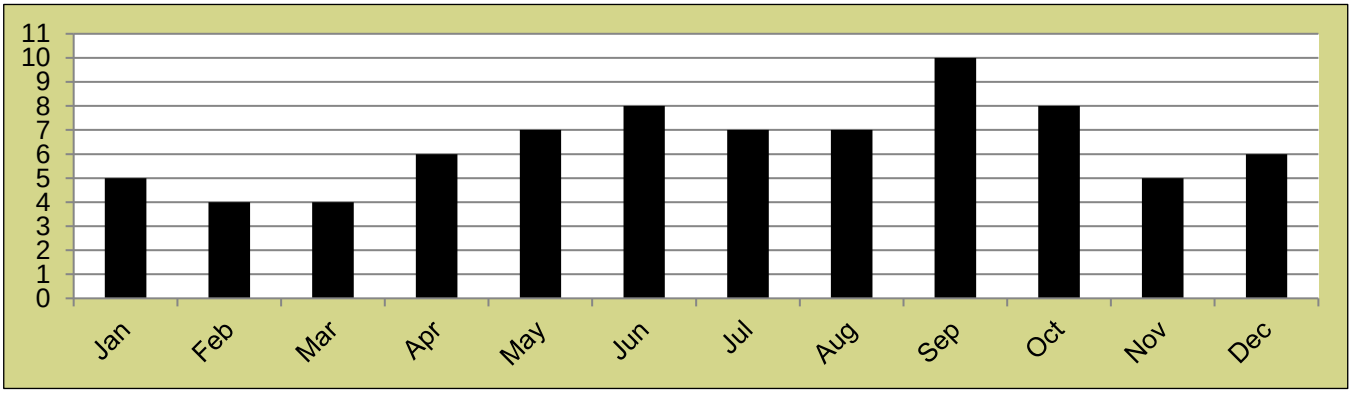
- ***Agricultural:*** When the amount of moisture in the soil no longer meets the needs of previously grown crops.
- ***Hydrological:*** When surface and subsurface water levels are significantly below their normal levels.
- ***Meteorological:*** When there is a significant departure from the normal levels of precipitation.
- ***Socio-Economic:*** When the water deficiency begins to significantly affect the population.

Droughts are regularly monitored by multiple federal agencies using a number of different indices. Typically, they are seasonal occurring in the late spring through early fall. Drought monitoring focuses on precipitation and temperature. When precipitation is less than normal, and natural water supplied begins to decrease, a drought is occurring.

When below average, little or no rain falls soil can dry out and plants can die. If unusually dry weather persists and water supply problems develop the time period is defined as a drought. Human activity such as over farming, excessive irrigation, deforestation, and poor erosion controls can exacerbate a drought's effects. It can take weeks or months before the effects of below average precipitation on bodies of water are observed. Depending on the region droughts can happen quicker, noticed sooner, or have their effects naturally mitigated. The more humid and wet an area is, the quicker the effects will be realized. A naturally dry region, which typically relies more on subsurface water will take more time to actualize its effects.

Periods of drought can have significant environment, agricultural, health, economic, and social consequences. The effects vary depending on vulnerability and regional characteristics. Droughts can also reduce water quality through a decreased ability for natural rivers and streams to dilute pollutants and increase contamination. The most common effects are diminished crop yield, increased erosion, dust storms, ecosystem damage, reduced electricity production due to reduced flow through hydroelectric dams, shortage of water for industrial production, and increased risk of wildfires.

Chart 1 – Droughts per Month, Glacier County (2004 – 2016)



**The data are from the Montana DNRC.*

4.3.2 – Location & Extent

Extended periods without sufficient rainfall can and do occur across Glacier County and its participating jurisdictions affecting the entire planning area, causing damage to lawns, gardens, flora and fauna. The events, when they do occur, occur on a massive geographic scale, often affecting multiple counties, regions, and states. Severe drought can cause enormous economic consequences, not only in the county but in the region and nation as well. There is no set speed of onset or warning period. A drought may begin in as short of period as a week or it may take months to reach an official declared drought.

There is no set speed of onset or warning period, a drought may began in as short of period as a week or it may take months to reach an official declared drought. Additionally, the drought can last for as little as a week to up the entire season.

When a drought begins and ends is difficult to determine. Rainfall data alone won't tell if an area is in a drought, how severe the drought may be, or how long the area has been in drought. However, one can identify various indicators of drought, such as rainfall, snowpack, stream flow, and more, and track these indicators to monitor drought. Researchers have developed a number of tools to help define the onset, severity, and end of droughts. Drought indices take thousands of bits of data on rainfall, snowpack, stream flow, etc., analyze the data over various time frames, and turn the data into a comprehensible big picture. A drought index value is typically a single number, which is interpreted on a scale of abnormally wet, average, and abnormally dry. There are three primary drought indices that are all used to determine the onset and the severity of a drought, the Standard Precipitation Index, the Palmer Drought Severity Index, and the Crop Moisture Index. During a drought event, Glacier County and its participating jurisdictions can expect see a range anywhere from 0.0 to – 4.0 on the Palmer Drought Severity Index or a -1.0 to -2 on the Standard Precipitation Index. Please see below and the following page for descriptions and tables of the primary drought indices.

The agricultural industry is the first and hardest hit by droughts. According to the NRCS' 2016 Land Use Survey, Glacier County and its participating jurisdictions have a significantly large agricultural base. This base spreads throughout the planning area and encompasses every participating municipality. These are depicted in Map 5.

Crop Moisture Index (CMI)
A derivative of the PDSI is the CMI. It looks at moisture supply in the short term for crop producing regions. The CMI monitors week-to-week crop conditions, whereas the PDSI monitors long-term meteorological wet and dry spells. The CMI was designed to evaluate short-term moisture conditions across major crop-producing regions. Because it is designed to monitor short-term moisture conditions affecting a developing crop, the CMI is not a good long-term drought monitoring tool. The CMI's rapid response to changing short-term conditions may provide misleading information about long-term conditions. The CMI uses the same index as the PDSI, but in its own redefined context.

The Palmer Drought Severity Index (PDSI)
The PDSI has been used the longest for monitoring drought. The PDSI allows for a categorization of various levels of wetness and dryness that are prominent over an area. The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil. Palmer values may lag emerging droughts by several months, are less well suited for mountainous land or areas of frequent climatic extremes, and are complex—haves an unspecified, built-in time scale that can be misleading.

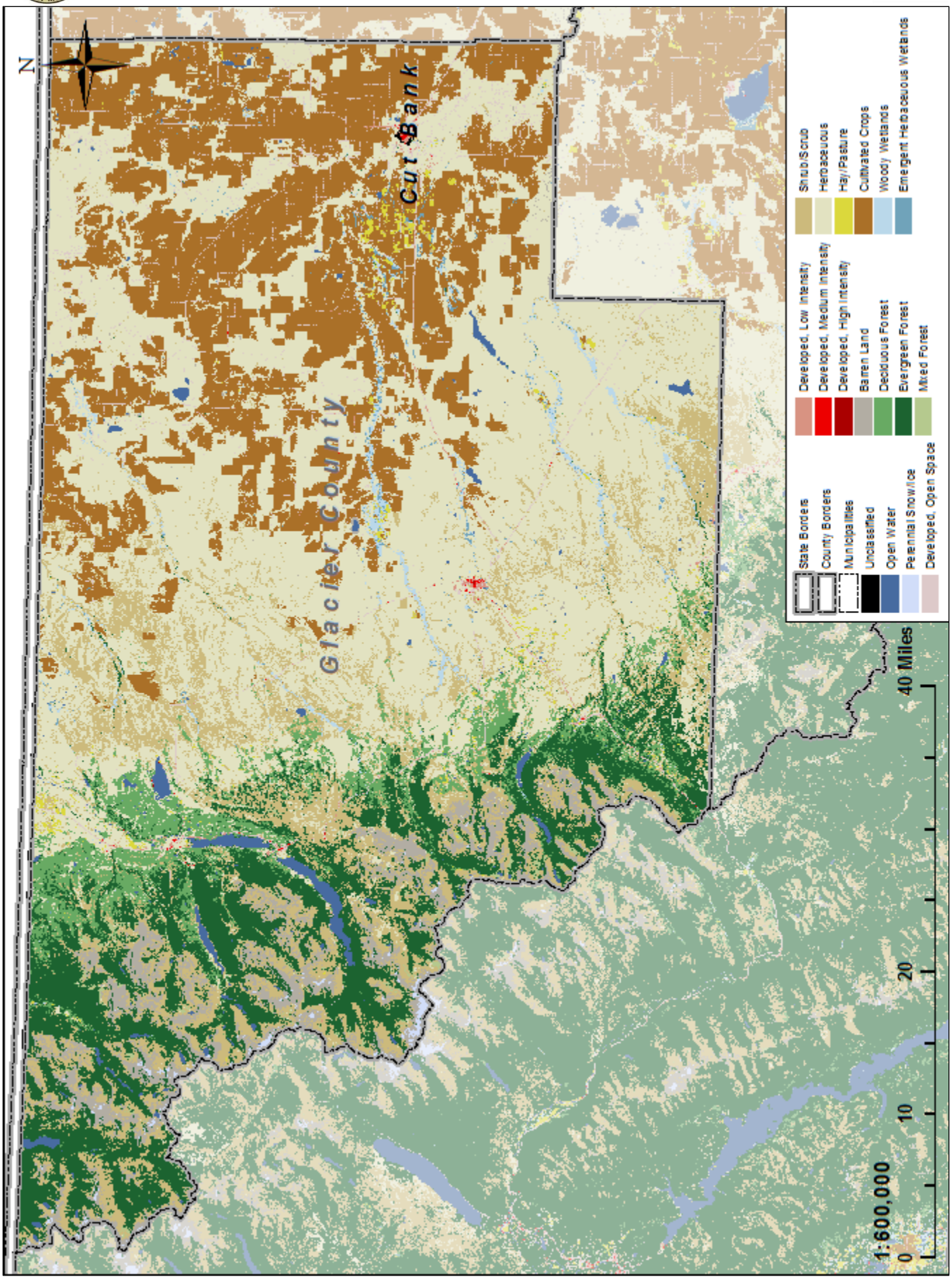
Table 11 – Palmer Drought Severity Index	
Extremely Wet	4.0 or more
Very Wet	3.0 to 3.99
Moderately Wet	2.0 to 2.99
Slightly Wet	1.0 to 1.99
Incipient Wet Spell	0.5 to 0.99
Near Normal	0.49 to -0.49
Incipient Dry Spell	-0.5 to -0.99
Mild Drought	-1.0 to -1.99
Moderate Drought	-2.0 to -2.99
Severe Drought	-3.0 to -3.99
Extreme Drought	-4.0 or less

The Standard Precipitation Index (SPI)

The SPI shows the actual precipitation compared to the probability of precipitation for various time frames. The SPI is an index based on precipitation only. It can be used on a variety of time scales, which allows it to be useful for both short-term agricultural and long-term hydrological applications. A drought event occurs any time the SPI is continuously negative and reaches an intensity of -1.0 or less. The event ends when the SPI becomes positive. Each drought event, therefore, has a duration defined by its beginning and end, and intensity for each month the event continues. The positive sum of the SPI for all the months within a drought event can be termed the drought's magnitude.

Table 12 – Standard Precipitation Index	
Extremely Wet	2.0+
Very Wet	1.5 to 1.99
Moderately Wet	1.0 to 1.49
Near Normal	-.99 to .99
Moderately Dry	-1.0 to -1.49
Severely Dry	-1.5 to -1.99
Extremely Dry	-2 and less

Map 5 – Glacier County, Land Use



4.3.3 – Previous Occurrences

Comprehensive data on droughts, drought impacts, and drought forecasting is extremely limited and often inaccurate. Due to the complexity of drought monitoring, the complexity of agricultural and livestock market pricing, and the large areas droughts impact, the USDA and USGS have difficulty quantifying and standardizing drought data. Each of these contributing drought factors has confounding variables within them.

The USGS partners with the USDA for drought monitoring by means of ground water and aquifer measurement. Since ground water and aquifer levels are highly variable from year to year, this indicator is useful for reporting whether there is a current shortage or surplus, but is unhelpful in forecasting future events. Additionally, ground water and aquifer levels correlate only in a lagged model to climactic conditions further compounding their usefulness in predicting future droughts.

Drought's primary impact is on agriculture and livestock. However, there are many factors it can affect: most notably livestock count, crop prices, crop losses, livestock size, and livestock by products such as milk. Absent a drought, these factors highly vary from season to season. Prices vary with international market factors influenced by conditions across the globe. Crop yields vary with other climate conditions such as too much rain during planting season or insect abundance, and even marketing campaigns developed to sell more meat from one type of livestock. Drought is only one factor in an equation of many variables.

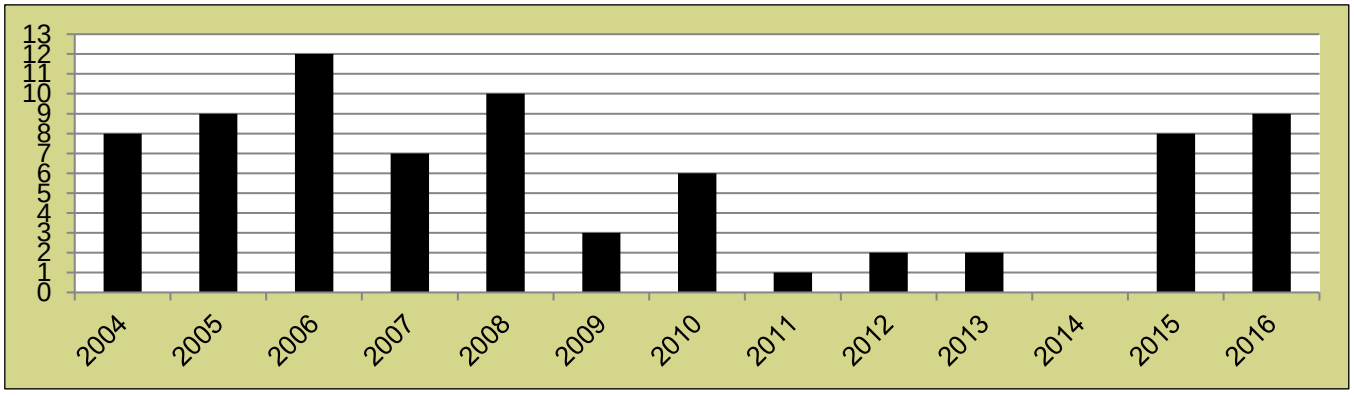
The USDA monitors these conditions and aggregates the data to create its drought monitor. However, due to the reasons discussed, it is limited in its ability to quantify how severe a drought was over specified period of time and a specific jurisdiction.

Glacier County and its participating jurisdictions have no recorded deaths of injuries from droughts.

Since 2004, the Montana DNRC has recorded 77 droughts in Glacier County and its participating jurisdictions. Glacier County and its participating jurisdictions have not recorded any property or crop damage from drought events.

For a complete list of recorded drought events, please reference Appendix E.

Chart 2 – Droughts per Year, Glacier County (2004 – 2016)



**The data are from the Montana DNRC.*

4.3.3A – Probability of Future Events

Glacier County and its participating jurisdictions can expect a drought event with a 385.00% probability per year, or 3.68500 events per year.

Table 13 – Probability, Droughts	
Event Year	**Event Count**
2004	8
2005	9
2006	12
2007	7
2008	10
2009	3
2010	6
2011	1
2012	2
2013	2
2014	0
2015	8
2016	9
Total Recorded Events =	77
Total Years =	13
Yearly Probability =	**385.00%**

**The data are from the Montana DNRC.*

4.3.4 – Assessing Vulnerability & Impact

Drought Impacts
Glacier County and its participating jurisdictions have recorded 77 drought events since 2004, of which the range and magnitude was between "slightly dry" and "extremely dry." Based on the future probability in Table 13, Glacier County and its participating jurisdictions can expect 3.8500 drought events per year which can range anywhere below 0 and -4 on the Palmer Drought Severity Index and 0 to -2 on the Standard Precipitation Index.

Table 14 – Historical Impacts, Droughts	
Count of Events	77
Impacts Per Year	5.92
Average Magnitude	-
Magnitude Range	-
Average Cost	$0
Magnitude of Cost	$0 - $0
Total Recorded Cost	$0
Average Fatalities	0.00
Total Fatalities	0
Average Injuries	0.00
Total Injuries	0

**The data are from the Montana DNRC.*

Vulnerability of Facilities
Drought does not pose any risk to Glacier County or its participating jurisdictions' facilities.

Vulnerability of Population
Drought in itself poses no direct risk of injury or death to Glacier County and its participating jurisdictions' population.

Vulnerability of Systems
Drought can have a significant effect on a jurisdiction's agriculture and tourism economies. If the precipitation level is below normal, farmers and ranchers will struggle to grow their crops and feed their livestock. If rivers, streams, and lakes dry up, tourist will be less likely to enjoy a jurisdiction's amenity resources. Map 5 depicts land use throughout Glacier County and its participating jurisdictions. According to the USDA's land use data, there is sizable agricultural throughout the planning area. The Census of Agriculture reports the planning area has a total of 602 farms over 1,570,323 acres of land. These farms on average account $105,579,000 in crops and livestock sold per year of which all are considered vulnerable to a prolonged drought.

4.3.4A – Infrastructure & Critical Facilities
Drought does not pose any risk to Glacier County or its participating jurisdictions' infrastructure and critical facilities. A complete list of infrastructure and critical facilities can be found in Appendix D.

4.3.4B – Land Use & Development Trends

Currently, there are no significant development projects in Glacier County or Cut Bank. Additionally, Glacier County and Cut Bank's populations are only growing at nominally positive rate. Thus there is no effect on any of the planning area's hazard vulnerability. Additionally, the number of farmed and pasture acres in the county is decreasing slightly each year.

4.3.4C – Unique & Varied Risk

All participating jurisdictions have significant agricultural areas at risk to droughts. These areas are marked in Map 5.

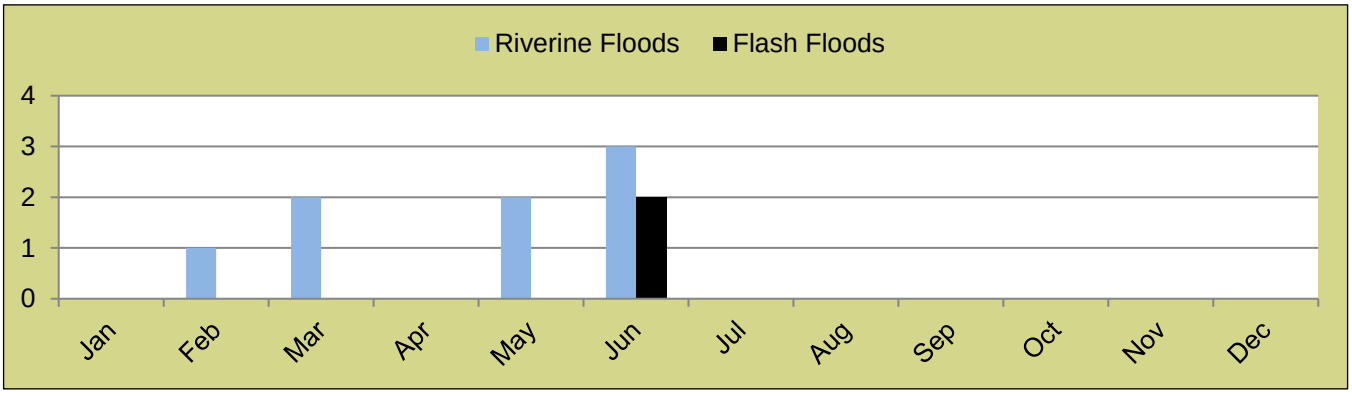
4.3FL – Floods

4.3.1 – Description

Flooding is the most prevalent and costly disaster in the United States. Flooding occurs when water, due to dam failures, rain, or melting snows, exceeds the absorptive capacity of the soil and the flow capacity of rivers, streams or coastal areas. At this point, the water concentration hyper extends the capacity of the flood way and the water enters the floodplain. Floods are most common in seasons of rain and thunderstorms. Floods can be associated with other natural phenomenon such as earthquakes and rapidly melting snow.

Intense rainfall, accompanying the large thunderstorms in Glacier County and its participating jurisdictions, may result in water flowing rapidly from higher elevations into valleys, collecting in, and sometimes overtopping the low lying streams which creates off stream flooding. Various types of floods can happen quickly in the form of a flash flood, or accumulate seasonally over a period of weeks as is the case in a riverine flood. Flooding can occur anytime throughout the year, but is typically associated with the spring season. The chart below illustrates season differences between riverine and flash flood impacts per month.

Chart 3 – Floods per Month, Glacier County (1996 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

4.3.2 – Location & Extent

A variety of factors affect the severity of flash and riverine flooding within the planning area. These include topography, weather characteristics, development, and geology. Intense flooding will create havoc in any jurisdictions affected. The predicative magnitude of flash and riverine floods varies greatly.

Flash Flooding

Flash flooding is unpredictable and can occur anywhere throughout the entire planning area. Glacier County and Cut Bank do not have any centralized, or identified re-occurring, locations that are more likely to experience flash flooding than other areas, based on previous events and historical documentation. The reviewed historical documentation repeatedly mentions roads and ditches being flooded, but no specific areas continually experiencing flash flooding. Additionally, when property damage occurred, none of the locations were repeatedly mentioned.

Historically, Glacier County and Cut Bank have seen rivers crest and overrun their banks from flash flooding. Measurements have been taken where flash flooding has accumulated to one foot of water over major roadways and 1.5 feet above flood stage of creeks and rivers. On occasion, heavy rains and melting snow has caused ice jams along the planning areas waterways further compounding the accumulation of flash flooding. It is rare that a flash flood causes the accumulation of water in residential or commercial structures in the planning area.

Riverine Flooding

Intense and widespread flooding can trap people and entire communities without basic goods or services. Any amount of damage can render a structure unusable for as long as recovery operation would take depending on the level of damage.

Riverine flooding throughout the county varies. SFHAs were identified via effective NFHL maps produced by FEMA. The greatest amount of riverine flooding the county and its participating jurisdictions have experienced in developed areas is one foot, but it is likely this value could be exceeded during future floods. The true magnitude of riverine floods is still a best estimate and remains conclusively indeterminate. Riverine flood depth estimates were determined using GIS modeling techniques and the results are shown in the table on the following page.

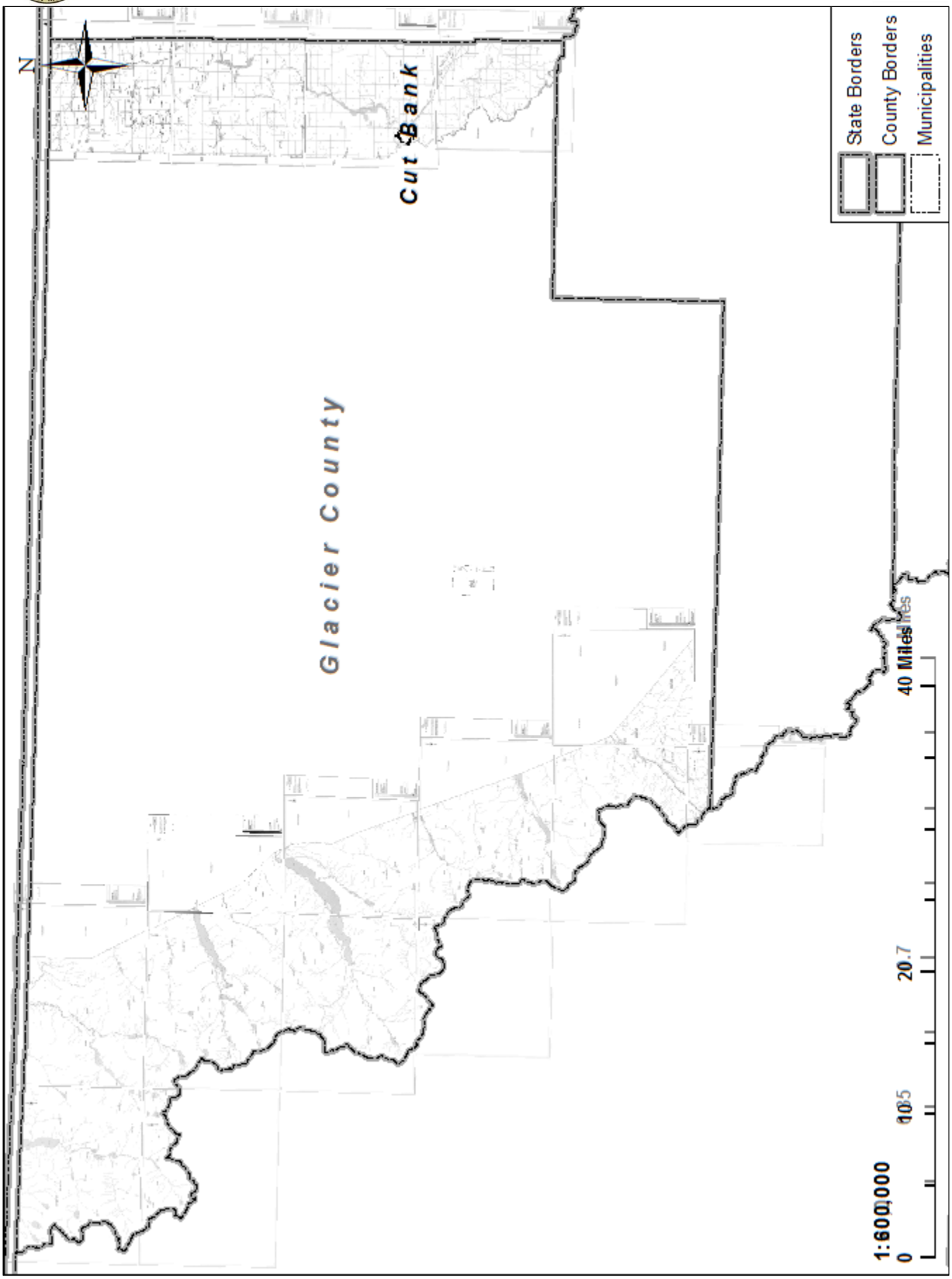
The following maps show effective FIRM floodplains identified by FEMA to depict the location of 100 and 500 year floodplains throughout Glacier County. Cut Bank does not have any identified floodplains while Glacier County has identified 100 year floodplains.

Table 15 – Flood Zone Classifications

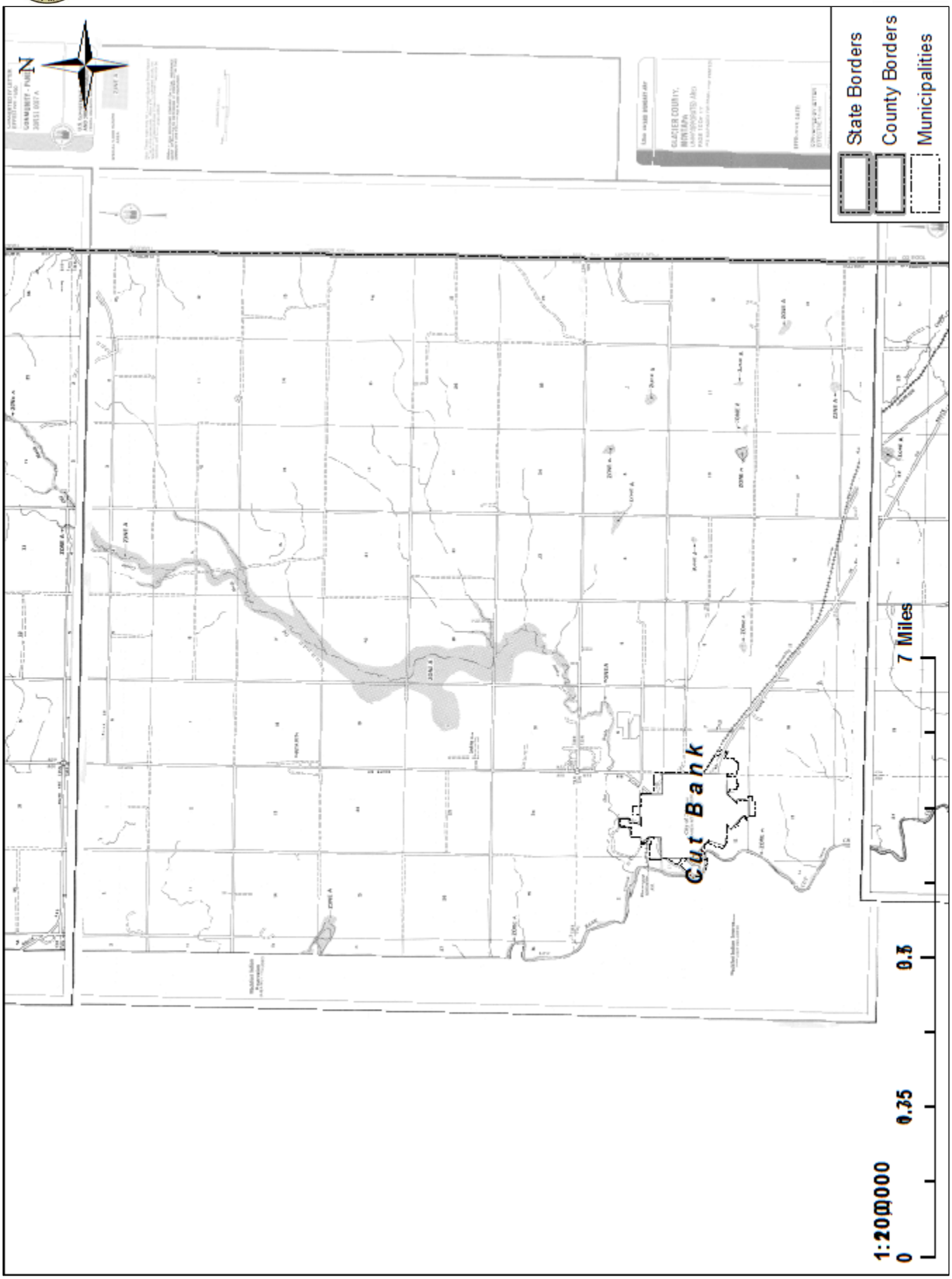
Zone Class	Description
A	An area inundated by 1% annual chance flooding, for which no BFEs have been determined. (100 Year Floodplain)
AE	An area inundated by 1% annual chance flooding, for which BFEs have been determined. (100 Year Floodplain)
B	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood. An area inundated by 0.2% annual chance flooding.

**For the following FEMA NFHL maps the A and AE zones have been combined as they are both considered 100 year floodplains.*

Map 6 – Glacier County, Floodplains



Map 7 – Cut Bank, Floodplains



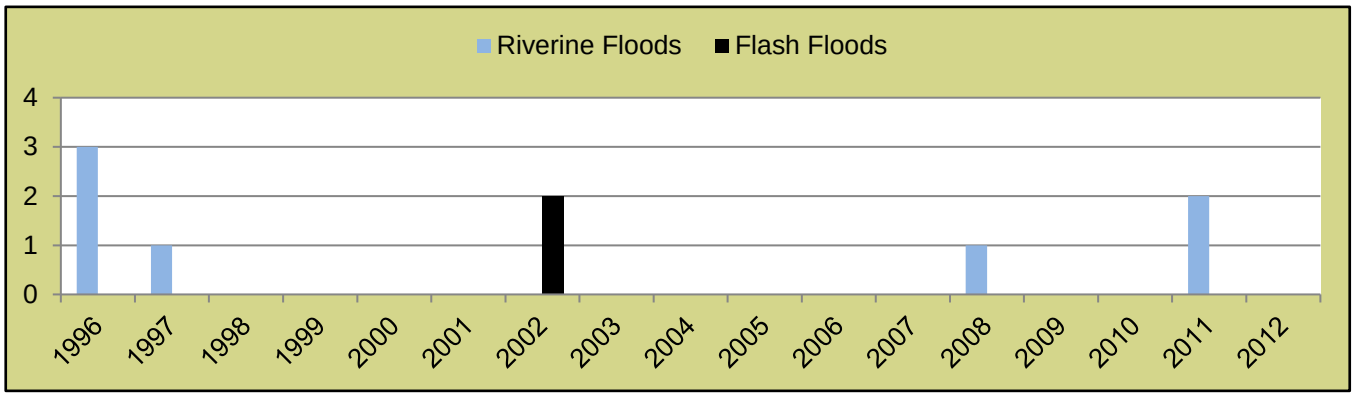
4.3.3 – Previous Occurrences

Since 1996, NOAA has recorded 8 riverine flood impacts in Glacier County. Neither Glacier County nor Cut Bank has recorded any loss of life or injury from riverine flooding. These events have caused $0 in property damage.

Since 1996, NOAA has recorded 2 flash flood impacts in the planning area. Glacier County and Cut Bank have recorded 0 fatalities and 0 injuries relating to flash flooding. These events have cost the planning area $0 in property damage.

Please see the chart below for flash and riverine flooding events per year.

Chart 4 – Floods per Year, Glacier County (1996 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

4.3.3A – Probability of Future Events

Glacier County and Cut Bank can each expect a flash flood event with 70.00% probability per year, or 0.7000 events per year. For a complete list of NOAA recorded flash flood events, please reference Appendix E.

Table 16 – Probability, Flash Floods	
Event Year	**Event Count**
2002	2
2003	0
2004	0
2005	0
2006	0
2007	0
2008	0
2009	0
2010	0
2011	0
2012	0
2013	0
2014	0
2015	0
2016	0
Total Recorded Events =	2
Total Years =	15
Yearly Probability =	**10.00%**

**The data are from the NOAA NCDC Storm Events Database.*

The definition of each flood zone's classification is used for the purpose of calculating the yearly probability of a riverine flood.

Jurisdictions with property in a 100 year floodplain can expect a 1% annual chance of flooding within the designated areas. Jurisdictions with property in a 500 year floodplain can expect a 0.2% annual chance of flooding within the designated areas.

Table 17 – Probability, Riverine Floods		
Jurisdiction	**Floodplain Exposure**	
	100 Year (1% Annual)	**500 Year (0.2% Annual)**
Glacier County	X	-
Cut Bank	-	-

**The data are from FEMA FIRMs.*

4.3.4 – Assessing Vulnerability & Impacts

Flood Impacts

Based on Maps 6 and 7 the future probability in Section 4.3.3.A, Glacier County is exposed to 100 year floodplains and can expect 0.01 riverine floods per year. The probability of flash is equal throughout each participating jurisdiction and is as depicted in Section 4.3.3A at 0.0100 events per year.

The following table is provided as a best available estimate of what a typical riverine or flash flood event in the region may cause in terms of damage, injuries, and fatalities.

Table 18 – Historical Impacts, Floods

Hazard	Riverine Floods	Flash Floods
Count of Events	8	2
Impacts Per Year	0.38	0.13
Average Magnitude	-	-
Magnitude Range	-	-
Average Cost	$0	$0.00
Magnitude of Cost	$0 - $0	$0 - $0
Total Recorded Cost	$0	$0
Average Fatalities	0.00	0.00
Total Fatalities	0	0
Average Injuries	0.00	0.00
Total Injuries	0	0

**The data are from the NOAA NCDC Storm Events Database.*

Vulnerability of Facilities

Flooding can cause minimal or complete damage to facilities taking them offline for days to years depending on the resources available after an event.

The average riverine flood event in Glacier County and Cut Bank costs $0, while the existing range of a single incident has been from $0 to $0. The average flash flood costs $0, while the existing range of a single incident has been from $0 to $0. Neither Glacier County nor Cut Bank has incurred any property damage from riverine or flash flooding.

Glacier County and Cut Bank's structures are valued at $331,731,000. Since flash flooding threatens the entire planning area, all structures are considered exposed and vulnerable. A GIS analysis of FEMA's identified SFHAs puts a total of $1,739,000 worth of the planning area's structural inventory exposed to riverine flooding. Please see the tables on the following page for a breakdown of these values by type of flooding and jurisdiction.

Table 19 – Vulnerable Structures, Flash Floods					
Jurisdiction	**Agricultural**	**Commercial**	**Government**	**Industrial**	**Residential**
Glacier County	$5,649,000	$13,119,000	$2,558,000	$4,793,000	$56,827,000
Cut Bank	$6,652,000	$86,412,000	$16,378,000	$14,235,000	$125,108,000
Total =	**$12,301,000**	**$99,531,000**	**$18,936,000**	**$19,028,000**	**$181,935,000**

**The data are from FEMA's HAZUS CDMS Database.*

Table 20 – Vulnerable Structures, Riverine Floods					
Jurisdiction	**Agricultural**	**Commercial**	**Government**	**Industrial**	**Residential**
Glacier County	$892,000	$0	$0	$0	$847,000
Cut Bank	$0	$0	$0	$0	$0
Total =	**$892,000**	**$0**	**$0**	**$0**	**$847,000**

**The data are compiled from a GIS Analysis based on FEMA's HAZUS CDMS Database and FEMA's FIRMs.*

Vulnerability of Population

If evacuation is not heeded, or flood waters rise quickly enough, citizens of the planning area can be swept away by floodwater currents, become trapped on rooftops or points of high elevations, and even sustain injury or death. Depending on the conditions, this will expose them to elements and deprive them of basic needs and services.

As described in Vulnerability of Facilities, water that is long lasting and slow to drain will encourage the growth of mold and other bio-hazardous material, rendering a facility unusable. Extra care, assessment, and sanitization are required before citizens can re-inhabit a facility, or they may face serious health concerns. Long term care facilities housing vulnerable populations can take longer to evacuate. Additionally, the potential presence of mold after a flood requires extra care to be taken before their population can re-inhabit a long-term care facility.

Glacier County and Cut Bank have 0 recorded fatalities from riverine floods and 0 fatalities from flash flood events. The population total of the planning area is 13,647. Of the 13,647, all are considered vulnerable and at risk to flash flooding and 17 are considered vulnerable and at risk to riverine flooding. Similarly, all 3,324 housing units are considered vulnerable to flash flooding while 8 are vulnerable to riverine flooding.

Table 21 – Vulnerable Populations, Flash & Riverine Flooding				
Jurisdiction	**Flash Flooding**		**Riverine Flooding**	
	Housing Units	**Population**	**Housing Units**	**Population**
Glacier County	1,877	10,762	8	17
Cut Bank	1,447	2,885	0	0
Total =	**3,324**	**13,647**	**8**	**17**

**The analysis is derived from U.S. Census Bureau data and FEMA's FIRMs.*

Vulnerability of Systems

Critical facilities and infrastructure can be rendered unusable or permanently destroyed having a significant impact on a jurisdiction's ability to conduct its day to day or current flood event operations. Significant damage to residential and or commercial structures can irrevocably damage a community and its economy creating refugees and economic hardship. If a chemical facility is significantly

impacted it is possible the chemicals stored at the facilities can wash away with the flood waters and have detrimental effects on the local environment.

4.3.4A – Infrastructure & Critical Facilities

All infrastructure and critical facilities are equally at risk to flash flooding, since it indiscriminately can affect the entire planning area. Through our GIS analysis none of the identified floodplains, only the Cut Bank Water Treatment Plan is located in a floodplain.

A complete list of infrastructure and critical facilities can be found in Appendix D.

4.3.4B – Land Use & Development Trends

Currently, there are no significant development projects in Glacier County or Cut Bank. Additionally, neither municipalities are growing at a significant enough rate to denote a reasonable increase in their hazard vulnerability due to land use, growth, or development trends.

4.3.4C – Unique & Varied Risk

Flash flooding has ability to affect a portion of or the entire planning area. Unfortunately, there is no accurate method of predicting the location or extent of a flash flood's impact, that being if it will affect one participating jurisdiction up to any number or all participating jurisdictions.

Additionally, it is not possible to predict any varying probability between the participating jurisdictions with the exception of varying risk as it is proportionate to a participating jurisdiction's demographics. Logically, participating jurisdictions with a greater population are at a higher risk as participating jurisdictions with a lower population are at a lower risk.

Although this plan addresses vulnerability to severe storms, without the possibility of being able to calculate all components of risk at a jurisdictional level, each jurisdiction's individual risk to flash flooding is not possible to calculate.

Table 22 – Unique & Varied Risk, Riverine Floods

Jurisdiction	Risk Characteristics
Glacier County	Parts of the jurisdiction are located in a 100 floodplain.
Cut Bank	No risk to riverine flooding.

4.3SS – Severe Storms

4.3.1 – Description

Severe storms comprise the hazardous and damaging weather effects often found in violent storm fronts. They can occur together or separate, they are common and usually not hazardous, but on occasion they can pose a threat to life and property.

This plan defines Severe Storms as a combination of the following severe weather effects as defined by NOAA and the NWS.

Hail: Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.

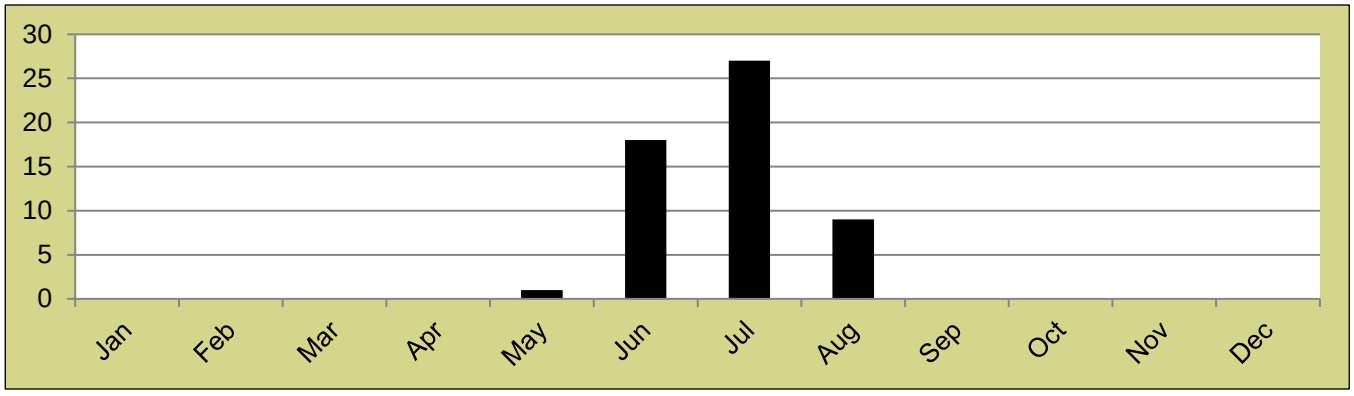
High/Strong Wind: Sustained wind speeds of 40 miles per hour or greater lasting for 1 hour or longer, or winds of 58 miles per hour or greater for any duration. Often referred to as straight line winds to differentiate from rotating or tornado associated wind.

Lightning: A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, between a cloud and the ground or between the ground and a cloud.

Thunderstorm Winds: The same classification as high or strong winds, but accompanies a thunderstorm. It is also referred to as a straight line wind to differentiate from rotating or tornado associated wind.

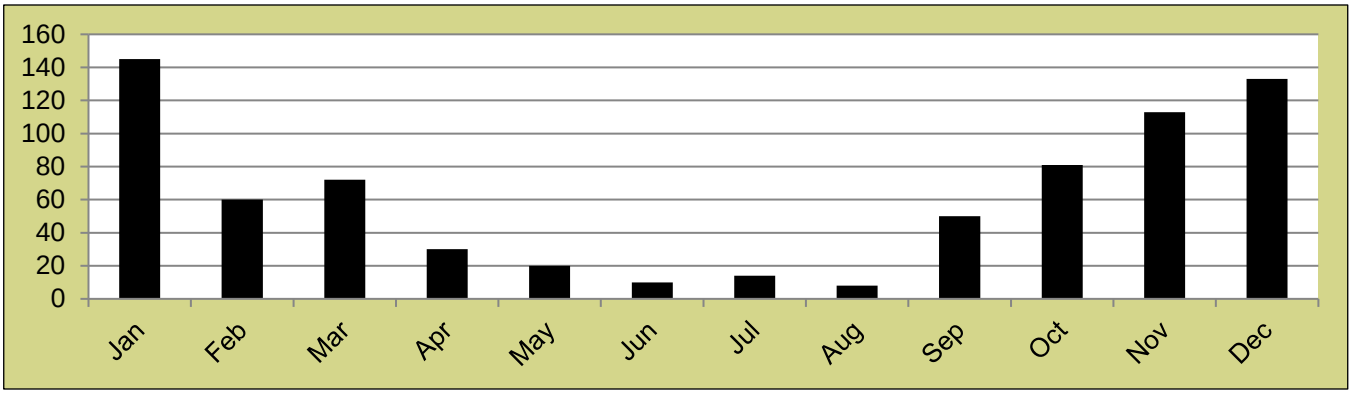
For consistency with the NWS and NOAA, high and strong winds are shown separate from thunderstorm winds when raw, collected data is displayed. However, for their impacts and probability, they are combined and referred to simply as “wind” events.

Chart 5 – Hail per Month, Glacier County (1957 – 2016)



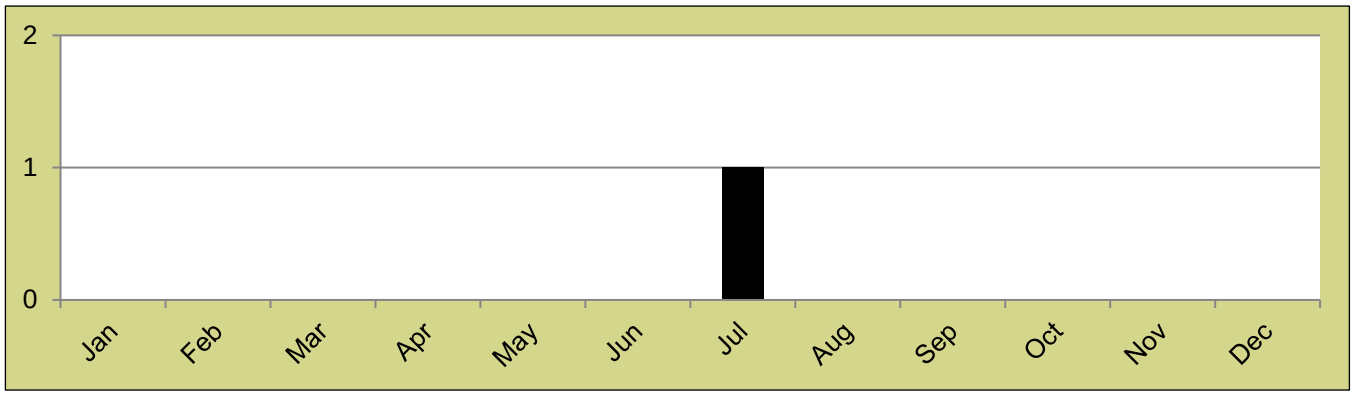
**The data are from the NOAA NCDC Storm Events Database*

Chart 6 – High Wind Events per Month, Glacier County (1996 – 2016)



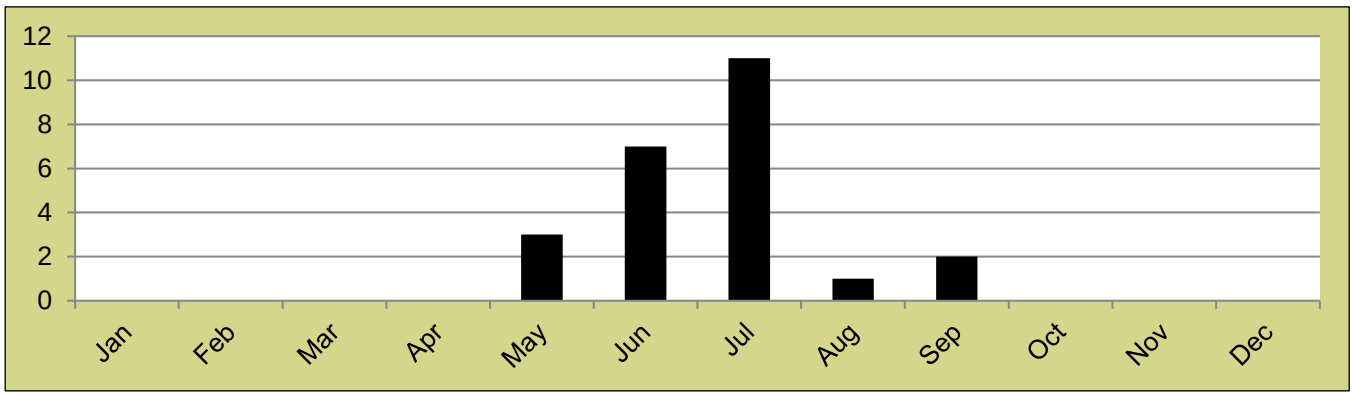
**The data are from the NOAA NCDC Storm Events Database*

Chart 7 – Lightning Strikes per Month, Glacier County (2013 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

Chart 8 – Thunderstorm Winds per Month, Glacier County (1968 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

4.3.2 – Location & Extent

Severe storms occur throughout the year in Glacier County and its participating jurisdictions. Thunderstorms, high, and strong winds can affect any size area from a county, region, or isolated pockets of city or neighborhood. In contrast, lightning will strike a single point. It is not often multiple strikes will hit and damage persons and property in one severe storm event. Hail will occur in small pockets of an accompanying storm.

Storms, severe or not, are often predicted within a day or multiple days in advance. The severity of a storm is not as easily predicted and when it is, the window of notification is up to few hours to under an hour. When a storm is imminent it is unknown whether or not hail, lightning, or damaging winds will occur until after an incident has been reported. Since severe storms typically affect an area the size of a region, the expected intensity is the same throughout the planning area.

Strong, high, and thunderstorm winds are classified as winds which occur between 40 and 70 miles per hour lasting for 1 hour or greater or of 58 miles per hour for any duration. The Beaufort Scale shown below displays the ranges of wind speed and correlates them with their typical effects. At a level 7 and 8 citizens should remain indoors and anywhere above a level 8 will cause damage to structures. Damage to any amount of structures can cause serious disruption to Glacier County and its participating jurisdictions. The scope of damage can range from one residential house up to widespread destruction of homes and reinforced buildings throughout the county. The planning area typically receives wind events between 42 and 116 miles per hour or a Beaufort level between 8 and 12.

It can safely be assumed any severe storm has the potential to cause a lightning strike. It can happen instantly with no warning and happen anytime throughout the storm's passage. A storm's lightning intensity is measured by lightning activity intensity levels outlined in the table on the following page. A strike could damage structures throughout the county and render it unusable for a period of time, or cause it to catch fire and damage it beyond repair. Most lightning strikes do not hit structures or people and therefore go unreported. The planning area can and has experienced lightning of all intensities listed in Table 23 on the following page.

Hail typically falls in sizes anywhere from 0.75 inches to upwards of 1.75 inches. A complete hail index with size and typical damages can be found in Table 24. Any incidents of hail can cause injury to Glacier County and its participating jurisdictions' citizens, while anything above 1 inch could cause damage to structures. If windows are broken, some facilities will be rendered unusable until repaired.

Beaufort Scale

Beaufort number	Wind Speed (mph)	Seaman's term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Large branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

Table 23 – Lightning Activity Intensity Levels	
LAL Level	**Description**
LAL 1	No Thunderstorms
LAL 2	Isolated thunderstorms: Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud-to-ground strikes in a 5 minute period.
LAL 3	Widely scattered thunderstorms: Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud-to-ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms: Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud-to-ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms: Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud-to-ground strikes in a 5 minute period.

Table 24 – Modified NOAA/TORRO Hailstorm Intensity Scale				
Code	**Intensity Category**	**Diameter (Inches)**	**Approximate Size**	**Typical Damage Impacts**
H0	Hard Hail	0 - 0.33	Pea	No damage
H1	Potentially Damaging	0.33 - 0.60	Marble/Mothball	Slight damage to crops
H2	Potentially Damaging	0.60 - 0.80	Dime/Grape	Significant damage to crops
H3	Severe	0.80 - 1.20	Nickel to Quarter	Severe damage to crops, damage to glass and plastic, paint and wood scored
H4	Severe	1.20 - 1.60	Half Dollar	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.60 - 2.00	Silver Dollar to Golf Ball	Damage to tiled roofs, significant risk of personal injury.
H6	Destructive	2.00 - 2.40	Egg	Aircraft bodywork dented, brick walls pitted
H7	Very Destructive	2.40 - 3.00	Tennis Ball	Severe roof damage, risk of serious injuries to persons not protected
H8	Very Destructive	3.00 - 3.50	Baseball to Orange	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.50 - 4.00	Grapefruit	Extensive structural damage, risk of severe injury or fatal injuries to persons not protected
H10	Super Hailstorms	4.00 +	Softball and up	Extensive structural damage, risk of severe injury or fatal injuries to persons not protected

4.3.3 – Previous Occurrences

Glacier County and its participating jurisdictions have recorded 0 fatalities and 3 injuries due to Severe Storms.

Since 1957, NOAA has recorded 55 hail events in Glacier County and its participating jurisdictions. These hail events have caused $5,000 in recorded property damage, but actual total amount is most likely significantly greater, but is unrecorded by any available source.

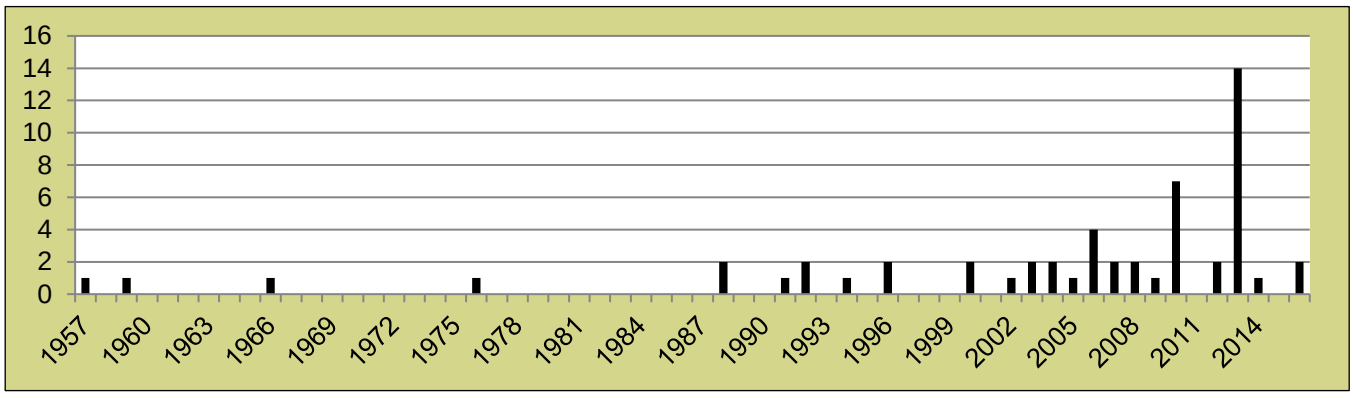
Since 2013, NOAA has recorded 1 lightning strike impact in Glacier County and its participating jurisdictions. This strike did not cause any property damage, but injured 3 people.

Since 1996, NOAA has recorded 736 strong and high wind events in Glacier County and its participating jurisdictions. These strong wind events have caused $996,000 in recorded property damage.

Since 1968, NOAA has recorded 24 thunderstorm wind events in Glacier County and its participating jurisdictions. These thunderstorm wind events have caused $10,000 in recorded property damage.

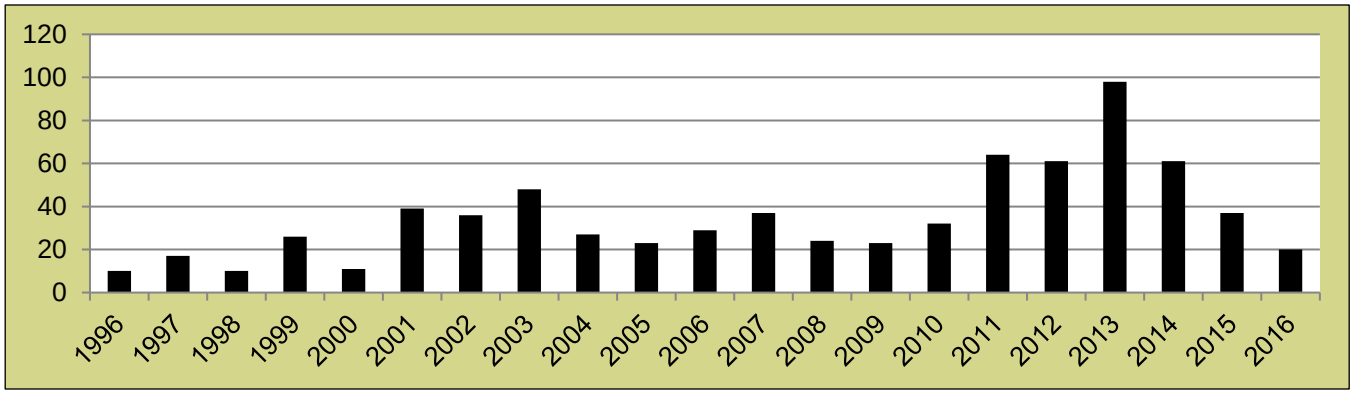
For a complete list of NOAA recorded severe storm events, please reference Appendix E.

Chart 9 – Hail per Year, Glacier County (1957 – 2016)



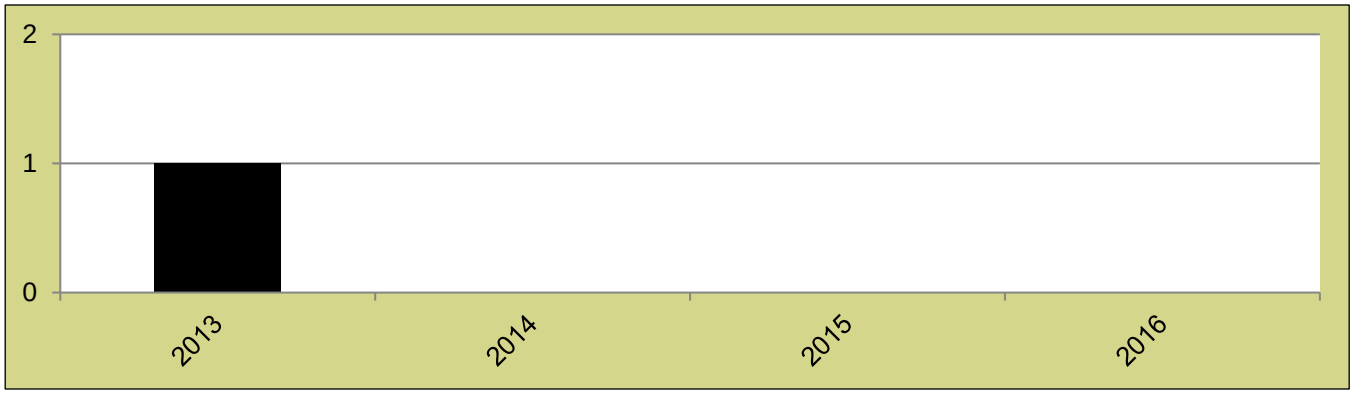
**The data are from the NOAA NCDC Storm Events Database*

Chart 10 – High Winds per Year, Glacier County (1996 – 2016)



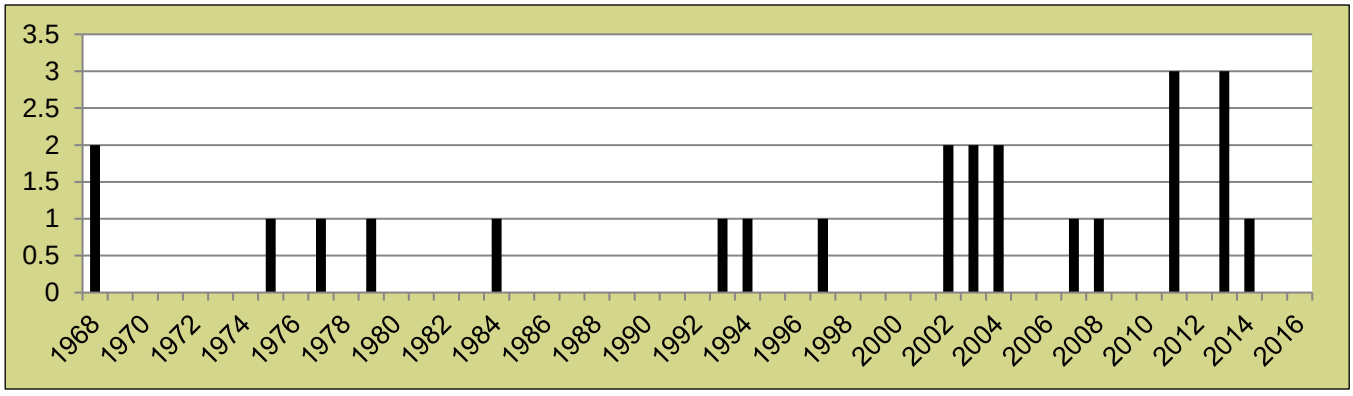
**The data are from the NOAA NCDC Storm Events Database*

Chart 11 – Lightning Strikes per Year, Glacier County (2013 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

Chart 12 – Thunderstorm Winds per Year, Glacier County (1968 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

4.3.3A – Probability of Future Events

Glacier County and Cut Bank can each expect a hail event with 30.56% probability per year, or 0.3056 events per year. They can each expect a lightning event with an unknown probability, since 1 event is not enough of a dataset to calculate a probability. The planning area can expect a strong, high, or thunderstorm wind event with a 514.97% probability per year, or 5.1497 events per year.

Table 25 – Probability, Severe Storms

Event Year	Event Count		
	Hail	Lightning	Wind Events
1957 - 1959	2	-	-
1960 - 1969	1	-	2
1970 - 1979	1	-	3
1980 - 1989	2	-	1
1990	0	-	0
1991	1	-	0
1992	2	-	0
1993	0	-	1
1994	1	-	1
1995	0	-	0
1996	2	-	10
1997	0	-	17
1998	0	-	11
1999	0	-	26
2000	2	-	11
2001	0	-	39
2002	1	-	38
2003	2	-	50
2004	2	-	29
2005	1	-	23
2006	4	-	29
2007	2	-	38
2008	2	-	25
2009	1	-	23
2010	7	-	32
2011	0	-	67
2012	2	-	61
2013	14	1	101
2014	1	-	62
2015	0	-	37
2016	2	-	20
Total Recorded Events =	55	1	760
Total Years =	60	-	49
Yearly Probability =	**30.56%**	**/**	**514.97%**

**The data are from the NOAA NCDC Storm Events Database.*

4.3.4 – Assessing Vulnerability & Impacts

Hail Impacts

Glacier County and its participating jurisdictions have recorded 55 hail events since 1957, of which the range of magnitude was between 0.75 and 1.75 inches in diameter with an average of 1.23 inches. Based on the hailstorm scale in Table 24 and future probability in Table 25, Glacier County and its participating jurisdictions can expect 0.3056 hail events per year ranging from 'potentially damaging' to 'destructive.'

Lightning Impacts

Glacier County and Cut Bank have recorded only 1 lightning impact. The planning area is still vulnerable to lightning strikes and they can occur, but without any historical precedent, there is no reasonable way to predict a range or magnitude.

Wind Impacts

Glacier County and its participating jurisdictions have recorded 760 wind events since 1968, of which the range of magnitude was between 42 and 116 miles per hour with an average of 56.6 miles per hour. Based on the Beaufort Scale and future probability in Table 25, Glacier County and Cut Bank can expect 5.1497 wind events per year ranging from Beaufort Scale 8 – "Fresh Gale" to Beaufort Scale 12 – "Hurricane Force."

Table 26 – Historical Impacts, Severe Storms

Hazard	Hail	Lightning	Winds
Count of Events	55	1	760
Impacts Per Year	0.92	0.25	15.51
Average Magnitude	1.23	-	56.60
Magnitude Range	0.75 - 1.75	-	42 - 116
Average Cost	$25.77	$0	$1,324
Magnitude of Cost	$0 - $5,000	$0 - $0	$0 - $350,000
Total Recorded Cost	$5,000	$0	$1,006,000
Average Fatalities	0.00	0.00	0.00
Total Fatalities	0	0	0
Average Injuries	0.00	3.00	0.00
Total Injuries	0	3	0

**The data are from the NOAA NCDC Storm Events Database.*

Vulnerability of Facilities

Structural vulnerability to severe storms is the same throughout Glacier County and its participating jurisdictions. Hail can be costly by damaging rooftops, outdoor equipment, and windows. Lightning can strike anything with the potential to significantly damage electrical infrastructure or ignite a fire. Wind events create flying debris which can damage infrastructure and buildings. Strong enough wind can cause structure damage to older, less well constructed buildings even toppling or leveling them. A FEMA Code 361 Tornado Safe Room will provide more than sufficient protection and resistance to any form of severe storm as they are designed and constructed above the standard metrics of a severe storm.

The average hail event in Glacier County and its participating jurisdictions costs $25 while the existing range of a single incident has been from $0 to $5,000.

Only one lightning impact has been recorded by the NWS in Glacier County. This strike did not cause any property damage. Without more data on lightning, it is not possible to calculate averages or other meaningful statistics on lightning.

The average wind event in Glacier County and its participating jurisdictions costs $1,324, while the existing range of a single incident has been from $0 to $350,000.

Glacier County and its participating jurisdictions' structures are valued at $331,731,000. Since severe storms threaten the entire planning area equally, all municipal structures are considered exposed. Please see the tables below for a breakdown of these values by jurisdiction.

Table 27 – Vulnerable Structures, Severe Storms

Jurisdiction	Agricultural	Commercial	Government	Industrial	Residential
Glacier County	$5,649,000	$13,119,000	$2,558,000	$4,793,000	$56,827,000
Cut Bank	$6,652,000	$86,412,000	$16,378,000	$14,235,000	$125,108,000
Total =	**$12,301,000**	**$99,531,000**	**$18,936,000**	**$19,028,000**	**$181,935,000**

**The data are from FEMA's HAZUS CDMS Database.*

Vulnerability of Population

Glacier County and Cut Bank's vulnerability to severe storms is the same throughout the planning area. In the absence of proper shelter, hail can cause serious injury to an unprotected person. As long as Glacier County and its participating jurisdictions' citizens stay indoors and away from windows, they will be protected against hail injury and death. Similarly, they can avoid being struck by lightning by staying indoors. Although lightning may strike a structure sheltering people, it is extremely unlikely that the strike itself will directly injure or kill a sheltered person. As long as a structure is able to maintain its integrity during high speed winds, it will protect people from wind injury or death. However, old or poorly constructed facilities are not good shelter as previously mentioned flying debris can break windows or cause structural damage. Either of these instances have the potential to seriously injure or kill anyone taking shelter in older, less well constructed building.

Glacier County and its participating jurisdictions have a total population of 13,647 in 3,324 housing units all of which are highly vulnerable and at risk to severe storms.

Historically, there have been 0 fatalities and 3 injuries recorded from severe storms in the planning area.

Table 28 – Vulnerable Populations, Severe Storms

Jurisdiction	Housing Units	Population
Glacier County	1,877	10,762
Cut Bank	1,447	2,885
Total =	**3,324**	**13,647**

**The analysis is derived from U.S. Census Bureau data.*

Vulnerability of Systems
Glacier County and its participating jurisdictions' assets and systems' vulnerability to severe storms is the same throughout the planning area.

Hail damage is typically superficial and does not hamper a community's assets, systems, or activities. Lightning strikes can destroy or damage a community asset, but since their strikes are typically isolated and rarely hit anything, it is unlikely to significantly impact a larger system. Wind events can destroy and damage multiple structures and points of infrastructure. It has the potential to significantly impact a community's power grid compounding the effects of other hazards such as, extreme heat, tornadoes, and winter storms.

4.3.4A – Infrastructure & Critical Facilities
All infrastructure and critical facilities are equally at risk, since severe storms indiscriminately affect the entire planning area. A complete list of infrastructure and critical facilities can be found in Appendix D.

4.3.4B – Land Use & Development Trends
Currently, there are no significant development projects in Glacier County or Cut Bank. Additionally, neither municipalities are growing at a significant enough rate to denote a reasonable increase in their hazard vulnerability due to land use, growth, or development trends.

4.3.4C – Unique & Varied Risk
Severe storms have ability to affect a portion of or the entire planning area. Unfortunately, there is no accurate method of predicting the location or extent of a severe storm's impact, that being if it will affect one participating jurisdiction up to any number or all participating jurisdictions.

Additionally, it is not possible to predict any varying probability between the participating jurisdictions with the exception of varying risk as it is proportionate to a participating jurisdiction's demographics. Logically, participating jurisdictions with a greater population are at a higher risk as participating jurisdictions with a lower population are at a lower risk.

Although this plan addresses vulnerability to severe storms, without the possibility of being able to calculate all components of risk at a jurisdictional level, each jurisdiction's individual risk to severe storms is not possible to calculate.

To predict unique and varied risks for Glacier County and its participating jurisdictions, one needs a comprehensive catalog of wind resilience ratings, hail impact ratings, and grounding capacity for every piece of infrastructure and structure.

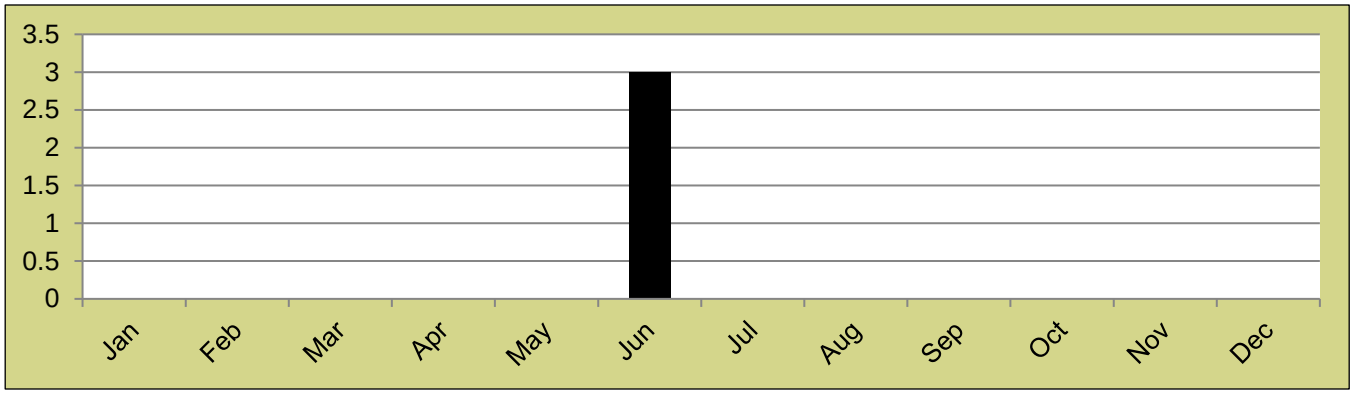
4.3T – Tornadoes

4.3.1 – Description

A tornado is a violent, dangerous, rotating column of air that is in contact with both the surface of the earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud. Often referred to as a twister or a cyclone, they can strike anywhere and with little warning. Tornadoes come in many shapes and sizes, but are typically in the form of a visible condensation funnel, whose narrow end touches the earth and is often encircled by a cloud of debris and dust.

Tornadoes can cause several kinds of damage to buildings. Tornadoes have been known to lift and move objects weighing more than 3 tons, toss homes more than 300 feet from their foundations, and siphon millions of tons of water. However, less spectacular damage is much more common. Houses and other obstructions in the path of the wind cause the wind to change direction. This change in wind direction increases pressure on parts of the building. The combination of increased pressures and fluctuating wind speeds creates stress on the building that frequently causes connections between building components, roofing, siding, windows, etc., to fail. Tornadoes can also generate a tremendous amount of flying debris. If wind speeds are high enough, airborne debris can be thrown at buildings with enough force to penetrate windows, roofs, and walls.

Chart 13 – Tornadoes per Month, Glacier County (1977 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

4.3.2 – Location & Extent

Fujita Scale		EF Scale	
Fujita Scale	3-Second Gust Speed (mph)	EF Scale	3-Second Gust Speed (mph)
F0	45-78	EF0	65-85
F1	79-117	EF1	86-109
F2	118-161	EF2	110-137
F3	162-209	EF3	138-167
F4	210-261	EF4	168-199
F5	262-317	EF5	200-234

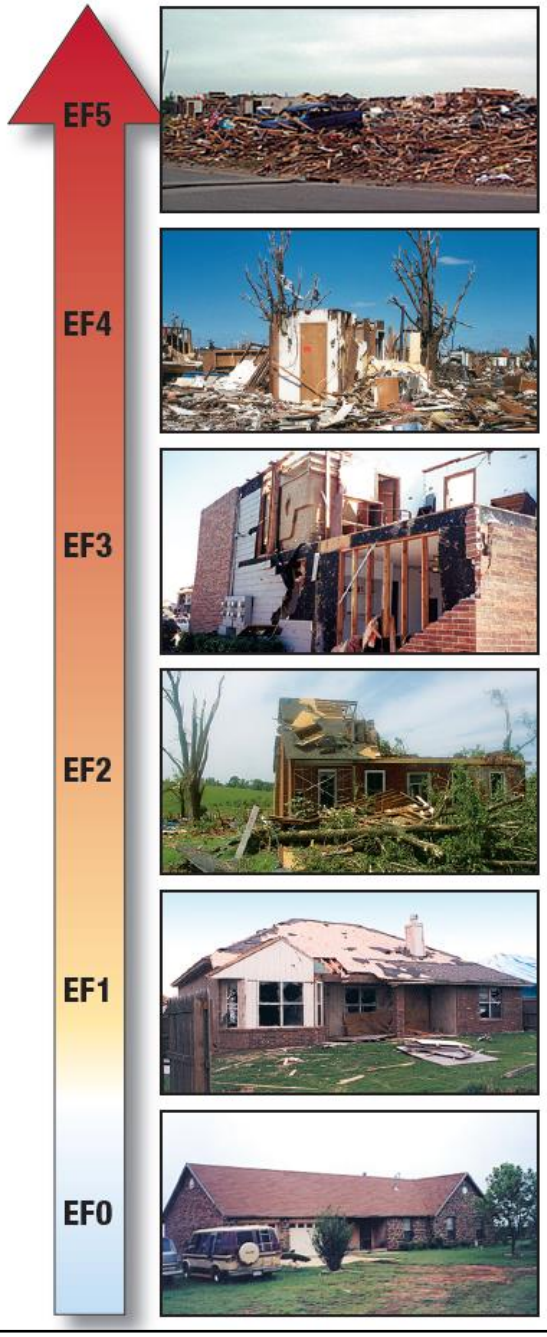
Tornadoes can strike anywhere in Glacier County or its participating jurisdictions placing the entire planning area at risk. Most tornados have wind speeds less than 110 miles per hour, and travel a few miles before dissipating. Many tornadoes only exist for a few seconds in the form of a touchdown. The most extreme tornados can attain wind speeds of more than 200 mph, stretch more than two miles across, and travel dozens of miles.

A tornado may arrive with a storm front and touchdown in a matter of seconds without warning. Other times tornado watches and sirens will alert communities of high potential tornado producing weather or an already formed tornado and its likely path.

Until 2007 the Fujita Tornado Scale ranked the severity of tornadoes. The Fujita scale assigned a numerical F value, F0 through F5, based on the wind speeds and estimated damage. Since 2007 the U.S. switched over to the Enhanced Fujita Scale. The altered scale adjusted the wind speed values per F level and introduced a rubric for estimating damage.

An EF0 tornado could lightly damage structures where they would become unsafe to use until repaired. An EF1 or larger tornado could destroy the entire neighborhood, town, or city or damage any number of structures to the point where they would be unusable for at least a year.

The NWS has recorded EF0 and EF1 touchdowns in the planning area and thus it should be prepared for more EF0 and EF1 touchdowns and even an occasional EF2.



Incredible: Strong frame houses are lifted from foundations, reinforced concrete structures are damaged, automobile-sized missiles become airborne, trees are completely debarked.

Devastating: Well-constructed houses are destroyed, some structures are lifted from foundations and blown some distance, cars are blown some distance, large debris becomes airborne.

Severe: Roofs and some walls are torn from structures, some small buildings are destroyed, non-reinforced masonry buildings are destroyed, most trees in forest are uprooted.

Considerable: Roof structures are damaged, mobile homes are destroyed, debris becomes airborne (missiles are generated), large trees are snapped or uprooted.

Moderate: Roof surfaces are peeled off, windows are broken, some tree trunks are snapped, unanchored mobile homes are overturned, attached garages may be destroyed.

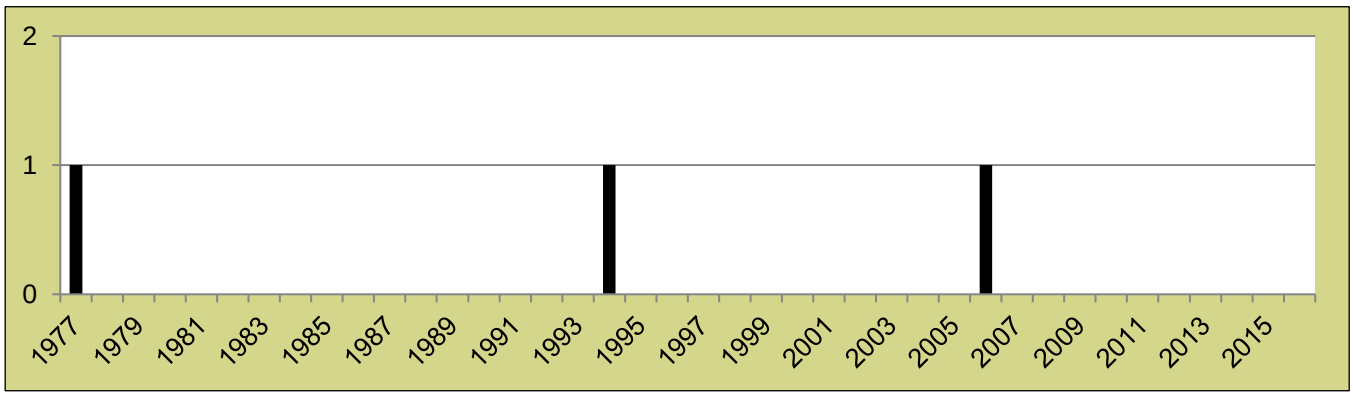
Light: Chimneys are damaged, tree branches are broken, shallow-rooted trees are toppled.

4.3.3 – Previous Occurrences

Since 1977, the NWS has recorded 3 tornadoes in the planning area. The planning area has recorded 0 fatalities and 0 injuries relating to tornado activity costing $525,000 in property damage.

For a complete list of NOAA recorded tornado events, please reference Appendix E.

Chart 14 – Tornadoes per Year, Glacier County (1977 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

4.3.3A – Probability of Future Events

Glacier County and its participating jurisdictions can expect a tornado with a probability of 2.56% per year or 0.0256 tornados per year.

Table 29 – Probability, Tornadoes	
Event Year	**Event Count**
1977 - 1979	1
1980 - 1989	0
1990	0
1991	0
1992	0
1993	0
1994	1
1995	0
1996	0
1997	0
1998	0
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	1
2007	0
2008	0
2009	0
2010	0
2011	0
2012	0
2013	0
2014	0
2015	0
Total Recorded Events =	3
Total Years =	39
Yearly Probability =	**2.56%**

**The data are from the NOAA NCDC Storm Events Database.*

4.3.4 – Assessing Vulnerability & Impacts

Tornado Impacts

The NWS has recorded 3 tornadoes since 1977 in the planning area, of which the range of magnitude was between EF0 and EF1 with an approximate average of an EF1. Based on the Enhanced Fujita Scale and the future probability in Table 29, Glacier County and its participating jurisdictions can expect 0.0256 tornadoes per year ranging from 'light' to 'moderate' damage with the proven potential to be impacted by an EF2 dealing out a 'considerable' amount of damage.

Table 30 – Historical Impacts, Tornadoes	
Count of Events	3
Impacts Per Year	0.08
Average Magnitude (Enhance Fujita Scale)	0.66
Magnitude Range (Enhance Fujita Scale)	EF0 - EF1
Average Cost	$175,000
Magnitude of Cost	$0 - $500,000
Total Recorded Cost	$525,000
Average Fatalities	0.00
Total Fatalities	0
Average Injuries	0.00
Total Injuries	0

**The data are from the NOAA NCDC Storm Events Database.*

Vulnerability of Facilities

Glacier County and its participating jurisdictions' vulnerability is the same throughout the planning area. Most tornadoes are in the EF0 – EF2 class. Building to modern wind standards and state codes provides significant protection from these hazard events; however, a community in the direct path of a violent, high scale tornado can do little to prevent significant property damage. Designing buildings to protect against extreme wind speeds, such as those associated with an EF4 or EF5 is extremely challenging and cost prohibitive. Anything less than a FEMA Code 361 compliant structure is susceptible to significant damage or complete destruction.

The average tornado event in Glacier County and its participating jurisdictions costs $175,000, while the existing range of a single incident has been between and EF0 and EF1 costing a total of $525,000.

Glacier County and Cut Bank's structures are valued at $331,731,000. Since tornadoes threaten the entire planning area equally, all municipal structures are considered exposed and vulnerable. Please see the tables below for a breakdown of these values by jurisdiction.

Please reference the figure on page 65 to compare EF classes to likely impacts and damages.

Table 31 – Vulnerable Structures, Tornadoes					
Jurisdiction	**Agricultural**	**Commercial**	**Government**	**Industrial**	**Residential**
Glacier County	$5,649,000	$13,119,000	$2,558,000	$4,793,000	$56,827,000
Cut Bank	$6,652,000	$86,412,000	$16,378,000	$14,235,000	$125,108,000
Total =	**$12,301,000**	**$99,531,000**	**$18,936,000**	**$19,028,000**	**$181,935,000**

**The data are from FEMA's HAZUS CDMS Database.*

Vulnerability of Population

Glacier County and its participating jurisdictions' vulnerability to tornadoes is the same throughout the planning area. An EF4 or EF5 tornado has the potential to level the smaller jurisdictions and kill everyone in them while being able to do nearly the same in the larger ones. A lesser magnitude tornado has the ability to kill Glacier County and Cut Bank's citizens as it rips off the roofs and walls of its structures while launching airborne missiles born from debris.

Glacier County and Cut Bank have a total population of 13,647 in 3,324 housing units all of which are highly vulnerable and at risk to tornadoes.

Historically, there have been 0 recorded fatalities and 0 injuries from tornadoes in Glacier County and Cut Bank.

Table 32 – Vulnerable Populations, Tornadoes		
Jurisdiction	**Housing Units**	**Population**
Glacier County	1,877	10,762
Cut Bank	1,447	2,885
Total =	**3,324**	**13,647**

**The analysis is derived from U.S. Census Bureau data.*

Vulnerability of Systems

Glacier County and its participating jurisdictions' community assets and systems' vulnerability to tornadoes is equal throughout the planning area. A small magnitude tornado will not significantly damage a community of its systems, but a larger magnitude tornado can impact a community for weeks, months, or years and even destroy a town or city completely. Significant damage to Glacier County and its participating jurisdictions would hinder the community's economy and increase its social vulnerability.

4.3.4A – Infrastructure & Critical Facilities

All infrastructure and critical facilities are equally at risk, since tornadoes indiscriminately affect the entire planning area. A complete list of infrastructure and critical facilities can be found in Appendix D.

4.3.4B – Land Use & Development Trends

Currently, there are no significant development projects in Glacier County or Cut Bank. Additionally, neither municipalities are growing at a significant enough rate to denote a reasonable increase in their hazard vulnerability due to land use, growth, or development trends.

4.3.4C – Unique & Varied Risk

Tornadoes have ability to affect a portion of or the entire planning area. Unfortunately, there is no accurate method of predicting the location or extent of a tornado's impact, that being if it will affect one participating jurisdiction up to any number or all participating jurisdictions.

Additionally, it is not possible to predict any varying probability between the participating jurisdictions with the exception of varying risk as it is proportionate to a participating jurisdiction's demographics. Logically, participating jurisdictions with a greater population are at a higher risk as participating jurisdictions with a lower population are at a lower risk.

Although this plan addresses vulnerability to severe storms, without the possibility of being able to calculate all components of risk at a jurisdictional level, each jurisdiction's individual risk to tornadoes is not possible to calculate.

4.3WF – Wildland & Brush Fires

4.3.1 – Description

The NWS defines a wildfire as: Any free burning uncontainable wildland fire not prescribed for the area which consumes the natural fuels and spreads in response to its environment. They can occur naturally, by human accident, and on rare occasions by human action. Typically their point of origin is far from human development with the exception of roads, power lines, and similar infrastructure. There is a constant threat to hikers, campers, and other people engaging in outdoor activities. Significant danger to life and property occurs when human development meets and becomes intertwined with wildland's vegetation. The threat of wildfire increases in areas prone to intermittent drought, or are generally arid or dry.

Population de-concentration in the U.S. has resulted in rapid development in the outlying fringe of metropolitan areas and in rural areas with attractive recreational and aesthetic amenities, especially forests, communities bordering forests and prairies where fires branch off. This demographic change is increasing the size of the wildland-urban interface (WUI), defined as the area where structures and other human development meet or intermingle with undeveloped wildland. Its expansion has increased the likelihood that wildfires will threaten life and property.

Rampant destruction can be mitigated by fire services regularly engaging in preventative burns and land use measures such as creating defensible spaces for residential land owners to minimize the spread of wildland and brush fires. These modifications may reduce the threat to property and can become a critical component of a residential building that can survive without firefighters. Both of these practices are used in Montana to minimize the extent of wildfire. See the Montana Ready Set Go Action Guide by the Montana State Fire Chiefs Association for more information.

4.3.2 – Location & Extent

The expansion of the WUI in recent decades has significant implications for wildland or brush fire management and its impact. The WUI creates an environment in which fire can move readily between structural and vegetation fuels. Two types of WUI are mapped: intermixed and interface. Intermix WUI are areas where housing and vegetation intermingle; interface WUI are areas with housing in the vicinity of dense, contiguous wildland vegetation.

The duration of a wildland depends on the weather conditions, how dry it is, the availability of fuel to spread, and the ability of responders to contain and extinguish the fire. Historically, some wildfires have lasted only hours, while other fires have continued to spread and grow for an entire season. They spread quickly and can go unnoticed until they have grown large enough to be seen by their dense smoke. If fuel is available, and the high wind speeds hit, a wildland or brush fire can spread over a large area in a very short amount of time. These factors make the difference between small upstart fires easily controlled by local fire services to fires destroying thousands of acres requiring multiple state and federal assets for containment and suppression.

Given the WUI and Intermix depictions in Maps 8 and 9, all participants have a theoretical exposure to wildfires. Based on historical events, the planning area should be prepared for rank 0 events on the Burn Severity Index, show below, but be prepared for a wildfire up to rank 3.

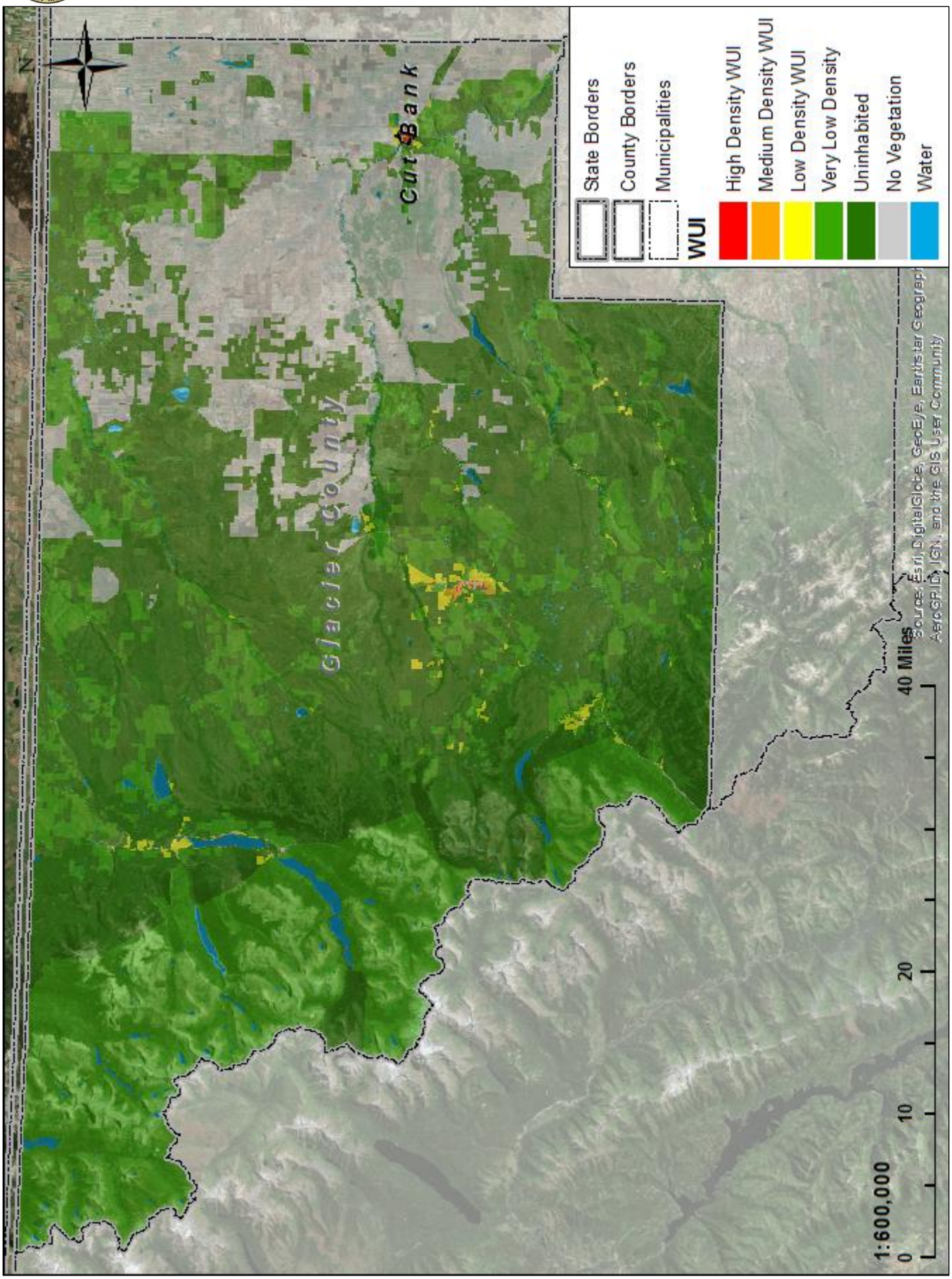
The table shown below, details the range of wildfire damages. The severity of the wildfire depends on a number of quickly changing environmental factors. It is impossible to strategically estimate the severity of a wildfire as the quickly changing factors, drought conditions and wind speed, have such a great influence on the wildfire conditions. The exposed participating jurisdictions (see the paragraph above), could experience a wildland or brush fire ranging anywhere from 0 to 4 on the Burn Severity Index.

Table 33 – Burn Severity Index

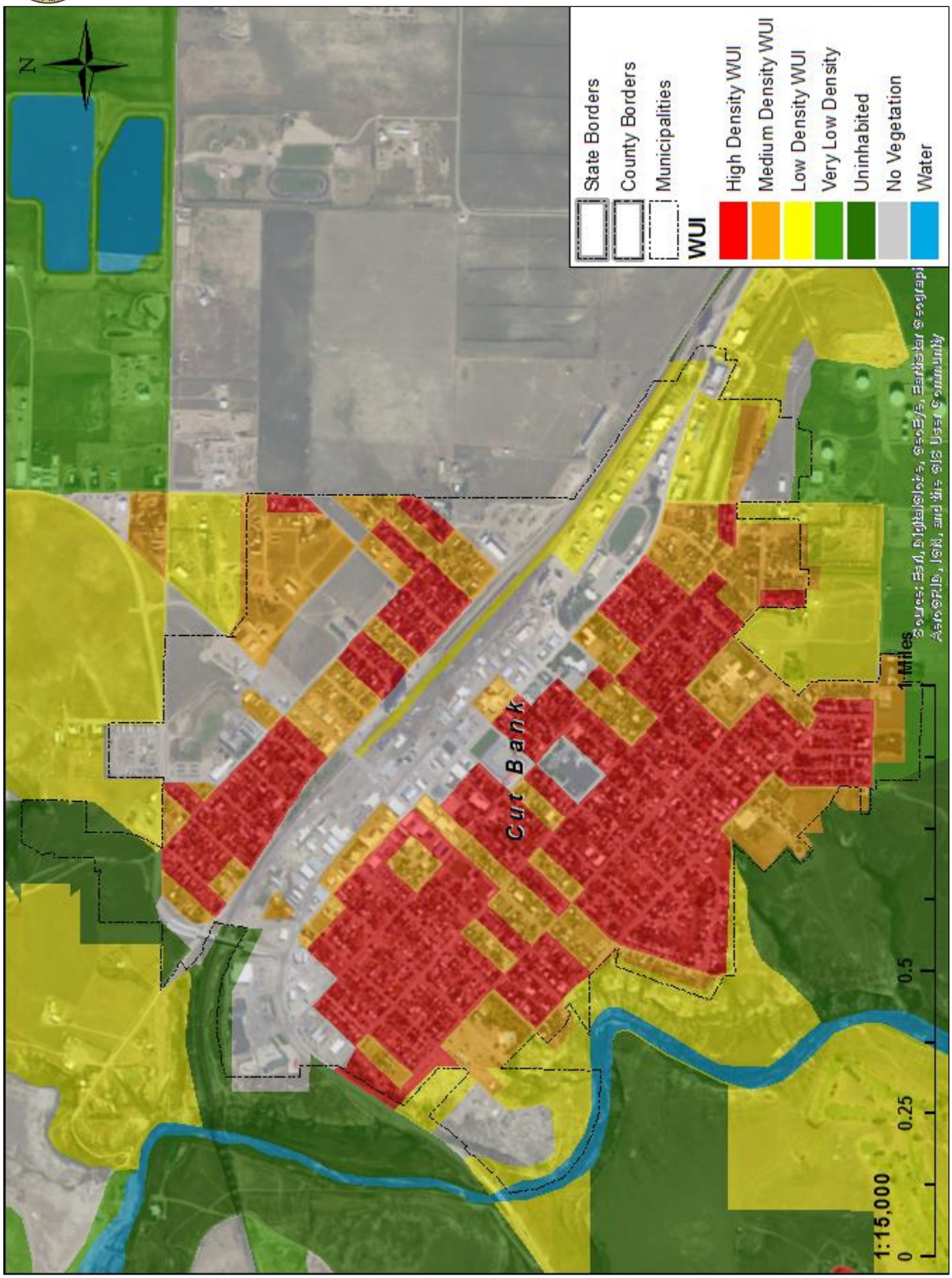
Rank	Burn Severity	Description	Characteristics
0	Unburned	Fire extinguished before reaching microsite	• Leaf litter from previous years intact and uncharred • No evidence of char around base of trees and shrubs • Pre-burn seedlings and herbaceous vegetation present.
1	Low Severity Burn	Surface fire which consumes litter yet has little effect on trees and understory vegetation.	• Burned with partially consumed litter present • Evidence of low flame heights around base of trees and shrubs (<0.5 m) • No significant decreases in overstory & understory basal area, diversity or species richness from pre-burn assessments • Usually burning below 80 ° C
2	Medium-Low Severity Burn	No significant differences in overstory density and basal area, & no significant differences in species richness. However, understory density, basal area, and species richness declined.	• No litter present and 100% of the area covered by duff • Flame lengths < 2 m • Understory mortality present, little or no overstory mortality
3	Medium-High Severity Burn	Flames that were slightly taller than those of Medium-low intensity fires, but these fires had occasional hot spots that killed large trees, With significant reduction in the understory	• Soil exposure on l-50% of the area • Flame lengths <6m • High understory mortality with some overstory trees affected
4	High Severity Burn	Crown fires, usually a stand replacing burn with relatively high overstory mortality	• Soil exposure >50% • Flame lengths >6m • Higher overstory mortality >20% • Usually burning above 800 ° C

**The index is courtesy of the Southern Appalachian Forest Coalition*

Map 8 – Glacier County, WUI



Map 9 – Cut Bank, WUI



4.3.3 – Previous Occurrences

Glacier County regularly experiences wildland and brush fires. This information is recorded by the Montana Natural Resources and Conservation Agency. During the development of this plan, the agency has not been able to deliver this information as they have been non-stop fighting wildland or brush fire outbreaks throughout Montana. The Glacier County OEM/DES will seek out this data as soon as it can be made available and update this portion of the plan with that information.

Although historical fires in the planning area are limited, climatic conditions can change over the next 5 years and Glacier County and this plan's participants need to be aware of their vulnerability.

4.3.3A – Probability of Future Events

Given the high incidence of wildland fires every year, the probability of the planning area experiencing a wildland fire is categorically determined to be "Highly Likely."

4.3.4 – Assessing Vulnerability & Impacts

Wildfire Impacts

Given the data deficiency described in Section 4.3.3, the current impacts of wildland and brush fires throughout the planning area are unknown, but are expected to be severe. The Glacier County OEM/DES will seek out this data as soon as it can be made available and update this portion of the plan with that information.

Vulnerability of Facilities

A wildfire burning near a jurisdiction may cover it in soot, cause secondary fires from traveling coals, or directly engulf facilities burning them to the ground. Facilities can be protected by creating defensible spaces or buffer zones, maintaining a fuel free environment, and structural modifications to prevent the growth of a wildfire.

Glacier County and its participating jurisdictions' structures are valued at $331,731,000. A GIS analysis of the identified WUI puts a total of $203,926,000 worth of the planning area's municipal structural inventory exposed and vulnerable to wildfire. Please see the table on the following pages for a breakdown of these values by jurisdiction.

Table 34 – Vulnerable Structures, Wildland & Brush Fires

Jurisdiction	Agricultural	Commercial	Government	Industrial	Residential
Glacier County					
Low WUI	$495,000	$1,094,000	$0	$79,000	$3,955,000
Medium WUI	$0	$153,000	$0	$79,000	$3,192,000
High WUI	$0	$0	$0	$0	$0
Municipal Total =	$495,000	$1,247,000	$0	$158,000	$7,147,000
Cut Bank					
Low WUI	$0	$0	$0	$0	$0
Medium WUI	$1,739,000	$32,903,000	$872,000	$3,255,000	$23,319,000
High WUI	$4,805,000	$23,095,000	$1,297,000	$6,828,000	$96,766,000
Municipal Total =	$6,544,000	$55,998,000	$2,169,000	$10,083,000	$120,085,000
Total	**Agricultural**	**Commercial**	**Government**	**Industrial**	**Residential**
Total Low WUI =	$495,000	$1,094,000	$0	$79,000	$3,955,000
Total Medium WUI =	$1,739,000	$33,056,000	$872,000	$3,334,000	$26,511,000
Total High WUI =	$4,805,000	$23,095,000	$1,297,000	$6,828,000	$96,766,000
Total WUI =	**$7,039,000**	**$57,245,000**	**$2,169,000**	**$10,241,000**	**$127,232,000**

**The data are compiled from a GIS analysis of FEMA's HAZUS CDMS Database and the Wildland Urban Interface.*

Vulnerability of Population

A jurisdiction's population greatest vulnerability is an inability to properly evacuate. They can be caught off guard due to improper warning systems and become trapped in a growing wildland or brush fire. Glacier County and its participating jurisdictions have a population of 13,647 of which 3,015 are considered vulnerable and at risk to wildland and brush fires. Similarly, of the total 3,324 housing units in the planning area, 1,526 are considered vulnerable to wildland and brush fires.

Although no injuries or deaths have occurred as a direct result of a wildand or brush fire, a local firefighter died while conducting fire suppression operations during the 1970s.

Table 35 – Vulnerable Populations, Wildland & Brush Fires						
Jurisdiction	Housing Units			Population		
	Low WUI	Medium WUI	High WUI	Low WUI	Medium WUI	High WUI
Glacier County	50	36	0	99	57	0
Cut Bank	0	279	1,161	0	590	2,269
Total =	**50**	**315**	**1,161**	**99**	**647**	**2,269**

**The data are compiled from a GIS analysis of U.S. Census Bureau data and the Wildland Urban Interface.*

Vulnerability of Systems

In the event a wildland or brush fire begins to burn and grow, evacuation routes may become blocked by the fire or by other people attempting to evacuate. The impingement of the local transportation system make appropriate warning and information paramount in mitigating Glacier County and its participating jurisdictions' systems vulnerability to wildland and brush fires.

4.3.4A – Infrastructure & Critical Facilities

The following table breaks down the critical facilities and infrastructure that are at risk to wildland and brush fires based on their location in the WUI.

A complete list of infrastructure and critical facilities can be found in Appendix D.

Table 36 – Critical Facilities and Infrastructure, Wildland & Brush Fires	
Jurisdiction	**Risk Characteristics**
Low WUI	Fire Prevention (1), Medical (1), Municipal (1)
Medium WUI	Fire Prevention (1), Hospital (1), Long-Term Care (1), Municipal (1), Shelter (3)
High WUI	Long-Term Care (3), Municipal (1), School (1)

4.3.4B – Land Use & Development Trends

Currently, there are no significant development projects in Glacier County or Cut Bank. Additionally, neither municipalities are growing at a significant enough rate to denote a reasonable increase in their hazard vulnerability due to land use, growth, or development trends.

4.3.4C – Unique & Varied Risk

Table 37 – Unique & Varied Risk, Wildland & Brush Fires	
Jurisdiction	**Risk Characteristics**
Glacier County	Low and medium risk WUI identified.
Cut Bank	Medium and high risk WUI identified.

4.3WS – Winter Storms

4.3.1 – Description

A winter storm encompasses multiple effects caused by winter weather. Included are strong winds, ice storms, heavy or prolonged snow, sleet, and extreme temperatures. Winter storms can be increasingly hazardous in areas and regions that only see winter storms intermittently.

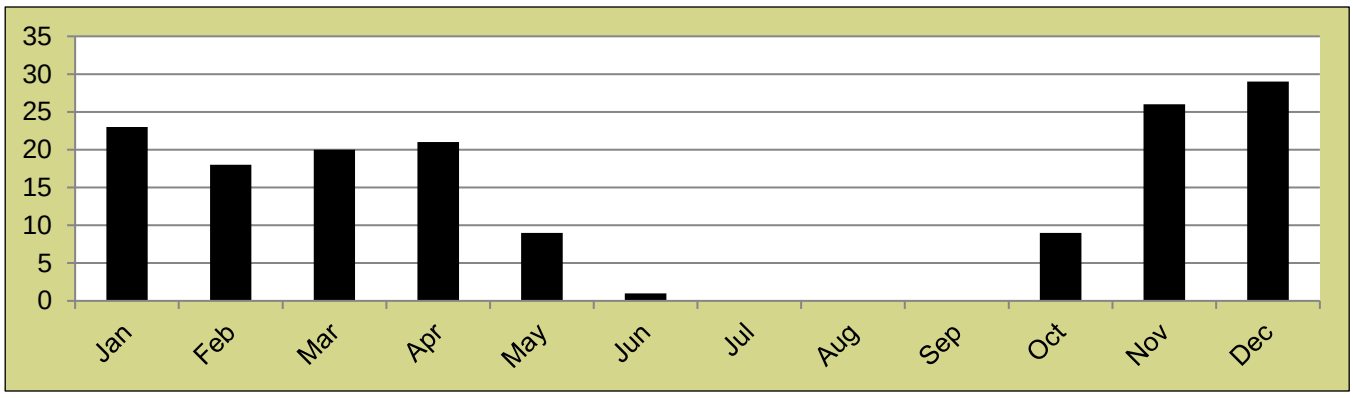
This plan defines winter storms as a combination of the following winter weather effects as defined by NOAA and the NWS.

Ice Storm: An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually accumulations of ¼" or greater.

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

Winter Storm: Hazardous winter weather in the form of heavy snow, heavy freezing rain, or heavy sleet. May also include extremely low temperatures and increased wind.

Chart X – Winter Storms per Month, Glacier County (1996 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

4.3.2 – Location & Extent

Winter storms occur intermittently throughout Glacier County and Cut Bank and often affect the entire planning area. These events occur on a massive geographic scale, often affecting multiple counties, regions, and states.

Winter storms typically form with warning and are often anticipated. Like other large storm fronts, the severity of a storm is not as easily predicted and when it is, the window of notification is up to few hours to under an hour. Although meteorologists estimate the amount of snowfall a winter storm will drop, it is not known exactly how many feet of snow will fall, whether or not it will form an ice storm, or how powerful the winds will be until the storm is already affecting a community.

Winter storms can range from moderate snow over a few hours to blizzard conditions with high winds, freezing rain or sleet, heavy snowfall with blinding wind-driven snow and extremely cold temperatures that last several days.

Historically, the planning area will typically receive an average of 6 inches during a winter storm, but in the most extreme cases can see up to 3 to 4 feet over the plains of the county and 5 to 8 feet in the western mountains. Neither Glacier County nor Cut Bank have recorded ice storm impacts, but ice storms have been recorded in neighboring communities. Based on these historical values, Glacier County and Cut Bank should be prepared to experience an ice storm with accumulation of up 0.25 inches of ice.

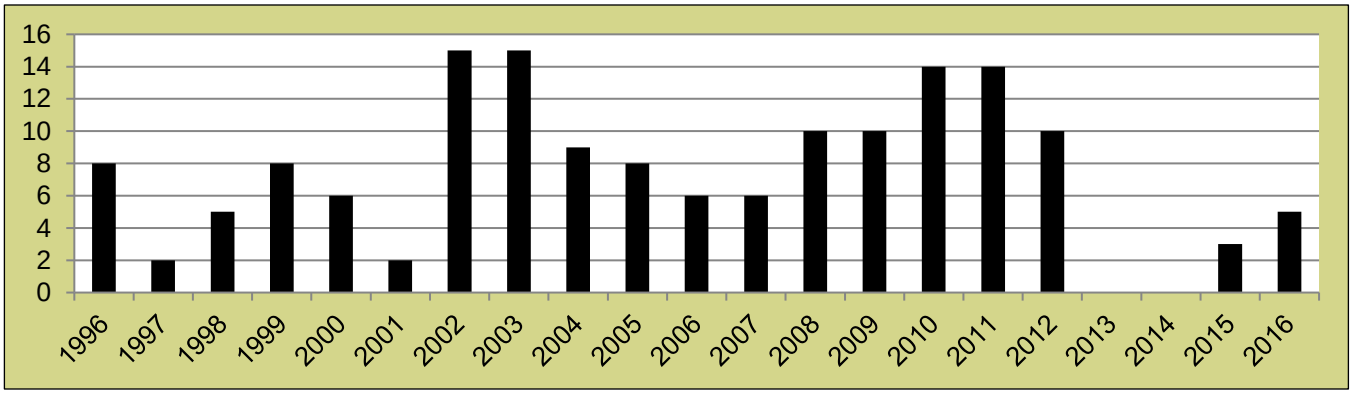
4.3.3 – Previous Occurrences

Glacier County and its participating jurisdictions have recorded only minor injuries and no fatalities from winter storms.

Since 1996, NOAA has recorded 156 winter storms in Glacier County and its participating jurisdictions. Glacier County and its participating jurisdictions have recorded $1,600,000 of property damage from these winter storms.

For a complete list of NOAA recorded winter storm events, please reference Appendix E.

Chart X – Winter Storms per Year, Glacier County (1996 – 2016)



**The data are from the NOAA NCDC Storm Events Database*

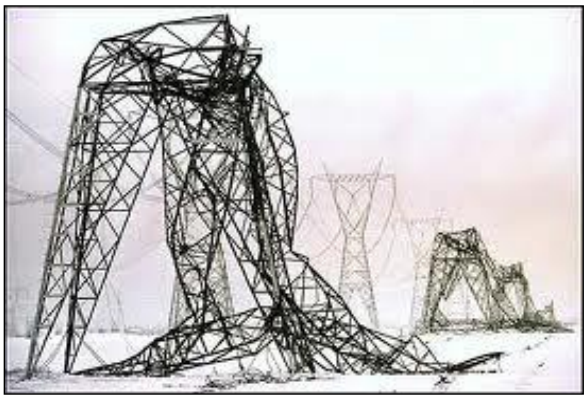
4.3.3A – Probability of Future Events

Glacier County and Cut Bank can expect a winter storm with a 742.86% probability per year, or 7.4286 events per year.

Table 39 – Probability, Winter Storms	
Event Year	**Event Count**
1996	8
1997	2
1998	5
1999	8
2000	6
2001	2
2002	15
2003	15
2004	9
2005	8
2006	6
2007	6
2008	10
2009	10
2010	14
2011	14
2012	10
2013	0
2014	0
2015	3
2016	5
Total Recorded Events =	156
Total Years =	21
Yearly Probability =	**742.86%**

**The data are from the NOAA NCDC Storm Events Database.*

4.3.4 – Assessing Vulnerability & Impact



Winter Storm Impacts

Glacier County and Cut Bank have recorded 156 winter storm events since 1996, of which the range of magnitude can be any combination of winter storms, but will always be considered severe. Based on the future probability in Table 39, Glacier County and Cut Bank can expect 7.4286 winter storms per year which could impact in the form of heavy accumulated snow, accumulated ice, extreme and prolonged cold temperatures, or any combination of the three.

Table 40 – Historical Impacts, Winter Storms	
Count of Events	156
Impacts Per Year	7.43
Average Magnitude	-
Magnitude Range	-
Average Cost	$44,444
Magnitude of Cost	$0 - $1,600,000
Total Recorded Cost	$1,600,000
Average Fatalities	0.00
Total Fatalities	0
Average Injuries	0.00
Total Injuries	0

**The data are from the NOAA NCDC Storm Events Database.*

Vulnerability of Facilities

Structural vulnerability to winter storms is the same throughout Glacier County and Cut Bank. Heavy snow accumulation can cause roofing to collapse on old or poorly constructed facilities. Ice storms will coat a facility's exterior, but is unlikely to cause anything more than superficial damage. Prolonged, extremely cold temperatures can cause significant damage to poorly insulated or heated facilities. The cold temperatures can cause a facility's water pipes and plumbing systems to freeze. As the water in these systems turns to ice it expands and eventually will cause pipes to burst.

Glacier County and Cut Bank's structures are valued at $331,731,000. Since winter storms threaten the entire planning area equally, all municipal structures are considered exposed and vulnerable. Please see the tables on the following page for a breakdown of these values by jurisdiction.

The average winter storm in the planning area costs $44,444, while the existing range of a single incident has been from $0 to $1,600,000.

Table 41 – Vulnerable Structures, Winter Storms					
Jurisdiction	**Agricultural**	**Commercial**	**Government**	**Industrial**	**Residential**
Glacier County	$5,649,000	$13,119,000	$2,558,000	$4,793,000	$56,827,000
Cut Bank	$6,652,000	$86,412,000	$16,378,000	$14,235,000	$125,108,000
Total =	**$12,301,000**	**$99,531,000**	**$18,936,000**	**$19,028,000**	**$181,935,000**

**The data are from FEMA's HAZUS CDMS Database.*

Vulnerability of Population

Glacier County and its participating jurisdictions' population are equally vulnerable throughout the planning area. Glacier County and its participating jurisdictions' citizens are at risk from prolonged, cold temperatures if they fail to be sheltered in an adequately heated structure or are unable to reach shelter. Some structures are dependent on electricity for their heating making them vulnerable if a winter storm causes power outages. Additionally, if a winter storm restricts travel, people may become immobile on roadways and be at the mercy of their vehicle's gas supply. Exposure from winter storms in any of these cases can lead to frostbite and hypothermia. Both of these conditions if untreated can lead to death.

Glacier County and its participating jurisdictions have a total population of 13,647 in 3,324 housing units all of which are highly vulnerable and at risk to winter storms.

Historically, there has been 0 recorded fatalities and 0 injuries relating to winter storms across region wide fronts in Glacier County and Cut Bank.

Table 42 – Vulnerable Populations, Winter Storms

Jurisdiction	Housing Units	Population
Glacier County	1,877	10,762
Cut Bank	1,447	2,885
Total =	**3,324**	**13,647**

**The analysis is derived from U.S. Census Bureau data.*

Vulnerability of Systems

Glacier County and Cut Bank's assets and systems vulnerability to winter storms is the same throughout the planning area. Winter storms create havoc on roads impacting travel from decreased speeds and traffic jams to an ice storm or blowing snow drifts making any travel impossible or extremely dangerous. Additionally, ice storms and snow accumulation can directly bring down power lines or bring down vegetation onto power lines. From these scenarios, Glacier County and Cut Bank can suffer power outages making it difficult to heat structures and exposing its citizens to prolonged cold temperatures.

4.3.4A – Infrastructure & Critical Facilities

All infrastructure and critical facilities are equally at risk, since winter storms indiscriminately affect the entire planning area. A complete list of infrastructure and critical facilities can be found in Appendix D.

4.3.4B – Land Use & Development Trends

Currently, there are no significant development projects in Glacier County or Cut Bank. Additionally, neither municipalities are growing at a significant enough rate to denote a reasonable increase in their hazard vulnerability due to land use, growth, or development trends.

4.3.4C – Unique & Varied Risk

Winter storms have the ability to affect a portion of or the entire planning area. Unfortunately, there is no accurate method of predicting the location or extent of a winter storm's impact, that being, if it will affect one participating jurisdiction up to any number or all participating jurisdictions.

Additionally, it is not possible to predict any varying probability between the participating jurisdictions with the exception of varying risk as it is proportionate to a participating jurisdiction's demographics. Logically, participating jurisdictions with a greater population are at a higher risk as participating jurisdictions with a lower population are at a lower risk.

Although this plan addresses vulnerability to winter storms, without the possibility of being able to calculate all components of risk at a jurisdictional level, each jurisdiction's individual risk to winter storms is not possible to calculate

4.4 – Hazard Risk Summary

The table on the following page outlines each participating jurisdiction's general risk to this plan's profiled hazards. The rankings are based on a composite evaluation of this plan's risk assessment, namely, a hazard's probability of occurring in the future, the vulnerability of a jurisdiction to a particular hazard, the intensity of past hazard impacts, and a joint evaluation of local experts and stakeholders.

Table 43 – Hazard Risk Summary

Jurisdiction	Hazard						
	Droughts	Flash Floods	Riverine Floods	Severe Storms	Tornadoes	Wildland and Brush Fires	Winter Storms
Glacier County	High	Low	Low	Medium	Low	High	Medium
Cut Bank	High	Low	*No Risk*	Medium	Low	High	Medium

4.5 – Excluded Hazards

Dam Failure
Although the Lake Sherburne Dam is classified by the USACE as a 'high hazard' dam and the dam's location is within Glacier County, the spillway gives way to a largely uninhabited area. Glacier County's last plan declares, and this has been verified, that only two residential structures and a gas station are within the potential inundation zone. Any amount of failure by the Lake Sherburne Dam will not reasonably affect Glacier County or Cut Bank.

Earthquakes
Neither the 2014 long-term nor the 2016 short-term induced seismicity models performed by the USGS place Glacier County in a risk area that would constitute reasonable threat or risk to earthquakes.

Landslides
The State of Montana Hazard Mitigation Plan (2013) does not identify Glacier County as at risk from landslides. Additionally, the USGS's landslide risk database corroborates this claim.

Volcanic Eruption
The State of Montana Hazard Mitigation Plan (2013) does not identify Glacier County as at risk from a volcanic eruption. Further, there is no evidence or documentation from USGS that says the planning area is at any risk, reasonable or otherwise, to a volcanic eruption.

Section 5 – Mitigation Strategy

Planning Process

Local Procedures & Resources

Planning Area

Hazard Risk Assessment

Mitigation Strategy

- Mitigation Capabilities
- Floodplain Programs
- Mitigation Goals
- Mitigation Projects
- Mitigation Evaluations & Prioritizations
- Planning Integration

5.1 – Mitigation Capabilities

Each type of stakeholder provides a set of capabilities, in some cases broad and in some cases narrow, by which they can increase the planning area's resiliency.

> ***County and Municipal Governments***
> The broadest form of mitigation capabilities come from the county and municipal governments. Their inherent legal authority allows them to institute the greatest regulatory and developmental changes.

Institutional Capability
Glacier County is a whole community that is capable of implementing the strategies identified herein. In addition, they are capable of promoting the mitigation process and educating the public about the hazards prevalent to their area, as well as mitigation process necessary to mitigate those hazards.

In an emergency, the county and municipality's response is an extraordinary extension of responsibility and action, coupled with normal day-to-day activity. Normal governmental duties will be maintained, with emergency operations carried out by those agencies assigned specific emergency functions under the Glacier County Emergency Operations Plan.

Political Capability
During the process of the development of this plan, opposition to mitigation measures was not evident in Glacier County or with the participating stakeholders. The primary limiting factor is funding, which is made more difficult by the current situation in the local, state, and national economy.

The county, cities, and their partnerships with the participating agencies are well-organized and responsive to community needs. Leadership is informed and remains up-to-date on the hazards that threaten the area. Citizens who did participate in the public meetings and presentations showed an interest in doing things to promote a safer county. Therefore, the county and municipalities (the governing board, staff, and citizen population) appear willing to promote the economic efficiency and social utility of the mitigation measures contained in this plan, if appropriate funding can be identified.

Technical Capability
The participating stakeholders have the basic technology needed to mitigate and respond to natural disasters. They are equipped with telephone and fax lines and a functional Emergency Operations Center in case of disaster. Many key persons are equipped with cellular phones, which can act as a backup to land lines in case service is lost. The county is connected to the Internet, which is a valuable source of information on approaching hazards and mitigation measures. GIS services are limited, but until the municipal governments fully implement GIS standard services, appropriate state agencies provide the necessary support.

Fiscal Capability
The stakeholders in this mitigation plan are not unique in the issues felt by small governments to retain the staff and resources necessary to accomplish the strategies necessary to mitigate the hazards in their area. However, they are aware of potential diverse funding sources available to communities for assisting in the fiscal needs required to implement local hazard mitigation plans, including both government and private programs.

While federal and state programs carry out the bulk of disaster relief programs that provide funds for mitigation, local governments are able to search for alternative funding sources to supplement the local hazard mitigation budget. The participants in the mitigation planning process are aware that before effective mitigation strategies can be applied, stable funding sources and effective incentives must be established on a per project basis to encourage participation by the private and public sectors.

5.1.1 – Authorities & Regulations

General Authority

Montana State law provides the legal authority for local governments to implement regulatory measures. The basis for much of this authority is the local government power designed to protect public health, safety and welfare. This authority enables local government to enact and enforce ordinances, and to define and abate nuisances. Hazard mitigation is a form of protecting public health, safety, and welfare, and falls under the general regulatory powers of local government. This also extends to building codes and inspections, land use, acquisition, and floodplain development regulation.

Building Codes and Inspections

Building codes and inspections provide local governments with the means to maintain county structures that are resilient to natural hazards. Glacier County and each of the participating has adopted the International Building Codes 2012. These codes prescribe minimum standards for building construction, which ensures that new buildings and structures are built to standards that are seismically sound, fire resistant and developed within flood-proofing measures. These codes also require appropriate hazard code updating and compliance when certain thresholds are met for remodel and renovation of existing buildings. These codes also authorize local governments to carry out building inspections to ensure local structures adhere to the minimum state building standards.

Glacier County officials have the primary role of enforcement of the International Building Code structural regulations. The Glacier County Building Department also take part in the inspection process for general public safety, construction, and building inspections. They enforce the appropriate codes both at the plan approval stage and the site inspection stage. Glacier County and its participating jurisdictions are committed to the high standards of building provided through the respective codes, and requires that the same codes and the same enforcement procedures apply during routine permitting procedures as well as following a disaster.

Land Use Planning

Through land use regulatory powers granted by the state, local governments can control the location, density, type and timing of land use and development in the community. Provisions of the land use plans are implemented through regulatory tools that include zoning and subdivision ordinances, and taxation. All participating municipal governments have direct land use planning programs through ordinances, codes, and zoning policies.

Taxation

Taxation can be a powerful mitigation tool by providing local governments with a way to guide development. Tax abatements may be used to encourage landowners and developers to integrate mitigation measures into the process of building new developments and retrofitting existing properties in the floodplain. These tools can be especially effective in encouraging the mitigation of existing structures.

5.1.2 – Floodplain Programs

Both Glacier County and Cut Bank are participants in the National Flood Insurance Program (NFIP). None of the plan's participants are members of the CRS program. The table on the following page contains a list of each community and their NFIP or CRS status.

Floodplain management is the operation of a community program of measures for reducing flood damage. These measures take a variety of forms; and generally include zoning, subdivision, or building requirements, and special-purpose floodplain ordinances. Each participating jurisdiction has codified floodplain development regulations in place.

Each NFIP participating community's floodplain program is administered by the county's floodplain administrator. NFIP Coordinators/Floodplain Administrators utilize by adoption federally created flood hazard maps in order to administer their programs and to actuarially rate new construction for flood insurance or development restrictions.

In Glacier County and Cut Bank, development in a floodplain is restricted. This restriction is enforced through the building permit application process. When an individual or business applies for a construction permit, its location within or outside of an identified floodplain is noted and reviewed by Glacier County's NFIP Coordinator/Floodplain Administrator. This process meets the minimum federal regulations set forth by the NFIP. In the event a property already exists within an identified floodplain, the local NFIP Coordinators/Floodplain Administrators facilitate the purchase of insurance against flood losses through the federal government.

The established floodplain management measures have proven to be successful in restricting current (with the exception of pre-regulation construction that is addressed later in Section 5) and future construction within the planning area's identified floodplains. Glacier County's NFIP Coordinators/Floodplain Administrator does not have plans to enhance or expand their current floodplain development regulations, rather they will maintain the rigorous standards that have been established to prevent future growth within the planning area's identified floodplains. They will accomplish this through the continued enforcement of the regulations and permitting process described above.

Table 44 – NFIP & CRS Community Status

FEMA Community Status Book Report, Montana – Communities Participating in the National Flood Program (9/27/2017)

Jurisdiction	CID	CRS Rating	Initial FHBM Identified	Initial Firm Identified	Current Effective Map Date	Registration/Entry Date
Glacier County	300151	N/A	12/22/77	01/01/90	01/01/90	01/01/90
Cut Bank	300110B	N/A	N/A	N/A	N/A	02/08/17

5.2 – Mitigation Goals

Goals for Glacier County and its participating jurisdictions were established based upon results from the local and state risk assessments, stakeholder meetings, and input from non-planning team local jurisdiction and state officials. These goals represent Glacier County and its participating jurisdictions' long-term vision for the continued reduction of hazard risks and the enhancement of mitigation capabilities.

Goal 1: Reduce the risk from natural hazard events utilizing community cooperation and an all hazards approach.

Goal 2: Pursue additional, complete, and accurate data in support of mitigation planning, disaster preparedness, disaster response, and disaster recovery operations.

Goal 3: Integrate the pre-disaster mitigation plan's findings into the planning, and decision-making processes for all current and future emergency management and preparedness related activities.

Goal 4: Minimize the risk to life and property from dam failures.

Goal 5: Minimize the risk to property from droughts.

Goal 6: Minimize the risk to life and property from floods.

Goal 7: Minimize the risk to life and property from severe storms.

Goal 8: Minimize the risk to life and property from tornadoes.

Goal 9: Minimize the risk to life and property from wildfires.

Goal 10: Minimize the risk to life and property from winter storms.

5.3 – Mitigation Projects

The Glacier County MPC identified a comprehensive range of 19 possible and unique mitigation projects and activities. The selected set carefully takes an all-hazards approach to mitigation while simultaneously addressing each of the individual nine profiled hazards.

The projects and actions were selected based upon their potential to reduce the risk to life and property with an emphasis on new and existing infrastructure, ease of implementation, community and agency support, consistency with local jurisdictions' plans and capabilities, available funding, vulnerability, and total risk. For further information on evaluation criteria, please see Section 5.4. The full list of mitigation projects, their descriptions, and prioritization per jurisdiction and stakeholder can be found in Appendix G.

For the status of mitigation projects since the development of Glacier County's previous pre-disaster mitigation plan please see Section 5.3.2.

The table on the following page summarizes the hazards addressed by each mitigation project and activity, and the corresponding participating jurisdictions suggested to undertake the project or activity.

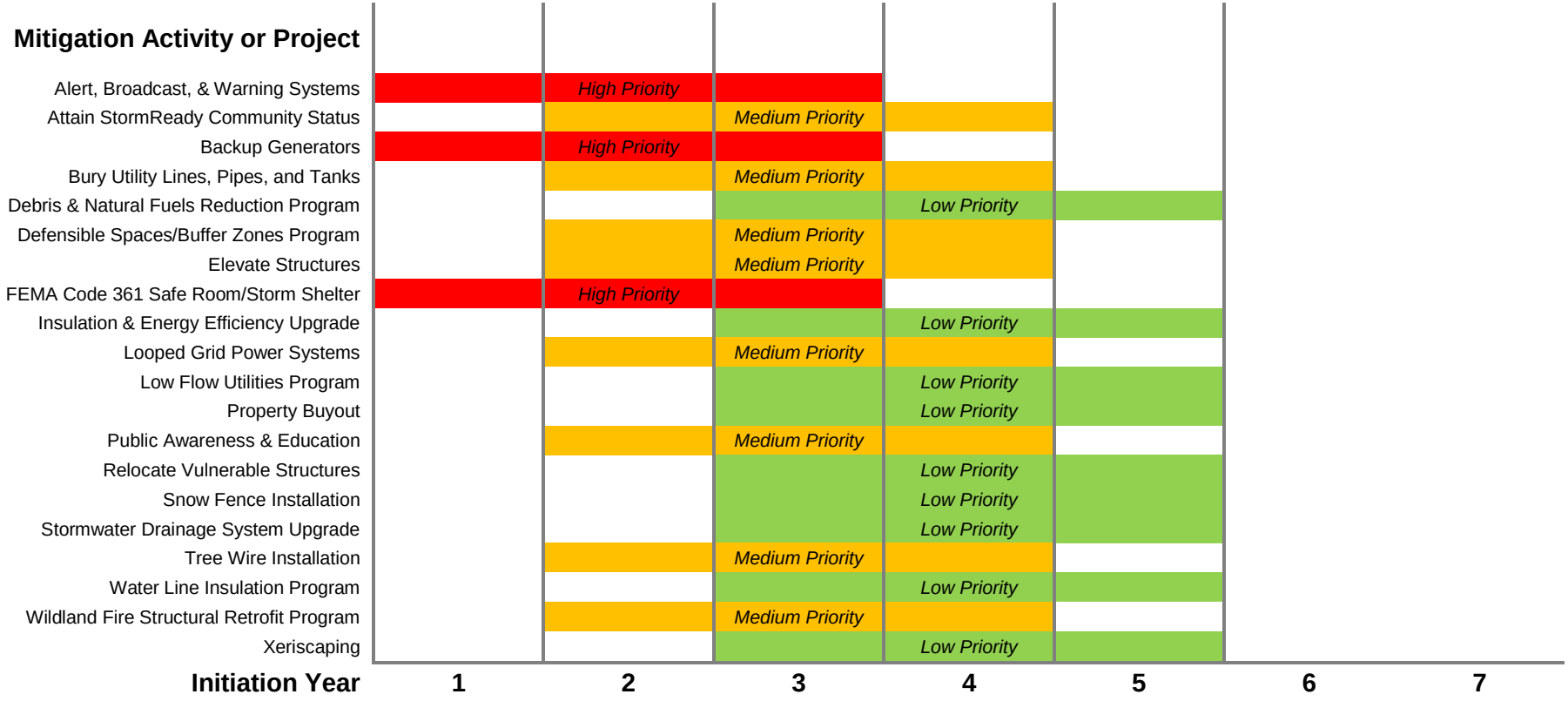
NOTE: Some projects and actions mitigate risk and vulnerability to multiple hazards. Some of these projects and actions list participating jurisdictions that are only at risk from one or a few of the mitigated hazards. For instance, the project: "Transportation Routing Notification Systems" mitigates against multiple hazards, including flash flooding. All participating jurisdictions are interested in this project, but some will not be using it to mitigate flash flooding. Instead they will be using the project to mitigate against severe storms, and winter storms.

Table 45 – Mitigation Projects Summary

Mitigation Project or Activity	Hazards Addressed	Jurisdictions
Alert, Broadcast, & Warning Systems	Dam Failure, Droughts, Floods, Severe Storms, Tornadoes, Wildland Fires, Winter Storms	Cut Bank, Glacier County
Attain StormReady Community Status	Droughts, Floods, Severe Storms, Tornadoes, Winter Storms	Glacier County
Backup Generators	Dam Failure, Droughts, Floods, Severe Storms, Tornadoes, Wildland Fires, Winter Storms	Cut Bank, Glacier County
Bury Utility Lines, Pipes, and Tanks	Severe Storms, Tornadoes, Winter Storms	Cut Bank, Glacier County
Debris & Natural Fuels Reduction Program	Wildland Fires	Cut Bank, Glacier County
Defensible Spaces/Buffer Zones Program	Wildland Fires	Cut Bank, Glacier County
Elevate Structures	Floods	Cut Bank, Glacier County
FEMA Code 361 Safe Room/Storm Shelter	Severe Storms, Tornadoes, Winter Storms	Cut Bank, Glacier County
Insulation & Energy Efficiency Upgrade	Winter Storms	Cut Bank, Glacier County
Looped Grid Power Systems	Severe Storms, Tornadoes, Winter Storms	Cut Bank, Glacier County
Low Flow Utilities Program	Droughts	Cut Bank, Glacier County
Public Awareness & Education	Dam Failure, Droughts, Floods, Severe Storms, Tornadoes, Wildland Fires, Winter Storms	Cut Bank, Glacier County
Relocate Vulnerable Structures	Floods	Cut Bank, Glacier County
Snow Fence Installation	Winter Storms	Cut Bank, Glacier County
Stormwater Drainage System Upgrade	Floods	Cut Bank, Glacier County
Tree Wire Installation	Severe Storms, Tornadoes, Winter Storms	Cut Bank, Glacier County
Water Line Insulation Program	Winter Storms	Cut Bank, Glacier County
Wildland Fire Structural Retrofit Program	Wildland Fires	Cut Bank, Glacier County
Xeriscaping	Droughts	Cut Bank, Glacier County

5.3.1 – Mitigation Projects Timeline

The graph below is a suggested timeline for Glacier County and its participating jurisdictions' implementation of their mitigation projects and activities. The graph's suggestions are based on implementing higher priority projects and activities earlier than lower priority projects and activities. If a project or activity's priority varies for any participating jurisdictions, the jurisdiction is listed below the project name and in italics. This timeline will vary from participating jurisdictions as their individual priorities change. Solid colors indicate a time in which it would be reasonably ideal to begin the project or activity while the shaded values represent a reasonable expectation until the project or activity is finished. This timeline will vary from participating jurisdictions as their individual priorities change. Please see Section 5.5.2 and Appendix G for per jurisdiction mitigation project and action prioritization.



5.3.2 – Mitigation Project Updates

Table 46 – Mitigation Project Updates		
Project (Previous Plan Project Designation)	**Status**	**Justification**
Provide Public Education and Awareness (1.1.1, 1.1.2, 1.1.3, 2.1.2, 3.2.1, 3.2.2, 6.1.1, 7.1.1, 8.1.1, 9.1.1)	Carried Forward	See project in Appendix G – Mitigation Project Prioritization
Acquire Generators and Critical Facilities and Schools (1.2.1)	Carried Forward	See project in Appendix G – Mitigation Project Prioritization
Develop Management Strategies for Post-Winter Storm Cleanup (1.2.2)	Not Included	Not a mitigation project
Install Mile Markers for Rescue Purposes (1.2.3)	Not Included	Not a mitigation project
Bury Power Lines (1.3.1)	Carried Forward	See project in Appendix G – Mitigation Project Prioritization
Install Air Flow Spoilers on Powerlines to Reduce Snow and Ice Buildup (1.3.2)	Completed	Already Installed by Utility Companies
Coordinate Maintenance and Mitigation Activities (1.3.3)	Not Included	Not a mitigation project
Explore Implementing Strong Wind Resistant Building Codes (1.4.1)	Not Included	Not a mitigation project
Promote Educational Programs such as Firewise (2.1.1)	Carried Forward	See project in Appendix G – Mitigation Project Prioritization
Obtain 4-Wheel Drive Vehicles for Hauling Water (2.2.1)	Not Included	Not a mitigation project
Construct Buildings Attached to Fire Hauls for Tenders (2.3.1)	Not Included	Not a mitigation project
Resize Culverts Where Needed to Mitigate Flooding Impacts (3.1.1)	Carried Forward	See project in Appendix G – Mitigation Project Prioritization
Identify Locations Where Culverts are Needed (3.1.2)	Not Included	Not a mitigation project
Construct a Stormwater Management System in Browning (3.3.1)	Not Included	Browning is being de-incorporated
Fortify the Dikes in Browning (3.3.2)	Not Included	Browning is being de-incorporated
Implement a Flood Mitigation Project to Address Flooding in Browning (3.3.3)	Not Included	Not a mitigation project, Browning is being de-incorporated
Provide Public Awareness on Communicable Disease Prevention (4.1.1)	Not Included	Not a mitigation project
Expand Capacity of Healthcare Facilities to Handle an Outbreak (4.2.1)	Not Included	Not a mitigation project
Obtain Mobile Decontamination Trailer (5.1.1)	Not Included	Not a mitigation project
Ensure Responders Receive Adequate Training (5.1.2)	Not Included	Not a mitigation project
Become NWS StormReady (6.1.2)	Carried Forward	See project in Appendix G – Mitigation Project Prioritization
Provide Educational Awareness on Earthquake Hazards (7.1.1)	Not Included	No Reasonable Risk to Earthquakes
Promote Use of Shatter-Proof Window Materials and Tie-Down Techniques (7.2.1)	Not Included	No Reasonable Risk to Earthquakes
Develop Funds and Public Impetus to Improve Water Intake System (8.1.2)	Not Included	Not a mitigation project
Increase NOAA Weather Radio Capabilities (10.1.1, 10.1.2)	Not Included	Not a mitigation project
Promote Awareness on Developing Family Disaster Plans (10.1.3)	Not Included	Not a mitigation project
Promote Awareness on Preparing Disaster Supply Kits (10.1.4)	Not Included	Not a mitigation project
Coordinate with Volunteer Agencies Regarding Shelter Operations (10.2.1)	Not Included	Not a mitigation project
Identify Sponsors for Purchase of NOAA Weather Radios (10.2.2)	Not Included	Not a mitigation project
Assist Critical Facilities in Acquiring NOAA Weather Radios (10.2.3)	Not Included	Not a mitigation project
Secure Browning Water Supply on Snowshed Hill (10.3.1)	Not Included	Not a mitigation project

5.4 – Mitigation Project Evaluations & Prioritization

Glacier County and its participating jurisdictions' primary hazard risks, and thus priorities are flooding, severe storms, wildland and brush fires, and winter storms.

A composite evaluation matrix was used to prioritize Glacier County and its participating jurisdictions' mitigation projects and activities. The evaluation was conducted for each mitigation project and activity for each participating jurisdiction. The composite evaluation matrix is comprised of the three factors detailed below.

The first factor is the STAPLE+E evaluation which is best for measuring feasibility and ease of implementation. The tables in Section 5.4.1 provide the STAPLE+E evaluation criteria and the evaluation itself.

The second factor is the effectiveness of the mitigation project. How well does it mitigate the impact of a particular hazard? This is determined by its ability to protect citizens, property, and systems. For instance, wires installed to pin down trees and other objects will reduce their ability to become uprooted or take flight during hazards of high wind, but are not as effective at reducing impacts from tornadoes or strong winds as are properly constructed and reinforced buildings. This factor is rated as: Low = 0.5, Medium = 1, and High = 1.5.

The third factor is a hazard risk based evaluation. It draws on the hazard risk summary found in Section 4.4 of this plan. Each risk rating is assigned a value based on the assessment (None = 0, Low = 5, Medium = 10, and High = 15). A summary of these results is displayed in Section 5.5.2 while the full, per jurisdiction per hazard tables are located in Appendix G.

$$(HRT) = (HR_1 + HR_2 + HR_n)$$

The total evaluation score is based on the hazard risk total multiplied by the effectiveness factor, added to the STAPLE+E score.

> ***Hazard Risk Total (HRT):*** The sum of values (low through high) of each hazard the project is designed to mitigate.
> ***Mitigation Project Effectiveness (MPE):*** A multiplier based on the project's effectiveness to mitigate against a chosen hazard.
> ***STAPLE+E Evaluation:*** A raw score comprised of positive and negative feasibility.

$$(Priority) = (STAPLE+E) + (MPE * HRT)$$

Upon completing the evaluations a composite score is calculated and prioritized based on their total score (Low = 0 – 25, Medium = 26 – 50, High = > 50).

5.4.1 – STAPLE+E

Table 47 – STAPLE+E Criteria	
Evaluation Category	**Sources of Information**
Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the communities' social and cultural values.
Technical	Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.
Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
Economic	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.
Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Table 48 – STAPLE+E Rankings

X = N/A - Even Impact	+ = Positive Influence											- = Negative Influence											
STAPLE+E Criteria	Social		Technical			Administrative			Political			Legal			Economic				Environmental					
Considerations	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contribute to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Goals	Consistent with Federal Laws	Total Impact
Alert, Broadcast, & Warning System	+	+	+	-	+	+	-	+	X	X	X	+	+	+	+	+	+	-	X	X	X	+	+	14
Attain StormReady Community Status	+	+	+	-	+	+	-	+	X	X	X	+	+	+	+	+	+	-	X	X	X	+	+	14
Backup Generators	+	+	+	+	+	+	-	-	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	13
Bury Utility Lines, Pipes, & Tanks	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	14
Debris & Natural Fuels Reduction Program	+	+	+	-	+	-	-	-	X	X	X	+	+	+	+	+	+	+	X	X	X	+	+	13
Defensible Spaces/Buffer Zones Program	+	+	+	-	+	+	-	-	X	X	X	+	+	+	+	+	+	+	X	X	X	+	+	14
Elevate Structures	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	14
FEMA Code 361 Safe Room/Storm Shelter	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	-	+	-	X	X	X	+	+	16
Insulation & Energy Efficiency Upgrade	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	+	+	-	X	X	X	+	+	15
Looped Grid Power Systems	+	+	+	+	+	-	-	-	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	12
Low Flow Utilities Program	+	+	+	+	+	+	-	+	X	X	X	+	+	+	-	-	+	+	X	X	X	+	+	14
Property Buyout	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	14
Public Awareness & Education Program	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	+	+	+	X	X	X	+	+	16
Relocate Vulnerable Structures	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	14
Snow Fence Installation	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	14
Storm Water Drainage System Upgrade	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	14
Tree Wire Installation	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	+	+	+	X	X	X	+	+	16
Water Line Insulation Program	+	+	+	+	+	+	-	+	X	X	X	+	+	+	+	+	+	-	X	X	X	+	+	15
Wildfire Structural Retrofit Program	+	+	+	-	+	+	-	+	X	X	X	+	+	+	+	-	+	-	X	X	X	+	+	13
Xeriscaping	+	+	+	+	+	+	-	+	X	X	X	+	+	+	-	-	+	+	X	X	X	+	+	14

5.5 – Planning Integration

Mitigation doesn't end at plan approval. Plan approval is only the beginning. The successful implementation of any number of mitigation activities and projects requires the coordination and collaboration of a number of local agency, departments, and organizations. Each group has varying decision-making processes and authorities governing their actions. This plan, once approved, must be integrated into their decision-making processes as a tool for improving their respective resiliencies.

This plan is not only useful for implementing mitigation activities and projects, but is also critical in making development plans and capital improvement projects. The risk assessment in this plan can prevent unmanaged and dangerous development into identified hazard areas or other portions of the planning area that decrease a community's overall resiliency.

Democratic Governments and Boards
These organizations rely on agenda proposals, deliberation and discussion, and voting to solidify their decision-making. This type of decision-making makes up the majority of Glacier County's participating jurisdictions and stakeholders.

This plan should be integrated into agenda proposal's designs and cross-referenced during deliberation and discussion of the proposed activity. By using this plan's risk assessment, development and capital improvement projects can be appropriately implemented taking into consideration a community's resiliency.

The Glacier County PDM will be incorporating into existing planning mechanisms in varying processes. These processes will be tailored to the unique characteristics of the planning mechanism and the governing structure of Glacier County and Cut Bank.

Budget Reviews
Each of the participating local governments conducts an annual budget review for a period of two months (although the dates are not rigid from year to year). Typically they begin in the summer months. During this period, each adopting jurisdiction will review this and future pre-disaster mitigation plans and conduct a feasibility and resiliency review of the suggested mitigation actions and projects.

The Glacier County OEM/DES will assist in the process as needed or requested by the jurisdiction providing grant or other funding opportunities, technical assistance, and other relevant support.

Emergency Management Planning
All participating jurisdictions in the Glacier County PDM, have deferred their emergency management authority to the Glacier County OEM/DES.

> ***Emergency Operations Plans*** – The Glacier County EOP's next update will reflect the most probable and dangerous hazard event scenarios from the PDM's risk assessment. Additionally, the PDM will be added in its entirety as an Appendix to the EOP. This revision is the responsibility of the Glacier County OEM/DES for all of the jurisdictions participating in this plan. Upon revision completion, all participating jurisdictions and appropriate emergency services will be notified of the revisions and sent out new copies of the EOP.
>
> ***State of Montana Multi-Hazard Mitigation Plan*** – The state's HMP is required by FEMA regulations to include assessments and integration of local and tribal PDMs. The process of integrating the Glacier County PDM into this plan is already an established process and is managed by MTDES.

Infrastructure, Development & Construction Projects
All jurisdictions in Glacier County approach infrastructure, development, and construction projects in the same way. The demographics Glacier County allows for planning to exist only through collaboration with their LEPC.

Glacier County Local Emergency Planning Committee (LEPC)
The Glacier County LEPC is a conduit for all mitigation actions and projects. It is headed by the Glacier County OEM/DES and meets monthly, although there is flexibility in their schedule. Their meetings are held in the Glacier County Annex/EOC. Members of the LEPC come from all jurisdictions and a wide variety of local agencies and departments.

Mitigation Projects & Actions Implementation
Upon adoption of a PDM or other EM related plans, the Glacier County OEM/DES will notify all participating jurisdictions when the next LEPC meeting topic will be reviewing mitigation project and action selections. Each jurisdiction then approves a list of mitigation actions and projects they want to pursue according to the mechanism listed in the table on the following page. During the LEPC meeting, the Glacier County OEM/DES will assist the jurisdictions in determining which grant program and path will be appropriate for the project. After selection, the jurisdictions return to the Glacier County OEM/DES, through the LEPC, for assistance on funding and managing the project. If additional funding is necessary, the jurisdictions will have to return to their community and pass a resolution to secure the funding. The resolution is subject to the process listed in table on the following page.

The Glacier County OEM/DES may assist in every facet from project inception to completion as well as working with other external organizations for tasks such as grant writing, project monitoring, and project management where appropriate.

Capital Improvement & Economic Development Planning
None of the participating jurisdictions currently have capital improvement or economic development plans.

Upon adoption of this plan, the Glacier County OEM/DES will notify each participating jurisdiction's governing authority. The notification will also contain a special notice to incorporate the following procedure to any capital improvement or economic development plans that may be developed in the future.

Upon project conception, the county commissioners, mayors and council members, may contact the Glacier County OEM/DES for funding guidance and grant assistance. In Glacier County and its participating jurisdictions improvement and development projects rely on grant funding. The Glacier County OEM/DES may advise the project proposing jurisdiction on which grant program is appropriate.

Following a funding source decision, the proposals will then be returned to the project proposing jurisdiction and undergo a vote by the appropriate governing body for approval. Upon approval by the governing body, the Glacier County OEM/DES may assist in applying for the grant funding for the new improvement or development project.

Any and all economic development plans initiated or supported by a jurisdiction, will undergo a hazard application process in which all hazard risk assessments from the PDM will be weighed into the benefit cost analysis. This can be done at the local level prior to working with the Glacier County LEPC or OEM/DES, or exist as a known future consideration and requirement. However, if done at the local level, it must be reviewed and approved by the Glacier County LEPC.

Appendix A – Reference Documents

FEDERAL METEOROLOGICAL HANDBOOK No. 1, Surface Weather Observations and Reports
U.S. Department of Commerce / NOAA, 2005

Guidelines and Specifications for Flood Hazard Mapping Partners
FEMA, 2002

Local Mitigation Plan Review Guide
FEMA, 2011

Local Mitigation Planning Handbook
FEMA, 2013

Mitigation Ideas A Resource for Reducing Risk to Natural Hazards
FEMA, 2013

Multi-hazard Loss Estimation Methodology – Flood Model – Hazus-MH – User Manual
FEMA, 2012

Multi-hazard Loss Estimation Methodology – Flood Model – Hazus-MH – Technical Manual
FEMA, 2012

MULTI-HAZARD MITIGATION PLANNING GUIDANCE UNDER THE DISASTER MITIGATION ACT OF 2000
FEMA, 2008

National Mitigation Framework
Department of Homeland Security, 2013

Ready, Set, Go! Montana Wildland Fire Action Guide
Montana Firefighters Association, 2013

Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)
FEMA, 2001

Winter Storms The Deceptive Killers: A Preparedness Guide
U.S. Department of Commerce / FEMA / NOAA / NWS / American Red Cross, 2008

Appendix B – Data Sources

Quantitative Data Sources
FEMA
NOAA NCDC
U.S. Census Bureau
USACE
USGS

Geographic Data Sources
BOLDplanning Inc.
ESRI
FEMA HAZUS (2.0, 2.1)
FEMA NFHL
NOAA NWS Storm Prediction Center
University of Wisconsin – Madison, Department of Forest Ecology and Management
U.S. Census Bureau
USDA SSURGO
USGS

Appendix C – Public Participation

Proudly Chicken dancing, Cameron Croff was part of the powwow at Heart Butte last week, as well as Maynard Kicking Woman and a host of Veterans.

The Heart Butte Veterans celebration honored Ryan Loring and his family during the buffalo stew feed at the Honoring All Veterans event last week.

Glacier County DES invites public to meeting at annex on Dec. 1

Representatives from the Glacier County Disaster and Emergency Services and BOLDplanning Inc., will meet on Thursday, Dec. 1, at 10 a.m. in Cut Bank. The meeting will take place at the Glacier County Courthouse Annex, 1210 East Main meeting room.

This meeting will kick off the development of the Glacier County Hazard Mitigation Plan update. The plan will address the county's natural hazards' vulnerabilities and will comply with state and federal regulations.

The public is encouraged to attend and ask questions, provide input, and express any concerns they may have.

Glacier Reporter 11-16-2016

prestressed concrete bulb-tee beams and W740 metal guardrail. The beams will be founded on a new stub abutment substructure. The stub abutment foundation consists of a cast-in-place concrete cap, backwall and wingwalls supported on driven steel piles. Glacier Engineering, 406-922-8594.

Glacier County is an Equal Opportunity Employer.

Michael J. DesRosier
Chairman, Glacier County Commission

Publish: Nov. 9, 16, 2016
MNAXLP

Glacier County DES invites public to meeting at annex on Dec. 1

Representatives from the Glacier County Disaster and Emergency Services and BOLDplanning Inc., will meet on Thursday, Dec. 1, at 10 a.m. in Cut Bank. The meeting will take place at the Glacier County Courthouse Annex, 1210 East Main meeting room.

This meeting will kick off the development of the Glacier County Hazard Mitigation Plan update. The plan will address the county's natural hazards' vulnerabilities and will comply with state and federal regulations.

The public is encouraged to attend and ask questions, provide input, and express any concerns they may have.

and will provide information on effective ways to quit permanently, including information on the Montana Tobacco Quit Line."

Tobacco users who call the Montana Tobacco Quit Line are 7 to 10 times more likely to quit. The Montana Tobacco Quit Line at 1-800-QUIT-

Blood drawing to be held today

A blood drawing is being held today, Wednesday, Nov. 16, from 11:30 a.m. until 5:30 p.m. The blood drawing started at 11:30 a.m. to accommodate the rush at noon.

If you would like to make an appointment, call Landis at 521-0174 or 873-2151.

Blackfeet Nation closes all waters to watercraft

The Blackfeet Nation will close all of its waters until further notice due to the recent announcement by Montana Fish, Wildlife and Parks that Tiber Reservoir tested positive for invasive mussel veligers. Canyon Ferry was announced as "suspect" for mussels. The closure will go into effect immediately, and may be lifted in whole or part as detection teams are deployed to determine which Blackfeet waters, if any, have been infected by either Tiber or Canyon Ferry.

The closure will ban both motorized and non-motorized craft, but fishing from the banks of Blackfeet waters will still be permitted.

Dona Rutherford, the Director of the Blackfeet Fish and Wildlife Department explained that the closure is necessary to protect Blackfeet waters from contamination. "Until the Blackfeet ascertain which if any of our waters have been impacted, this precautionary step will ensure that unimpaired waters retain their current mussel-free status," said Rutherford.

In 2015, the Blackfeet adopted Ordinance 113, which required all watercraft - motorized and non-motorized - to be inspected prior to launching on Blackfeet waters. In that same year, the Blackfeet, in partnership with the Flathead Basin Commission, opened the first Tribal watercraft inspection station (WIS) in Montana in Browning on Highway 2. In 2016, a second WIS was opened in Seville, outside of Cut Bank.

"In 2017, we will need to significantly increase our efforts if we are to be successful at preventing mussel introductions within the boundaries of the Blackfeet Reservation," said Tyson Running Wolf, Tribal Business Council. The Blackfeet will be evaluating steps that need to be taken in 2017 to beef up their existing AIS prevention effort.

Ordinance 113 is the most protective statute of its kind in Montana, and it is hoped that it can be used as the model for the state in developing more protection AIS legislation during the 2017 session.

For further information contact Dona Rutherford, Director of Blackfeet Fish and Wildlife, at 338-7207.

Pioneer Press 11-16-2016

BOLD planning

Sign In Sheet

Plan: Glacier Co. HMP | Hazard Mitigation Planning Meeting | Date: Dec 1, 2016

Name Jurisdiction	Department Position	Phone # e-Mail Address
Tony Goetz	BOLDplanning - Mitigation Planner	tony@boldplanning.com
John Taylor	Bold Planning	john.taylor@boldplanning.com
LeAnn Hermance	Pondera Co DES	pondes@3rivers.net
Michael Hoffman	Quality & Risk Manager	mhoffman@nrmcinc.org
Courtney Eberhardy	Two Medicine Area Ranger, Glacier National Park	courtney_Eberhardy@nps.gov
Carae McDivitt	Glacier County Public Health	cmcdivitt@glaciercountymt.org.
Betsy Seglem Glacier Community Health	~~Director~~ Operations Compliance Coordinator	bseglem@glaciercha.org 873-5870
Robert Lucas (C)		
Patrick Stramad (E)		
Charles Farmer OES Glacier County		
Ron Anderson	Glac Co Sanitarian	rander@3rivers.net 868-4957
LANDIS KREEKS		
RED CROSS GLACIER COUNTY		

JURISDICTION USING SOFT MATCH: Glacier County

POINT OF CONTACT OR LEAD INSTRUCTOR: Charles Farmer

EVENT NAME: PDM Training - City of Cut Bank

LOCATION: Cut Bank City Hall

DATE AND TIME: February 21, 2017 ~~1:30~~ 6:30 pm CONTACT HOURS: 1 Page: 1

Montana DES Training / Event Roster

LEAVE SHADED AREA BLANK

Name /Title: / Organization:	E-mail or Phone #: / Address:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 53.5 per mile	2015 Hourly $ for Volunteers $23.56	Total Soft Match
Timothy Curtiss City Council	620 4th St SE Cut Bank	Yes (No)		1		23.56	23.56
Donovan Grubb Cut Bank City Council	125 1ST AVE SW, Cut Bank, MT	Yes (No)		1		23.56	23.56
Tyson Michaels Cut Bank City Council	308 8th Ave SE. Cut Bank, MT	Yes (No)		1		23.56	23.56
Tim Kipp Cut Bank City Council	702 1st ST S.E. Cut Bank MT	Yes (No)		1		23.56	23.56
Linda Burley City of Cut Bank	221 W Main, Cut Bank MT	Yes (No)		1		23.56	23.56
Dan Rasmussen/Mayor City of Cut Bank	580 6th Ave SE, Cut Bank, MT	Yes (No)		1		23.56	23.56
James Suta City Superintendent City of Cut Bank	221 W Main, Cut Bank MT	Yes (No)		1		23.56	23.56

Total Pg 1 - - - $ 164.92

JURISDICTION USING SOFT MATCH: Glacier County

POINT OF CONTACT OR LEAD INSTRUCTOR: Charles Farmer

EVENT NAME: PDM Training - City of Cut Bank

LOCATION: Cut Bank City Hall

DATE AND TIME: February 21, 2017 ~~1:30 pm~~ 6:30 pm CONTACT HOURS: 1 Page: 2

Montana DES Training / Event Roster

LEAVE SHADED AREA BLANK

Name /Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 53.5 per mile	2015 Hourly $ for Volunteers $23.56	Total Soft Match
Robert A. Smith - City Attorney	406-873-2669						
	Address: 113 East Main St. C.B. MT 59427	Yes / No		1		23.56	23.56
Name / Title:	**E-mail or Phone #:**	**EMPG/Fed Funded?**	**Est R/T Miles**	**Est Total Hours**	**$ 53.5 per mile**	**2015 Hourly $ for Volunteers $23.56**	**Total Soft Match**
Michael Schultz Chief of Police	MSCHULTZ@CITYOFCUTBANK.ORG						
Organization:	Address: 113 E. MAIN ST. CUT BANK	Yes / No		1		23.56	23.56
Name /Title:	**E-mail or Phone #:**	**EMPG/Fed Funded?**	**Est R/T Miles**	**Est Total Hours**	**$ 53.5 per mile**	**2015 Hourly $ for Volunteers $23.56**	**Total Soft Match**
Charles Farmer	des@glaciercountymt.org						
Organization: Glacier County DES	Address: 512 E. Main St. Cut Bank, MT 59427	Yes / No	N/A	1			~~0~~
Name / Title:	**E-mail or Phone #:**	**EMPG/Fed Funded?**	**Est R/T Miles**	**Est Total Hours**	**$ 53.5 per mile**	**2015 Hourly $ for Volunteers $23.56**	**Total Soft Match**
Organization:	Address:	Yes / No					
Name /Title:	**E-mail or Phone #:**	**EMPG/Fed Funded?**	**Est R/T Miles**	**Est Total Hours**	**$ 53.5 per mile**	**2015 Hourly $ for Volunteers $23.56**	**Total Soft Match**
Organization:	Address:	Yes / No					
Name / Title:	**E-mail or Phone #:**	**EMPG/Fed Funded?**	**Est R/T Miles**	**Est Total Hours**	**$ 53.5 per mile**	**2015 Hourly $ for Volunteers $23.56**	**Total Soft Match**
Organization:	Address:	Yes / No					
Name /Title:	**E-mail or Phone #:**	**EMPG/Fed Funded?**	**Est R/T Miles**	**Est Total Hours**	**$ 53.5 per mile**	**2015 Hourly $ for Volunteers $23.56**	**Total Soft Match**
Organization:	Address:	Yes / No					

Total Pg 2 @ 47.12
Total Pg 1 164.92
Grand Total --- @ 212.04

JURISDICTION USING SOFT MATCH: Glacier County

POINT OF CONTACT OR LEAD INSTRUCTOR: Charles Farmer

EVENT NAME: PDM Briefing - Planning Team

LOCATION: Glacier County Voting Center

DATE AND TIME: April 5, 2016 9:00 am CONTACT HOURS: 1.5 Page: 1

Montana DES Training / Event Roster

LEAVE SHADED AREA BLANK

Name / Title: / Organization:	E-mail or Phone #: / Address:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0.54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
[illegible] / [illegible]	[illegible] / 312 1st AVE S.E. Cut Bank, MT [illegible]	Yes / No				23.07	
Darryl Omsberg / Co. Supt. of Schools	darryldo@bresnan.net / Annex Bldg	Yes / (No)				23.07	
Dennis Seglem / Museum	/ P.O. Box 536	Yes / (No)				23.07	
Shannon Pepion / Maintenance	spepion@glaciercountymt.org /	Yes / (No)				23.07	
John Evans / Roads	GCRD35@gmail.com /	Yes / (No)				23.07	
Janine Scott / Clerk of Dist Ct	jascott@mt.gov /	Yes / (No)				23.07	
Kari Lewis / MSU Extension	Kari.lewis@montana.edu /	Yes / (No)				23.07	

JURISDICTION USING SOFT MATCH: Glacier County

POINT OF CONTACT OR LEAD INSTRUCTOR: Charles Farmer

EVENT NAME: PDM Briefing - Planning Team

LOCATION: Glacier County Voting Center

DATE AND TIME: April 5, 2016 9:00 am CONTACT HOURS: 1.5 Page: 2

Montana DES Training / Event Roster

LEAVE SHADED AREA BLANK

Name /Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0 .54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
Cicily Calfbossribs	CCalfbossribs@glaciercountymt.org					23.07	
Clerk + Recorder's	Address:	Yes / No					
Name / Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0 .54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
Tom McKay	crazycoyote_tom@yahoo.com					23.07	
Organization: County Commissioner	Address: Box 72 Browning, MT 59417	Yes / No					
Name /Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0 .54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
Glenda M. Hall	gmhall@glaciercountymt.org					23.07	
Organization: Clerk + Recorder	Address: 512 E. Main, Cut Bank	Yes / No					
Name / Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0 .54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
Charles Farmer	des@glaciercountymt.org					23.07	
Organization: Glacier County DES	Address: 512 E. main st. Cut Bank, MT 59427	Yes / No					
Name /Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0 .54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
						23.07	
Organization:	Address:	Yes / No					
Name / Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0 .54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
						23.07	
Organization:	Address:	Yes / No					
Name /Title:	E-mail or Phone #:	EMPG/Fed Funded?	Est R/T Miles	Est Total Hours	$ 0 .54 per mile	2015 Hourly $ for Volunteers	Total Soft Match
						23.07	
Organization:	Address:	Yes / No					

Glacier County

PDM Tr.
Plannin Team Mtg

Date: 4/5/16

~~2015~~ Commissioner Meetings
Attendance Roster

Title	Name	Present	Notes
Commissioner	Michael DesRosier	✓	
Commissioner	Ron Rides At The Door	—	
Commissioner	Tom McKay	✓	
Clerk & Recorder	Glenda M. Hall	✓	
Minutes Clerk	Cicily Calfbossribs	✓	
Roads	John Evans	✓	
EMS	Amie Allison	✓	
Museum	Dennis Segler	✓	
Maintenance	Shannon Pepion	✓	
Supt. of Schools	Daryl Omsberg	✓	
Clerk of Dist Ct	Janine R Scott	✓	
DES	Charles Farmer	✓	
MSU Extension	Kari Lewis	✓	
public	Joyce Lewis	✓	
"	Carol Larson	✓	
P	Annie Taylor	✓	
	Marlene Guardipee	✓	
Public	Vickie Boyce	✓	
Public	Laurie Elgaard	✓	
Public	John Overcast	✓	
Treas Ofc	Gale Gallagher	✓	
Press	Lehhyne Kavanagh		
Public	[illegible]	✓	
public	[illegible]	✓	
	Kathy McLaughlin	✓	
Public	Ron Shaw	✓	
[illegible]	[illegible]	✓	
PUBLIC	Cathy Lauenstein	✓	
"	Byron Lauenstein	✓	
"	Elaine Mitchell	✓	
	Pam Anderson	✓	

Intialed by:__________

Appendix D – Critical Facilities & Infrastructure

Table 49 – Critical Facilities	
Name	**Type**
Geographic Location - Glacier County	
Babb Fire Hall	Fire Prevention
Big Sky Colony	Colony
Browning Fire Hall	Fire Prevention
Cut Bank Airport	Utility
Cut Bank Sewage Treatment Plant	Utility
Cut Bank Water Plant	Utility
East Glacier Fire Hall	Fire Prevention
Glacier County Museum	Municipal
Glacier Colony	Colony
Glacier County Roads Garage	Municipal
Glacier County Roads Garage #2	Municipal
Glendale Colony	Colony
Hidden Lake Colony	Colony
Horizon Colony	Colony
Santa Rita Tower	Utility
Seville Colony	Colony
Geographic Location - Cut Bank	
Anna Jeffries Elementary	School
BeeHive Homes	Long-Term Care
Cut Bank City Hall	Municipal
Cut Bank Civic Center	Shelter
Cut Bank Fire Hall	Fire Prevention
Cut Bank High School	School
Cut Bank Junior High	School
Cut Bank Police Department	Police
Cut Bank Villas	Long-Term Care
Cut Bank Voting Center	Municipal
Glacier Care Center	Long-Term Care
Glacier Community Health Center	Medical
Glacier County Annex/EOC	Municipal
Glacier County Courthouse	Municipal
Glacier County Electric CoOp	Utility
Glacier County EMS	Medical
Glacier County Library	Municipal
Glacier County Sheriff's Office	Police
Glacier Ridge Apartments	Long-Term Care
HC Davis Elementary	School
LDS Church	Shelter
Methodist Church	Shelter
Northern Rockies Medical Center	Hospital
Northwestern Energy	Utility
Presbyterian Church	Shelter

Appendix E – Hazard Event Records

Table 50 – Drought Records, Glacier County, Montana

77 Drought event(s) were reported in Glacier County, Montana between 01/01/2004 and 01/01/2017

Mag: Magnitude (Wind speed in MpH) Dth: Deaths Inj: Injuries

PrD: Property Damage (US Dollars) CrD: Crop Damage (US Dollars)

Location	Date	Mag	Dth	Inj	PrD	CrD
Glacier County	3/1/2004	Severely Dry	0	0	$0	$0
Glacier County	4/1/2004	Severely Dry	0	0	$0	$0
Glacier County	5/1/2004	Severely Dry	0	0	$0	$0
Glacier County	6/1/2004	Severely Dry	0	0	$0	$0
Glacier County	7/1/2004	Severely Dry	0	0	$0	$0
Glacier County	8/1/2004	Severely Dry	0	0	$0	$0
Glacier County	9/1/2004	Moderately Dry	0	0	$0	$0
Glacier County	10/1/2004	Severely Dry	0	0	$0	$0
Glacier County	4/1/2005	Severely Dry	0	0	$0	$0
Glacier County	5/1/2005	Severely Dry	0	0	$0	$0
Glacier County	6/1/2005	Moderately Dry	0	0	$0	$0
Glacier County	8/1/2005	Slightly Dry	0	0	$0	$0
Glacier County	9/1/2005	Moderately Dry	0	0	$0	$0
Glacier County	10/1/2005	Moderately Dry	0	0	$0	$0
Glacier County	11/1/2005	Slightly Dry	0	0	$0	$0
Glacier County	12/1/2005	Slightly Dry	0	0	$0	$0
Glacier County	1/1/2006	Moderately Dry	0	0	$0	$0
Glacier County	2/1/2006	Moderately Dry	0	0	$0	$0
Glacier County	3/1/2006	Moderately Dry	0	0	$0	$0
Glacier County	4/1/2006	Slightly Dry	0	0	$0	$0
Glacier County	5/1/2006	Slightly Dry	0	0	$0	$0
Glacier County	7/1/2006	Slightly Dry	0	0	$0	$0
Glacier County	8/1/2006	Slightly Dry	0	0	$0	$0
Glacier County	9/1/2006	Moderately Dry	0	0	$0	$0
Glacier County	10/1/2006	Moderately Dry	0	0	$0	$0
Glacier County	11/1/2006	Severely Dry	0	0	$0	$0
Glacier County	12/1/2006	Severely Dry	0	0	$0	$0
Glacier County	9/1/2007	Moderately Dry	0	0	$0	$0
Glacier County	10/1/2007	Slightly Dry	0	0	$0	$0
Glacier County	11/1/2007	Slightly Dry	0	0	$0	$0
Glacier County	12/1/2007	Moderately Dry	0	0	$0	$0
Glacier County	11/1/2008	Extremely Dry	0	0	$0	$0
Glacier County	12/1/2008	Extremely Dry	0	0	$0	$0
Glacier County	1/1/2009	Extremely Dry	0	0	$0	$0
Glacier County	2/1/2009	Severely Dry	0	0	$0	$0
Glacier County	3/1/2009	Severely Dry	0	0	$0	$0
Glacier County	4/1/2009	Moderately Dry	0	0	$0	$0
Glacier County	5/1/2009	Slightly Dry	0	0	$0	$0
Glacier County	6/1/2009	Moderately Dry	0	0	$0	$0
Glacier County	7/1/2009	Slightly Dry	0	0	$0	$0
Glacier County	8/1/2009	Slightly Dry	0	0	$0	$0
Glacier County	12/1/2009	Slightly Dry	0	0	$0	$0
Glacier County	1/1/2010	Slightly Dry	0	0	$0	$0
Glacier County	2/1/2010	Slightly Dry	0	0	$0	$0
Glacier County	3/1/2010	Moderately Dry	0	0	$0	$0
Glacier County	4/1/2010	Moderately Dry	0	0	$0	$0

Location	Date	Mag	Dth	Inj	PrD	CrD
Glacier County	5/1/2010	Moderately Dry	0	0	$0	$0
Glacier County	6/1/2010	Slightly Dry	0	0	$0	$0
Glacier County	9/1/2011	Slightly Dry	0	0	$0	$0
Glacier County	7/1/2012	Slightly Dry	0	0	$0	$0
Glacier County	8/1/2012	Moderately Dry	0	0	$0	$0
Glacier County	9/1/2012	Moderately Dry	0	0	$0	$0
Glacier County	10/1/2012	Moderately Dry	0	0	$0	$0
Glacier County	1/1/2013	Moderately Dry	0	0	$0	$0
Glacier County	2/1/2013	Slightly Dry	0	0	$0	$0
Glacier County	5/1/2015	Slightly Dry	0	0	$0	$0
Glacier County	6/1/2015	Slightly Dry	0	0	$0	$0
Glacier County	7/1/2015	Slightly Dry	0	0	$0	$0
Glacier County	8/1/2015	Slightly Dry	0	0	$0	$0
Glacier County	9/1/2015	Slightly Dry	0	0	$0	$0
Glacier County	10/1/2015	Slightly Dry	0	0	$0	$0
Glacier County	11/1/2015	Slightly Dry	0	0	$0	$0
Glacier County	12/1/2015	Moderately Dry	0	0	$0	$0
Glacier County	1/1/2016	Extremely Dry	0	0	$0	$0
Glacier County	2/1/2016	Extremely Dry	0	0	$0	$0
Glacier County	3/1/2016	Extremely Dry	0	0	$0	$0
Glacier County	4/1/2016	Extremely Dry	0	0	$0	$0
Glacier County	5/1/2016	Extremely Dry	0	0	$0	$0
Glacier County	6/1/2016	Moderately Dry	0	0	$0	$0
Glacier County	7/1/2016	Moderately Dry	0	0	$0	$0
Glacier County	8/1/2016	Moderately Dry	0	0	$0	$0
Glacier County	9/1/2016	Slightly Dry	0	0	$0	$0
Glacier County	4/30/2016	Moderately Dry	0	0	$0	$0
Glacier County	5/31/2016	Moderately Dry	0	0	$0	$0
Glacier County	6/30/2016	Moderately Dry	0	0	$0	$0
Glacier County	7/31/2016	Moderately Dry	0	0	$0	$0
Glacier County	8/31/2016	Moderately Dry	0	0	$0	$0
		County Totals	**0**	**0**	**$0**	**$0**

**The data are from the Montana DNRC*

Table 51 – Flash Flood Records, Glacier County, Montana

2 Flash Flood event(s) were reported in Glacier County, Montana between 06/06/2002 and 01/01/2017

Mag: Magnitude (No Indices) Dth: Deaths Inj: Injuries

PrD: Property Damage (US Dollars) CrD: Crop Damage (US Dollars)

Location	Date	Mag	Dth	Inj	PrD	CrD
West Portion	6/6/2002	-	0	0	$0	$0
Countywide	6/10/2002	-	0	0	$0	$0
		County Totals	**0**	**0**	**$0**	**$0**

**The data are from the NOAA NCDC Storm Events Database.*

Table 52 – Riverine Flood Records, Glacier County, Montana

8 Flood event(s) were reported in Glacier County, Montana between 02/08/1996 and 01/01/2017

Mag: Magnitude (No Indices) Dth: Deaths Inj: Injuries

PrD: Property Damage (US Dollars) CrD: Crop Damage (US Dollars)

Location	Date	Mag	Dth	Inj	PrD	CrD
Glacier County	2/8/1996	-	0	0	$0	$0
Glacier County	3/15/1996	-	0	0	$0	$0
Glacier County	6/7/1996	-	0	0	$0	$0
Cutbank	3/20/1997	-	0	0	$0	$0
St. Mary	5/23/2008	-	0	0	$0	$0
Browning Starr Airport	5/24/2011	-	0	0	$0	$0
Kiowa	6/7/2011	-	0	0	$0	$0
Del Bonita	6/18/2014	-	0	0	$0	$0
		County Totals	**0**	**0**	**$0**	**$0**

**The data are from the NOAA NCDC Storm Events Database.*

Table 53 – Hail Records, Glacier County, Montana

55 Hail event(s) were reported in Glacier County, Montana between 08/10/1957 and 01/01/2017

Mag: Magnitude (Diameter in inches) Dth: Deaths Inj: Injuries

PrD: Property Damage (US Dollars) CrD: Crop Damage (US Dollars)

Location	Date	Mag	Dth	Inj	PrD	CrD
Glacier County	8/10/1957	1.25	0	0	$0	$0
Glacier County	7/20/1959	1	0	0	$0	$0
Glacier County	5/29/1966	0.75	0	0	$0	$0
Glacier County	6/30/1976	1	0	0	$0	$0
Glacier County	6/28/1988	1.75	0	0	$0	$0
Glacier County	6/28/1988	0.75	0	0	$0	$0
Glacier County	6/29/1991	1.75	0	0	$0	$0
Glacier County	7/28/1992	1.75	0	0	$0	$0
Glacier County	8/1/1992	1.75	0	0	$0	$0
Cut Bank	7/18/1994	1.25	0	0	$5,000	$0
Cut Bank	7/26/1996	1	0	0	$0	$0
Santa Rita	7/26/1996	1.75	0	0	$0	$0
Cutbank	8/4/2000	0.75	0	0	$0	$0
Del Bonita	8/4/2000	1.75	0	0	$0	$0
Cutbank	8/30/2002	1.75	0	0	$0	$0
Cutbank	6/10/2003	1.75	0	0	$0	$0
Cutbank	6/10/2003	0.75	0	0	$0	$0
Babb	6/23/2004	1.5	0	0	$0	$0
Kiowa	6/23/2004	0.75	0	0	$0	$0
Browning	8/9/2005	0.75	0	0	$0	$0
Browning	6/13/2006	0.88	0	0	$0	$0
Babb	6/13/2006	1	0	0	$0	$0
East Glacier Park	7/3/2006	1.75	0	0	$0	$0
East Glacier Park	7/3/2006	1.75	0	0	$0	$0
Cutbank	6/16/2007	1	0	0	$0	$0
Blackfoot	6/29/2007	1.75	0	0	$0	$0
East Glacier Park	7/4/2008	0.75	0	0	$0	$0
Cutbank	7/26/2008	0.75	0	0	$0	$0

Location	Date	Mag	Dth	Inj	PrD	CrD
Browning	7/4/2009	1	0	0	$0	$0
Browning	7/10/2010	1.75	0	0	$0	$0
Browning	7/10/2010	1	0	0	$0	$0
St Mary	7/19/2010	1	0	0	$0	$0
St Mary	7/19/2010	1	0	0	$0	$0
Browning	7/19/2010	1.5	0	0	$0	$0
Cutbank	7/19/2010	1	0	0	$0	$0
Cutbank	7/19/2010	1	0	0	$0	$0
Browning	6/26/2012	1.75	0	0	$0	$0
Santa Rita	7/26/2012	1.75	0	0	$0	$0
Browning	6/18/2013	1.75	0	0	$0	$0
Browning	6/18/2013	1.75	0	0	$0	$0
Browning	6/18/2013	1	0	0	$0	$0
St Mary	6/18/2013	1	0	0	$0	$0
Cutbank	7/5/2013	1	0	0	$0	$0
Santa Rita	7/7/2013	1.5	0	0	$0	$0
Cutbank	7/17/2013	1	0	0	$0	$0
Babb	7/24/2013	1.5	0	0	$0	$0
Babb	7/24/2013	1	0	0	$0	$0
(Ctb)Cutbank Muni Airport	7/24/2013	1	0	0	$0	$0
Cutbank	7/24/2013	1	0	0	$0	$0
Santa Rita	7/28/2013	1	0	0	$0	$0
Cutbank	8/5/2013	1	0	0	$0	$0
Babb	8/10/2013	1	0	0	$0	$0
Babb	7/10/2014	1	0	0	$0	$0
Cutbank	6/30/2016	1	0	0	$0	$0
Cutbank	8/14/2016	1	0	0	$0	$0
		County Totals	**0**	**0**	**$5,000**	**$0**

**The data are from the NOAA NCDC Storm Events Database.*

Appendix F – Mitigation Projects

#1 – Alert, Broadcast, & Warning Systems Upgrade			
Description	The jurisdictions will continue to improve their alert, broadcast, and warning systems to give information and instructions in the face of an impending hazard impact to prevent injury and property damage. These systems will allow citizens to better protect themselves in the event of an impending or potentially impending hazard. Additionally, hazard or weather specific information can be delivered to assist in achieving the previously stated goal.		
Hazard/s Addressed	Dam Failure, Floods, Severe Storms, Tornadoes, Wildland Fires, Winter Storms		
Status	On-going & Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$50,000 - $200,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	High	Cut Bank	Medium

#2 – Attain StormReady Community Status			
Description	The NWS' Storm Ready Community Program helps arm America's Communities with communication and safety skills needed to save lives and property before and during an event. StormReady helps community leaders and emergency managers strengthen local safety programs from severe weather through advanced planning, education, and awareness.		
Hazard/s Addressed	Droughts, Floods, Severe Storms, Tornadoes, Wildland Fires, Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	N/A	**Cost Estimate**	$0
Lead Department/s	Glacier County OEM/DES	**Effectiveness**	Low
Jurisdictional Priority			
Glacier County	Medium	Cut Bank	Medium

#3 – Backup Generators			
Description	Backup generators provide critical facilities with electricity in the event a community's electrical transmission grid is either damaged by earthquakes, severe storms, tornadoes, or winter storms, or overloaded by excessive use during an extreme heat or a winter storm.		
Hazard/s Addressed	Dam Failure, Floods, Severe Storms, Tornadoes, Wildland Fires, Winter Storms		
Status	On-going & Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$25,000 - $50,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	High	Cut Bank	Medium

#4 – Bury Utility Lines, Pipes, & Tanks			
Description	Transferring existing utilities lines, pipes, and chemical storage tanks from above ground to below ground will significantly reduce the amount of property damage incurred from wind, ice, and snow related events.		
Hazard/s Addressed	Severe Storms, Tornadoes, Winter Storms		
Status	On-going & Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$10,000 - $50,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	Medium	Cut Bank	Medium

#5 – Dam Repair & Retrofit			
Description	Undergoing much need structural repair and retrofit will bring them back into compliance as well as strengthening them against future threats.		
Hazard/s Addressed	Dam Failure		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$100,000 - $250,000
Lead Department/s	Glacier County OEM/DES	**Effectiveness**	High
Jurisdictional Priority			
Glacier County	Low	Cut Bank	N/A

#6 – Debris & Natural Fuels Reduction Program			
Description	This project includes the physical removal of debris and clearing quick-to-burn vegetation. Reducing the amount of debris and natural fuels in a community will deprive wildfires of the material it requires to spread and prevent high winds from launching deadly and damaging debris around during a severe storm or tornado. This project will be implemented in high risk areas as identified in this plan's WUI maps and well-known to burn areas as determined by the participating jurisdictions and appropriate local agencies.		
Hazard/s Addressed	Severe Storms, Tornadoes, Wildland Fires		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	FP&S, HMGP, PDM, Local Budgets	**Cost Estimate**	$10,000 - $25,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Low
Jurisdictional Priority			
Glacier County	Low	Cut Bank	N/A

#7 – Defensible Spaces/Buffer Zones Program			
Description	Creating defensible spaces and buffer zones void of vegetative fuel and covered with gravel or rock helps prevent the spread of wildfire as well as creating an area in which local emergency response serviced can safely operate. This 2-pronged approach directly mitigates damage to property and protects lives, but also indirectly mitigates the threat to life and property in the area at large. This project will be implemented in high risk areas as identified in this plan's WUI maps and well-known to burn areas as determined by the participating jurisdictions and appropriate local agencies.		
Hazard/s Addressed	Wildland Fires		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	FP&S, HMGP, PDM, Local Budgets	**Cost Estimate**	$10,000 - $50,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	Medium	Cut Bank	Medium

#8 – Elevate Structures			
Description	Structures located within identified flood zones can be elevated above base flood elevation or predicted other predicted flood inundation levels.		
Hazard/s Addressed	Floods		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	FMA, HMGP, Local Budgets, PDM	**Cost Estimate**	$50,000 - $100,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	High
Jurisdictional Priority			
Glacier County	Low	Cut Bank	Low

#9 – FEMA Code 361 Safe Room/Storm Shelter			
Description	FEMA Code 361 regulations ensure a structure is capable of withstanding wind speeds greater than 200 miles per hour. Additionally, these anti-tornado regulations also ensure the structure is protected against hail, lightning, high and strong winds. This project can be implemented as a retrofit of a current structure or the construction of a new facility. Any critical facility is a potential target for this, but realistically location will be determined by which participating jurisdictions have the want and resources to accomplish this project.		
Hazard/s Addressed	Severe Storms, Tornadoes, Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	New
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$250,000 - $1,000,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	High
Jurisdictional Priority			
Glacier County	High	Cut Bank	High

#10 – Insulation & Energy Efficiency Upgrade			
Description	Upgrading a facility's windows, windows frames, roofing, and insulation will allow it to better maintain a desired warm or cool temperature during prolonged extreme heat or winter storms. Additionally, it decreases the energy load necessary to do so, decreasing the burden on the local energy grid.		
Hazard/s Addressed	Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$10,000 - $50,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	Low	Cut Bank	Low

#11 – Looped Grid Power Systems			
Description	Linear power grids have single points of failure that are vulnerable to a number of hazards. Looped power grids operate in parallel and are thus significantly more resistant to damage allowing the utilities to maintain power after an event.		
Hazard/s Addressed	Dam Failure, Severe Storms, Tornadoes, Wildland Fires, Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$10,000 - $100,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	Medium	Cut Bank	Medium

#12 – Low Flow Utilities Program			
Description	To decrease water usage before, during, and after a drought, communities can install low water flow utilities throughout its critical facilities and infrastructure. This will not only decrease water usage, but also decrease water demands. The planning area should implement this project in conjunction with their school districts and critical facilities standard maintenance cycles.		
Hazard/s Addressed	Drought		
Status	Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$25,000 - $100,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Low
Jurisdictional Priority			
Glacier County	Low	Cut Bank	N/A

#13 – Public Awareness & Education			
Description	A campaign will inform and educate the public on hazard risks, allowing them to better protect their property through preparation and their lives through appropriate evacuation and survival procedures.		
Hazard/s Addressed	Dam Failure, Droughts, Floods, Severe Storms, Tornadoes, Wildland Fires, Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$5,000 - $25,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Low
Jurisdictional Priority			
Glacier County	Medium	Cut Bank	Medium

#14 – Relocate or Rebuild Vulnerable Structures			
Description	Some structures may be able to be relocated from identified floodplains or dam inundation zones. Removing them from identified hazard area will eliminate their risk.		
Hazard/s Addressed	Dam Failure		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	FMA, HMGP, PDM, Local Budgets	**Cost Estimate**	$5,000 - $100,000
Lead Department/s	Glacier County OEM/DES	**Effectiveness**	High
Jurisdictional Priority			
Glacier County	Low	Cut Bank	N/A

#15 – Snow Fence Installation			
Description	Snow fences force drifting snow to accumulate in a desired place minimizing the amount of snowdrift on roads and railways. Controlling snow accumulation decreases the danger to a jurisdiction's citizens traveling during and after a winter storm. This project should be implemented along major transportation routes throughout the planning area.		
Hazard/s Addressed	Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$25,000 - $100,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Low
Jurisdictional Priority			
Glacier County	Low	Cut Bank	Low

#16 – Storm Water Drainage System Upgrade			
Description	Significant flood damage in developed communities can be prevented by upgrading their storm water drainage system. This mitigation measure will allow flood waters to drain quicker and prevent excess accumulation. This project should be implemented in older drainage systems and any expanding areas throughout the planning area.		
Hazard/s Addressed	Floods		
Status	Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	FMA, HMGP, PDM, Local Budgets	**Cost Estimate**	$25,000 - $50,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	High
Jurisdictional Priority			
Glacier County	Low	Cut Bank	Low

#17 – Structural Integrity Monitoring Instruments			
Description	Dam failure is often preventable, but due to the structural nature of their construction and limited inspection resources, inspections happen too infrequently. Installing a series of seismic monitoring instruments at strategic locations along a dam can detect small, often unnoticed or detected, shifts in the dams substructure that are the primary cause in premature collapse or failure. These instruments serve not only as early warning devices, but as the means to ensuring a dam's maintenance and repair schedule is kept.		
Hazard/s Addressed	Dam Failure		
Status	Proposed	**Infrastructure Emphasis**	New & Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$50,000 - $100,000
Lead Department/s	Glacier County OEM/DES	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	Low	Cut Bank	N/A

#18 – Tree Wire Installation			
Description	Securing trees with wire harnesses will prevent wind related events from blowing them over and potentially onto the jurisdiction's facilities and infrastructure. This project should be implemented in areas of heavy vegetation and high population density.		
Hazard/s Addressed	Severe Storms, Tornadoes, Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$5,000 - $25,000
Lead Department/s	Glacier County OEM/DES	**Effectiveness**	Low
Jurisdictional Priority			
Glacier County	Medium	Cut Bank	Medium

#19 – Water Line Insulation Program			
Description	Insulating a facility's water pipes helps prevent them from freezing and bursting due to sudden and prolonged low temperatures during winter storms. The planning area should implement this project in conjunction with their school districts and critical facilities standard maintenance cycles.		
Hazard/s Addressed	Winter Storms		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$5,000 - $50,000
Lead Department/s	Glacier County OEM/DES	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	Low	Cut Bank	Low

#20 – Wildfire Structural Retrofit Program			
Description	Retrofitting structures with screened vent enclosures, double paned glass, and spark arrestors will reduce the chances of a structure igniting from a wildfire as well as a wildfire's chance of spreading.		
Hazard/s Addressed	Wildland Fires		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	FP&S, HMGP, PDM, Local Budgets	**Cost Estimate**	$5,000 - $50,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Medium
Jurisdictional Priority			
Glacier County	Medium	Cut Bank	N/A

#21 – Xeriscaping			
Description	Xeriscaping is a specific method of landscaping and gardening designed to reduce and eliminate the need for supplemental water. By practicing xeriscaping on jurisdiction owned properties the net system wide water necessary for a community to maintain itself is substantially reduced.		
Hazard/s Addressed	Droughts		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Budgets	**Cost Estimate**	$5,000 - $50,000
Lead Department/s	Glacier County OEM/DES, Municipal Governments	**Effectiveness**	Low
Jurisdictional Priority			
Glacier County	Low	Cut Bank	N/A

Appendix G – Mitigation Project Prioritization

Table 54 – Mitigation Project Prioritization – Glacier County											
Mitigation Project or Activity	**STAPLE+E**	**Effectiveness Multiplier**	**Hazard**							**Total**	**Priority**
			Droughts	**Flash Floods**	**Riverine Floods**	**Severe Storms**	**Tornadoes**	**Wildland Fires**	**Winter Storms**		
Alert, Broadcast, & Warning System	14	1	15	5	5	10	5	15	10	79	High
Attain StormReady Community Status	14	0.5	15	5	5	10	5	15	10	46.5	Medium
Backup Generators	13	1	15	5	5	10	5	15	10	78	High
Bury Utility Lines, Pipes, & Tanks	14	1	-	-	-	10	5	-	10	39	Medium
Debris & Natural Fuels Reduction Program	13	0.5	-	-	-	-	-	15	-	20.5	Low
Defensible Spaces/Buffer Zones Program	14	1	-	-	-	-	-	15	-	29	Medium
Elevate Structures	14	1.5	-	5	5	-	-	-	-	29	Medium
FEMA Code 361 Safe Room/Storm Shelter	16	1.5	-	-	-	10	5	-	10	53.5	High
Insulation & Energy Efficiency Upgrade	15	1	-	-	-	-	-	-	10	25	Low
Looped Grid Power Systems	12	1	-	-	-	10	5	-	10	37	Medium
Low Flow Utilities Program	14	0.5	15	-	-	-	-	-	-	21.5	Low
Property Buyout	14	1.5	-	-	5	-	-	-	-	21.5	Low
Public Awareness & Education Program	16	0.5	15	5	5	10	5	15	10	48.5	Medium
Relocate Vulnerable Structures	14	1.5	-	-	5	-	-	-	-	21.5	Low
Snow Fence Installation	14	0.5	-	-	-	-	-	-	10	19	Low
Storm Water Drainage System Upgrade	14	1.5	-	5	5	-	-	-	-	29	Medium
Tree Wire Installation	16	0.5	-	-	-	10	5	-	10	28.5	Medium
Water Line Insulation Program	15	1	-	-	-	-	-	-	10	25	Low
Wildfire Structural Retrofit Program	13	1	-	-	-	-	-	15	-	28	Medium
Xeriscaping	14	0.5	15	-	-	-	-	-	-	21.5	Low

Table 55 – Mitigation Project Prioritization – Cut Bank

Mitigation Project or Activity	STAPLE+E	Effectiveness Multiplier	Hazard							Total	Priority
			Droughts	Flash Floods	Riverine Floods	Severe Storms	Tornadoes	Wildland Fires	Winter Storms		
Alert, Broadcast, & Warning System	14	1	15	5	X	10	5	15	10	74	High
Attain StormReady Community Status	14	0.5	15	5	X	10	5	15	10	44	Medium
Backup Generators	13	1	15	5	X	10	5	15	10	73	High
Bury Utility Lines, Pipes, & Tanks	14	1	-	-	-	10	5	-	10	39	Medium
Debris & Natural Fuels Reduction Program	13	0.5	-	-	-	-	-	15	-	20.5	Low
Defensible Spaces/Buffer Zones Program	14	1	-	-	-	-	-	15	-	29	Medium
Elevate Structures	14	1.5	-	5	X	-	-	-	-	21.5	Low
FEMA Code 361 Safe Room/Storm Shelter	16	1.5	-	-	-	10	5	-	10	53.5	High
Insulation & Energy Efficiency Upgrade	15	1	-	-	-	-	-	-	10	25	Low
Looped Grid Power Systems	12	1	-	-	-	10	5	-	10	37	Medium
Low Flow Utilities Program	14	0.5	15	-	-	-	-	-	-	21.5	Low
Property Buyout	14	1.5	-	-	X	-	-	-	-	14	Low
Public Awareness & Education Program	16	0.5	15	5	X	10	5	15	10	46	Medium
Relocate Vulnerable Structures	14	1.5	-	-	X	-	-	-	-	14	Low
Snow Fence Installation	14	0.5	-	-	-	-	-	-	10	19	Low
Storm Water Drainage System Upgrade	14	1.5	-	5	X	-	-	-	-	21.5	Low
Tree Wire Installation	16	0.5	-	-	-	10	5	-	10	28.5	Medium
Water Line Insulation Program	15	1	-	-	-	-	-	-	10	25	Low
Wildfire Structural Retrofit Program	13	1	-	-	-	-	-	15	-	28	Medium
Xeriscaping	14	0.5	15	-	-	-	-	-	-	21.5	Low

Appendix H – Plan Adoption Resolutions

<GLACIER COUNTY RESOLUTON>

<CUT BANK RESOLUTION>

Appendix I – State of Montana Approval Letter

Appendix J – Federal Approval Letter