

Big Horn County Pre-Disaster Mitigation Plan

Basin, Burlington, Byron, Cowley, Deaver, Frannie, Greybull, Lovell,
Manderson, and Big Horn County, WY.



Big Horn River Ice Jam, Greybull, Wyoming
March 9, 2014

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EXECUTIVE SUMMARY

Bog Horn County, Wyoming, and the incorporated communities of Basin, Burlington, Byron, Cowley, Deaver, Frannie, Greybull, Lovell, and Manderson prepared and adopted a Pre-Disaster Mitigation Plan (PDM Plan) in 2010. This plan is a revision to ensure these ten local jurisdictions remain disaster-resistant.

This revision was prepared by Big Horn County with the assistance of contractor, Beck Consulting, and subcontractor, AMEC Foster Wheeler. The content of the plan relies on the advice and guidance of the Local Emergency Planning Committee (LEPC) and Mayors and Clerks of the incorporated towns. Both the LEPC and Mayors and Clerks actively participated in the update by determining the status of projects from the 2010 plan, validating natural hazards of concern, reviewing draft products, and identifying and prioritizing mitigation projects.

Information was available about the project through newspaper coverage and the county's website. Meetings--all open to the public--were held in Basin, Burlington, Deaver, and Greybull. The draft plan was made available through town and county websites and the public library for a four-week period starting in late October 2015.

The plan contains five chapters and several appendices with supporting information. The chapters include an introduction, a description of the planning process, the hazard profiles, mitigation actions, and monitoring and updating the plan. Local plans and sources were utilized as were state and national data bases. A total of nine natural hazards were prioritized and profiled for the county. The hazard profiles included information about past occurrences, vulnerability, potential impact, and future development. The nine hazards include; dam failure, drought, earthquakes, floods, hail, tornadoes, wildland fire, wind and winter storms.

The goals and action items in this plan revision were developed after consideration of:

- the projects identified in the 2010 PDM Plan,
- research of past disasters,
- the risks and vulnerabilities, and
- available resources and capacities.

Chapter IV contains the mitigation goals and actions--or projects. Ten goals (rewritten to address each local jurisdiction's needs individually) with a total of 45 projects were either carried over and/or developed during this revision process. Projects that had not been accomplished from the 2010 plan, that were still appropriate and meaningful were incorporated into the revision.

Goal One: Mitigate natural and human caused hazards to reduce the potential for property loss or damage, injury and loss of life for Big Horn County.

Goals 2-10 contain this same wording except to name the each specific jurisdiction.

Table of Contents

Chapter 1 INTRODUCTION.....	1-1
Purpose.....	1-1
Specific Jurisdictions Participating in the Plan Update.....	1-1
Mitigation Goals	1-1
Scope and Plan Organization	1-2
Appendices	1-3
Authority.....	1-3
Chapter 2 PLANNING PROCESS.....	2-1
Process Followed to Update the Plan.....	2-1
How the Jurisdictions Participated in the Plan Update	2-1
Opportunity for Involvement by Other Interests	2-2
How the Planning Team Reviewed and Analyzed the Existing Plan	2-2
How the Public Was Involved in the Planning Process.....	2-2
Review and Incorporation of Existing Plans	2-5
Chapter 3 RISK ASSESSMENT AND HAZARD PROFILES	3-7
Introduction and Methodology	3-8
Identified Hazards.....	3-8
Vulnerability Overview	3-8
Structural Vulnerability.....	3-13
Vulnerable Populations	3-14
Critical Facilities	3-14
Dam Failure.....	3-20
Drought.....	3-30
Earthquake.....	3-44
Flooding	3-54
Damaging Hail.....	3-83
High Winds and Downbursts	3-89
Tornado.....	3-95

Wildfire	3-101
Severe Winter Weather	3-112
Chapter 4 HAZARD MITIGATION GOALS AND PROJECTS.....	4-1
How the goals and projects were developed	4-1
Project Costs	4-1
Project Priorities	4-1
Project Types	4-3
Abbreviations used in table	4-11
Action Plan.....	4-12
Use of Cost-Benefit Analysis	4-12
Existing Authorities, Policies, Programs and Resources for Implementation	4-12
Chapter 5 PLAN MONITORING, MAINTENANCE, REVISION AND COORDINATION	5-1
Responsible Parties.....	5-1
Plan Monitoring and Evaluation	5-1
Plan Update Review Triggers.....	5-1
Revision Procedures	5-2
Incorporation into Other Plans.....	5-2
Opportunity for Continued Public Involvement	5-3

Table of Figures

Figure 2-1 Mayors' and Clerks' meeting, Deaver, July 16, 2015	2-1
Figure 3-1 Big Horn County Dams.....	3-24
Figure 3-2 Dams Located Outside Big Horn County.....	3-25
Figure 3-3 Drought Progression Chart	3-30
Figure 3-4 Percentage of Wyoming in Drought by Category, 2000 - 2015	3-32
Figure 3-5 State of Wyoming Drought Conditions, January 2013. Big Horn County in Circle.	3-33
Figure 3-6 State of Wyoming Drought Conditions, January 2007. Big Horn County in Circle.	3-33
Figure 3-7 State of Wyoming Drought Conditions, January 2003. Big Horn County in Circle.	3-34
Figure 3-8 State of Wyoming Drought Conditions, July 2015. Big Horn County in Circle.	3-35
Figure 3-9 State of Wyoming Drought Conditions by Surface Water Supply. Big Horn County in Circle.	3-36
Figure 3-10 Palmer Drought Index.....	3-37
Figure 3-11 Wyoming Palmer Hydrological Drought Index 1895-2014	3-38
Figure 3-12 Pre and Post Drought Production of Barley, Big Horn County	3-39
Figure 3-13 Pre and Post Drought Production of Beans, Big Horn County	3-40
Figure 3-14 Pre and Post Drought Production of Corn for Silage, Big Horn County	3-40
Figure 3-15 Pre and Post Drought Production of Corn for Grain, Big Horn County.....	3-41
Figure 3-16 Pre and Post Drought Production of Oats, Big Horn County	3-41
Figure 3-17 Pre and Post Drought Production of Sugarbeets, Big Horn County	3-42
Figure 3-18 Pre and Post Drought Production of All Wheat, Big Horn County.....	3-42
Figure 3-19 Wyoming Earthquake Epicenters > 2.5 Magnitude, 1871 to 2015.....	3-46
Figure 3-20 Exposed Known or Suspected Active Faults in Wyoming.....	3-47
Figure 3-21 2% in 50 year Seismic Hazard Measured in Peak Ground Acceleration (M/s).	3-50
Figure 3-22 HAZUS-MH Earthquake Scenarios for Wyoming, 2014	3-52
Figure 3-23 Flood Events by Year in Big Horn County, 1928 – 2014.....	3-56
Figure 3-24 Big Horn County FEMA Flood Hazards.....	3-58
Figure 3-25 Summary of Flood Events by Month, Big Horn County 1928 - 2014	3-59
Figure 3-26 Town of Greybull, Levee Structure and Protected Area.....	3-61
Figure 3-27 Bighorn County FEMA Flood Hazards	3-65
Figure 3-28 Basin FEMA Flood Hazards	3-68
Figure 3-29 Burlington FEMA Flood Hazards	3-70
Figure 3-30 Cowley FEMA Flood Hazards	3-72
Figure 3-31 Frannie FEMA Flood Hazards.....	3-74
Figure 3-32 Greybull FEMA Flood Hazards	3-77
Figure 3-33 Lovell FEMA Flood Hazards.....	3-79
Figure 3-34 Manderson FEMA Flood Hazards	3-81
Figure 3-35 Future Flood Hazard in Future Growth Area Wyoming, 2014. Big Horn County in Circle.....	3-82
Figure 3-36 Hail Events by Hail Diameter. Big Horn County 1959 – 2014.	3-86
Figure 3-37 Time of Day Hail Events in Big Horn County 1959-2014.....	3-87
Figure 3-38 Month of Occurrence - Hail Events in Big Horn County 1959 to 2009	3-87
Figure 3-39 General Locations - Hail Events in Big Horn County 1959-2014.....	3-88
Figure 3-40 Schema of Microburst and Tornado	3-89
Figure 3-41 Aerial Image of Downburst Damage.....	3-90
Figure 3-42 Microburst Path, Basin Wyoming July 2004	3-91
Figure 3-43 High Wind Events by Year. Big Horn County 1996 to 2015	3-92
Figure 3-44 High Wind Events by Month. Big Horn County 1985-2015	3-93
Figure 3-45 EF-Scale Tornadoes By Rating.....	3-99

Figure 3-46 F-Scale Tornadoes By Rating.....	3-99
Figure 3-47 Historical Tornadoes by Month. Big Horn County 1959 - 2014	3-99
Figure 3-48 Historical Tornadoes by Time of Day. Big Horn County 1959 - 2014.....	3-100
Figure 3-49 Big Horn County Wildfire Occurrences, 1980 - 2013	3-103
Figure 3-50 Number of Wildfires per Year – Big Horn County 1980 to 2013	3-104
Figure 3-51 Total Acres Burned by Year - Big Horn County 1980-2013	3-104
Figure 3-52 Significant Fires by Month – Big Horn County 1980 to 2013.....	3-105
Figure 3-53 Significant Fires by Ignition Source – Big Horn County 1980 to 2013	3-105
Figure 3-54 Big Horn County WUI Red Zones	3-107
Figure 3-55 Big Horn County Communities Wildfire Hazard Risk	3-110
Figure 3-56 Severe Winter Weather Events by Year, Big Horn County 1996 to 2014	3-114
Figure 3-57 Severe Winter Weather Events by Month, Big Horn County 1978 to 2015	3-116
Figure 3-58 Winter Weather Events and Losses, Wyoming 1960-2012. Big Horn County in Circle.	3-117

Table of Tables

Table 2-1 Local Plans	2-5
Table 3-1 Big Horn County Building Asset Summary. Total Improved and Content Value by Jurisdiction.....	3-9
Table 3-2 Unincorporated County Building Asset Summary.	3-9
Table 3-3 Town of Basin Building Asset Summary. Total Improved and Content Value by Jurisdiction.	3-10
Table 3-4 Town of Burlington Building Asset Summary. Total Improved and Content Value by Jurisdiction.	3-10
Table 3-5 Town of Byron Building Asset Summary. Total Improved and Content Value by Jurisdiction.	3-10
Table 3-6 Town of Cowley Building Asset Summary. Total Improved and Content Value by Jurisdiction.	3-11
Table 3-7 Town of Deaver Building Asset Summary. Total Improved and Content Value by Jurisdiction.	3-11
Table 3-8 Town of Frannie Building Asset Summary. Total Improved and Content Value by Jurisdiction.....	3-11
Table 3-9 Town of Greybull Building Asset Summary. Total Improved and Content Value by Jurisdiction.	3-12
Table 3-10 Town of Lovell Building Asset Summary. Total Improved and Content Value by Jurisdiction.....	3-12
Table 3-11 Town of Manderson Building Asset Summary. Total Improved and Content Value by Jurisdiction.	3-12
Table 3-12 Community Building Codes - Status By Community	3-13
Table 3-13 Critical Facilities by Community.....	3-14
Table 3-14 Worst Case Predictions from Dam Emergency Plans for Big Horn County.....	3-27
Table 3-15 Summary of Agricultural (Crop) Impacts to Drought, Big Horn County.....	3-43
Table 3-16 Modified Mercalli Scale	3-45
Table 3-17 List of Seismic Events, Big Horn County 1967 - 2014.....	3-48
Table 3-18 HAZUS 2.1 Model, Big Horn County Potential Losses	3-53
Table 3-19 Summary of Flood Events, Big Horn County 1928 - 2014.....	3-55
Table 3-20 FEMA NFIP and FIRM Map Data, Current September 2015	3-62
Table 3-21 Potential Loss Summary for Flood Scenarios. All Big Horn County.....	3-64
Table 3-22 Potential Loss Summary for Flood Scenarios. Unincorporated Big Horn County.....	3-66
Table 3-23 Potential Loss Summary for Flood Scenarios, Town of Basin	3-67
Table 3-24 Potential Loss Summary for Flood Scenarios, Town of Cowley	3-71
Table 3-25 Potential Loss Summary for Flood Scenarios, Town of Greybull	3-75
Table 3-26 Potential Loss Summary for Flood Scenarios, Town of Lovell	3-78
Table 3-27 Potential Loss Summary for Flood Scenarios, Town of Manderson	3-80
Table 3-28 Summary Bighorn County Hail History 1960-2014	3-84
Table 3-29 Bighorn County Hail History 1960-2014	3-84
Table 3-30 Summary of Wind Weather Events and Impacts. Big Horn County 1993 to 2015.	3-92
Table 3-31 Fujita Scale Description.....	3-96
Table 3-32 Summary Tornado History, Big Horn County.....	3-97
Table 3-33 List Tornado History, Big Horn County.....	3-98
Table 3-34 Major (+1,000 Acres) Fires – Big Horn County 1975 to 2015	3-102
Table 3-35 Summary of Winter Weather Events and Impacts,. Big Horn County 1978 to 2015.	3-115
Table 4-4-1: Project Types by Goal/Jurisdiction	4-3
Table 4-2 Goal One Projects: Big Horn County	4-4
Table 4-3 Goal Two Projects: Town of Basin.....	4-5
Table 4-4 Goal Three Projects: Town of Burlington.....	4-5
Table 4-5 Goal Four Projects: Town of Byron	4-6
Table 4-6 Goal Five Projects: Town of Cowley.....	4-7
Table 4-7 Goal Six Projects: Town of Deaver	4-7
Table 4-8 Goal Seven Projects: Town of Frannie	4-8
Table 4-9 Goal Eight Projects: Greybull	4-9
Table 4-10 Goal Nine Projects: Town of Lovell	4-9
Table 4-11 Goal Ten Projects: Town of Manderson	4-10

Chapter 1 INTRODUCTION

Hazard mitigation is any action taken before, during, or after a disaster to permanently eliminate or reduce the long-term risk to human life and property from natural and technological hazards.

Since the priority to implement mitigation activities is usually very low in comparison to the perceived threat, some important mitigation measures take time to put in place. Mitigation success can be promoted if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management.

Hazard mitigation measures must be practical and cost effective, with consideration given to cultural, environmental, and political acceptability. Actions taken to limit the vulnerability of a society to hazards must not in themselves be more costly than the anticipated damages.

Hazard mitigation planning can occur at many points. One of the most effective points is when capital investment and land use decisions are made, based on vulnerability. Capital investments, whether for homes, roads, public utilities, pipelines, power plants, or public works, determine to a large extent the nature and degree of hazard vulnerability of a community. Once a plans or initiatives are in place, very few opportunities will present themselves over the useful life of the project or structure to correct any errors in location or construction with respect to the hazard vulnerability.

Purpose

This Plan serves to assist public officials and the citizens of the ten local jurisdictions to assess natural and human-caused hazards and vulnerabilities, and to identify measures within which to mitigate those hazards. Big Horn County developed and adopted a Multi-Hazard Mitigation Plan in 2003 and updated that plan in 2010. This 2015 PDM Plan revises and updates the most recent--2010 plan.

Additionally, the Disaster Mitigation Act (DMA) of 2000 requires local governments to develop and submit mitigation plans as a condition of receiving Pre-Disaster Mitigation (PDM) and Hazard Mitigation Grant Program (HMGP) project grants. DMA 2000 streamlines the delivery and utilization of disaster recovery assistance and places increased emphasis on local mitigation planning.

Specific Jurisdictions Participating in the Plan Update

The specific jurisdictions participating in the plan update are the incorporated communities of Basin, Burlington, Byron, Cowley, Deaver, Frannie, Greybull, Lovell, and Manderson, and Big Horn County. Each of these jurisdictions participated in the previous plan. There are no new participating jurisdictions. There are no other incorporated communities in the County.

Mitigation Goals

The goals in Big Horn County's 2015 PDM Plan update are organized by jurisdiction. Each of the ten local jurisdictions has one goal. Under each goal are projects specific to that jurisdiction. By organizing the plan in this way, it is easy for each community and the county to see exactly which projects they have determined are needed, which projects they are agreeing to with adoption, and which projects they will be responsible for working on.

The 2010 plan had eight goals. The LEPC—serving as the local planning team—revisited those goals at their first meeting in June 2015. The status of work accomplished on the 2010 goals is provided in Appendix B of this plan update. The LEPC made decisions to retain, discard, or deem the goals accomplished at that meeting.

The plan goals are as follows:

1. Reduce the potential loss of life and property from natural and human-caused disasters in Basin.
2. Reduce the potential loss of life and property from natural and human-caused disasters in Burlington.
3. Reduce the potential loss of life and property from natural and human-caused disasters in Byron.
4. Reduce the potential loss of life and property from natural and human-caused disasters in Cowley.
5. Reduce the potential loss of life and property from natural and human-caused disasters in Deaver.
6. Reduce the potential loss of life and property from natural and human-caused disasters in Frannie.
7. Reduce the potential loss of life and property from natural and human-caused disasters in Greybull.
8. Reduce the potential loss of life and property from natural and human-caused disasters in Lovell.
9. Reduce the potential loss of life and property from natural and human-caused disasters in Manderson.
10. Reduce the potential loss of life and property from natural and human-caused disasters in Big Horn County.

Scope and Plan Organization

The Big Horn County Pre-Disaster Mitigation Plan covers the entire county and all incorporated municipalities within, of which there are nine. The incorporated municipalities include Basin, Burlington, Byron, Cowley, Deaver, Frannie, Greybull, Lovell, and Manderson. These communities participated in the 2010 Big Horn County PDM Plan and the 2015 update.

This Plan is organized into five chapters with three supporting appendices. The appendices assist in understanding the hazard-specific issues facing the county and named towns within. The chapters are as follows:

Section 1: Introduction

This section provides background material to put the Plan and mitigation strategies into the context of Big Horn County's unique assets, resources, and hazards. The County Profile provides an overview of the county and the communities within its external boundaries; including geographic, demographic, economic characteristics, land use, and development trends.

Section 2: Planning Process

This section provides an overview of the process used to develop the Plan, including jurisdictional and public involvement. Appendix A contains the documentation for the planning process.

Section 3: Risk Assessment: Hazard Profile And Vulnerability

This section also presents information about historical disasters occurring throughout the county, and where applicable, the region. Historical analysis describes potential hazards, past impacts, potential losses, critical assets, public property valuations, and special population locations, and general vulnerability.

Section 4: Mitigation

This section uses the hazard and risk information presented in Section 3 to expand on the broad goals. A set of actions or projects are specified that can be accomplished to lessen the chances and/or severity of a potential disaster occurring within Big Horn County and its local communities. Recognizing the limitation of resources to accomplish all projects identified, this section also sets forth local priorities for the projects.

Section 5: Plan Maintenance and Implementation

This chapter describes how this plan is to be maintained and kept current. This section provides information on the implementation, monitoring and evaluation of the Plan.

[Appendices](#)

Appendix A: Flood Events

Appendix B: High Wind Events

Appendix C: Wildfire

Appendix D: Winter Storm Events

Appendix E: Status of the 2010 Plan Projects

Appendix F: Planning Process Documentation

Appendix G: Resolutions of Adoption

[Authority](#)

The Big Horn County PDM Plan meets the requirements of the Interim Final Rule published in the Federal Register on February 26, 2003, at 44 CFR Part 201 as part of the Disaster Mitigation Act of 2000. The Pre-Disaster Mitigation (PDM) Program was authorized by §203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act (Stafford Act), 42 USC, as amended by §102 of the Disaster Mitigation Act of 2000. FEMA's planning regulation, 44 CFR Part 201, Hazard Mitigation Planning, establishes criteria for State and local hazard mitigation planning. Further noted are 2009 Wyoming Statutes - Title 19, Defense Forces and Affairs, "Wyoming Disaster and Civil Defense Act." W.S. 19-13-101 to 414.

Chapter 2 PLANNING PROCESS

Process Followed to Update the Plan

The Plan was developed and prepared for Big Horn County by Barb Beck of Beck Consulting assisted by AMEC Foster Wheeler. Ms. Beck served as the prime contractor responsible for the overall process and products and specifically conducted all meetings in the county and writing Chapters 1, 2, 3, 5, and 6. AMEC Foster Wheeler prepared the hazard identification and risk assessment (HIRA) found in Chapter 4.

The planning process began in May 2015 and concluded in December 2015 with FEMA deeming the plan approvable by the local jurisdictions. The county obtained signed resolutions of adoption from the signatories in early 2016.

The content of the plan relies heavily on the advice and guidance of the Local Emergency Planning Committee (LEPC) and the chief elected officials and their staff. The LEPC served as the local planning team and represented a wide range of interests, served as a technical resource, guided the planning process, and finally reviewed the draft

document for accuracy and completeness. LEPC and elected official involvement in the planning process is important for subsequent adoption and successful implementation of the plan.

The Mayors brought local knowledge of the situations in their jurisdictions.

Please see the meeting summaries below and the information in Appendix A for additional detail on how the jurisdictions, planning team (LEPC), other interests, and the public participated in the planning process.

How the Jurisdictions Participated in the Plan Update

The ten incorporated communities and Big Horn County participated in the planning process. Many of the communities are quite small with little or no paid staff--so elected official, clerk, and emergency responder participation was deemed the most appropriate engagement for them. Participation occurred in the following ways across all 11 jurisdictions:

- By providing key staff (County Planner, Mayors and Clerks) to participate in various meetings including public meetings, the Mayors' and Clerks' meeting, and the Local Emergency Planning Committee (LEPC) meetings,

Figure 2-1 Mayors' and Clerks' meeting, Deaver, July 16, 2015



- By issuing news releases during the planning process,
- By identifying actions taken on projects from the 2010 plan,
- By providing information on critical infrastructure and facilities,
- By providing existing plans and documents,
- By providing maps and GIS information,
- By providing contacts for critical information,
- By meeting with the contractor one-on-one as requested,
- By providing feedback on draft goals and identifying project needs,
- By posting project information on government websites or flyers on bill boards,
- By reviewing and commenting on the draft plan, and
- By adopting the plan once FEMA approval is obtained.

Opportunity for Involvement by Other Interests

There are two weekly newspapers in Big Horn County, the Lovell Chronicle and the Greybull Standard. News releases were provide to the papers. The County Sheriff has a webpage where information was posted on meetings. The County Emergency Manager has a non-emergency social media messaging system that was used to provide information to all interested parties. The LEPC represented a wide range of interests including law enforcement, fire, public health, elected officials, industry, etc. All meetings were open to the public and held in public facilities in locations around the County.

How the Planning Team Reviewed and Analyzed the Existing Plan

The LEPC—serving in the role of the planning team--contributed to the update of the plan in a number of ways. First, they reviewed the status of the projects in the existing plan. They identified natural disasters that had occurred since the 2010 update. They provided resources and contacts for the contractors. The LEPC reviewed the list of hazards from the 2010 plan and members identified the additional hazard of naturally-occurring toxic gas seeps which was incorporated into the 2015 HIRA. LEPC members shared information about the planning process with other members of their various organizations. The LEPC identified and validated the mitigation projects. And, finally, LEPC members were afforded the opportunity to review and comment on the draft plan.

How the Public Was Involved in the Planning Process

All meetings held to update the plan were open to the public. With the exception of the Mayors' and Clerks' meetings, the other meetings occurred at their regularly scheduled and noticed times and dates. A summary of each meeting is given below.

Meeting #1 – Summary

The first meeting for the project was a public meeting scheduled in Greybull on June 25, 2015, to kick-off the plan update. There were no attendees at this meeting. This may have been due to a conflict with a popular summer festival in the Lovell area.

Meeting #2 – Summary

The second meeting for the project was an LEPC meeting. This meeting took place in Greybull on June 25, 2015. There were xx members of the LEPC present at this meeting. A briefing paper was handed out

and contractor Beck went over the overall purpose and the reasons for updating the plan. The group brainstormed disasters that had occurred in the previous five years.

Meeting #3 – Summary

The third meeting for the project occurred in Deaver and was scheduled to take advantage of the mayors' and clerks' meeting. The briefing paper was passed out and explained. The mayors were asked to fill out a worksheet listing new development by type (residential, commercial, industrial, or government.) They were queried about whether they had a land use plan. Finally, each mayor identified the hazards they believed their community was vulnerable to from the list of county-wide hazards. Contractor Beck explained that each community must have at least one project in the plan in order to adopt it and be eligible for the benefits the plan provides.

Meeting #4 - Summary

The fourth meeting was a public meeting in Greybull. The meeting took place on August 27 at the County Weed and Pest building. Prior to the meeting, news releases were provided to the two in-county newspapers. The Town of Greybull posted the meeting on their website, the Sheriff's Office posted notice of the meeting on their website, and flyers were prepared and distributed electronically and posted around the community. Despite this effort there were just two attendees at the meeting. Contractor Beck announced the project to the public, went over the briefing paper, and explained how citizens could offer input and stay involved.

Meeting #5 - Summary

The fifth meeting was another meeting with the LEPC. The meeting took place in Greybull. LEPC members and others in attendance took the natural hazard quiz together. The quiz was an educational tool based on the HIRA research. LEPC members were invited to offer project ideas and also informed about how to stay involved and participate in review of the draft plan in the fall of 2015.

Meeting #6 – Summary

The sixth meeting coincided with the Mayors' and Clerks' meeting in the Town of Burlington on September 17. Each of the nine incorporated communities was represented by their mayor or town clerk, or both. The group took the natural hazard quiz with facts from the HIRA research together. Then, contractor Beck worked with the elected officials to identify mitigation projects for each community based on the specific hazards the communities were vulnerable to.

Meeting #7 – Summary

The final project meeting was held in Basin in conjunction with the County Commissioner's regularly scheduled meeting. The draft PDM plan was presented and the public comment period opened. Following this meeting, the draft plan was available for a 30-day public review. The plan was available in hard copy at the Commissioners' office in Basin and the Emergency Management office in Lovell. Each community with a website posted the draft plan and the county posted the plan on the county's website. Legal ads announcing the availability of the draft plan were purchased in both the Greybull and Lovell newspapers.

No comments were received during the public comment period closed. Plan Review Tool was prepared and concurrent with the public comment period the plan was submitted to the Wyoming Office of Homeland Security for review. Following this review, the plan was submitted to FEMA. Once deemed approvable by FEMA, the local jurisdictions adopted the plan.

Review and Incorporation of Existing Plans

Copies of existing plans assisted in data collection, public involvement, methodology, and document review. Technical studies and data bases consulted for the HIRA are cited in the appropriate text. Local plans consulted for background information, project ideas, and to ensure consistency are listed in the table below.

Table 2-1 Local Plans

Name of Plan	Jurisdiction	Date	Remarks
Big Horn County Land Use Plan	County	2010	Goal D. Encourage development that is well planned with respect to environmental hazards... Strategies: protect riparian areas, floodplains and wetlands; consider wildfire, potential for flash flooding, soil capacity, and geological hazards. Maps include floodplains, slopes, wetlands.
Subdivision Regulations	County	2012	Soils map, identification of natural water courses and irrigation structures, review and recommendations from Fire Protection District required for minor and major subdivisions. May not locate in areas subject to flooding or floodplains, may not locate on slopes of 30% or more. Planning office may require additional studies related to limiting factors.
Community Wildfire Protection Plan, Addendum	County	2005, 2010	Information incorporated in Wildland Fire risk assessment section.
Natural Hazard Mitigation Plan	County	2010	This 2015 plan is an update of the 2010 plan which was consulted extensively.
Big Horn County EOP	County		Not current.
Basin Wyoming Master Plan	Basin	2012	Population increase slow and steady. Need for adequate emergency services identified. Floodplain mapped for NFIP 1977. Maps inadequate in area annexed since. Zoning since 1970's. Largely unchanged.
Town of Burlington Community Devel. Plan	Burlington	2004	404 parcels of land, 139 undeveloped. Fire hall completed 2004, can serve as shelter. Need municipal GIS system.

Name of Plan	Jurisdiction	Date	Remarks
Zoning Ordinance	Burlington	2005	Does not address natural hazards. Establishes building permit. References international bldg. codes.
	Byron	2007	Does not address natural hazards.
	Cowley	2007	Does not address natural hazards.
	Deaver		Does not address natural hazards.
Frannie Town Development Code	Frannie	2005	Requires compliance permit for subdivisions and mobile home parks. Evaluates proposals for slopes, floodplains, drainage, hydrology, and other natural resource conditions.
Greybull Community Development Plan	Greybull	2006	Big Horn River listed as recreation asset. Public Service goal to promote water conservation. Land development goal to work with County on subdivisions within 1 mile. Plans to use Greybull dike for pathway. 19 planning areas--no area for natural resource hazards or floodplain. (Appendix A: recommendations for dated zoning code. Appendix B: marketing plan.)
Muni. Code, Title 18 Zoning	Greybull	2014	New developments required to submit erosion and runoff control plans.
Floodplain Ord. #790	Greybull	2013	Applies to all Special Flood Hazard Areas based on FEMA 2014 DFIRMS.
Lovell Master Plan	Lovell	2006	Little undeveloped land in Town. Recommendations to work with County on subdivisions within 1 mile and consider hazardous structures ordinance. Storm drainage system deemed inadequate. Development constraints were mapped.
Manderson	Manderson	N/A	Town has no land use plan or zoning.

Note: High Hazard Dam Emergency Action Plans are confidential and on file with the Big Horn County Office of Emergency Management.

Chapter 3 RISK ASSESSMENT AND HAZARD PROFILES

The Risk Assessment serves as a single source of hazard information for Big Horn County and participating communities within. Other plans may be referenced and remain vital hazard documents, but each hazard has its own profile in this plan. This portion of this Risk Assessment provides a brief overview of natural hazards that concern the county, and identifies the hazards that are profiled and analyzed further. The Risk Assessment provides the basis for many of the mitigation goals and proposed actions found later in the plan. The following hazards were identified and profiled in 2010 and revisited during the 2015 plan update:

- Dam Failure
- Drought
- Earthquake
- Flooding
- Damaging Hail
- High Winds and Downbursts
- Tornado
- Wildfire
- Severe Winter Weather

As the plan was updated in 2015, other hazards were brought up at planning meetings and reviewed for inclusion, but were ultimately not assessed. Hazardous material incidents, human health emergencies, livestock health emergencies, and terrorism events (particularly school and government focused threats) were identified as hazards for emphasis in subsequent mitigation planning efforts. Volcanic ash, lightning strikes, and landslides were considered but did not receive significant weight by the LEPC as a whole as they have not caused significant impacts in the past.

Other specific hazards discussed during the 2015 update, but ultimately not profiled further in this plan, included:

- Toxic gas seeps – the planning committee discussed toxic gasses seeping from the ground as a potential hazard for inclusion into the plan. There is scattered history of fires and explosions occurring in the region during digging for wells and other new development. However, because of the difficulty in forecasting events and the relatively small-scale nature of the hazard and its impacts, toxic gas seep was not given a full-scale assessment in the final plan.
- Livestock disease – the committee discussed different livestock diseases that have the potential to affect Big Horn County, including brucellosis and chronic wasting disease, disease from mass livestock casualty and tularemia. Upon further discussion, it was decided that since these types of incidents are covered by other agencies and plans, they would not be included in the mitigation plan.
- Human disease – the committee discussed different diseases and pandemics that could affect Big Horn County. Ultimately, it was decided that like livestock disease, human disease is covered by other plans and agencies, and would not be included in the mitigation plan.
- Sedimentation – sedimentation of the Yellowtail Reservoir was discussed as a potential hazard by the committee; upon further review, it was decided that sedimentation goes beyond the scope of this plan.

Introduction and Methodology

The Risk Assessment becomes the factual basis for proposed activities that aim to mitigate damage to the existing communities, and provides a planning foundation for mitigation actions. A risk analysis was conducted for each hazard and quantified using the information gathered to assess risk. The analysis addresses the potential amount of damage a hazard event can cause (hazard magnitude), in relation to how frequently such events are likely to occur (hazard frequency). Risk assessment activities included the mapping of hazard occurrences, the development of numerous charts and tables to display findings, and identification of at-risk critical facilities, operations, and populations. Strategies for both short-term and long-term mitigation and disaster risk reduction were then developed based on this evaluation, and are captured in Chapter 5 of this PDM Plan.

Hazard magnitude and frequency estimates rely on data gathered from a number of sources. Historical data, scientific projections, and inhabitants' subjective judgments are, again, used for this purpose. Magnitude estimates are generally based on the severity of potential impact on three critical vulnerabilities: human life, property, and services. FEMA has, however, recognized that there are other issues tied to community support of risk mitigation including social, cultural, and economical issues. The remainder of this section discusses the hazard profile elements relevant to the risk assessment and vulnerabilities associated with each hazard.

Identified Hazards

The county and participating towns and cities have identified nine (9) hazards with the greatest exposure that could affect or threaten communities and/or the unincorporated areas of the county in terms of structural, physical and economic impact. This Section describes the causes and characteristics of each hazard, documents how they have affected the county and its communities in the past, identifies the geographic extent of the hazard, the intensity of the hazard, and the likelihood of its occurrence. The assessment focuses on Big Horn County and the communities within. However, where applicable, hazards may be also discussed in relation to the Big Horn Basin and the Greater Yellowstone Region.

A risk assessment was conducted for each identified hazard or threat by researching recent and formal State and County hazard assessments, examination of historical documentation, and by identifying conditions or events that have affected the region in the past. Composite data from all sources was utilized to assign a quantitative magnitude for each hazard, based on the following criteria.

- **Loss Potential** Physical damages that may result if a hazard event occurs
- **Population Impacted** Relative amount of population at risk from hazard impacts
- **Probability** Likelihood that a given event would occur within 365 days
- **Jurisdictions at Risk** Jurisdictions that are at risk from the particular hazard

Vulnerability Overview

Many of the hazards and risks described in this plan can be, to a large degree, considered geographically random or "able to impact any time, any place." This includes tornado, high winds and downbursts, hail, severe winter weather, and seismic events. Non-random occurrences as they would relate to geography include hazards or threats of flooding, dam failure and wildfire. Vulnerability information is specific where possible to include vulnerability mapping under the proceeding individual hazard profiles, and also provided in a general format where appropriate.

Estimates for building and content values by jurisdiction are provided below in the following tables. This is provided as a baseline estimate of property exposure. While it is not likely that any hazards in the plan would have widespread impacts on the building stock of the County, the table below could be used as an estimate of loss in the unlikely event that a tornado, for example, impacted the Town of Basin.

Contents exposure is estimated as a percent of the improvement value (specifically, 50% of the improvement value for residential structures and 100% for non-residential structures), based on standard FEMA methodologies. Land values are not included in this analysis, because land remains following disasters, and subsequent market devaluations are frequently short-term and difficult to quantify. Additionally, state and federal disaster assistance programs generally do not address loss of land or its associated value.

Table 3-1 Big Horn County Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Building Count	Improved Value	Est. Content Value	Total Exposure
Basin	589	\$57,328,426	\$29,899,255	\$87,227,681
Burlington	111	\$10,817,158	\$5,720,260	\$16,537,418
Byron	219	\$17,731,145	\$9,076,830	\$26,807,975
Cowley	277	\$35,945,476	\$17,980,099	\$53,925,575
Deaver	85	\$5,591,893	\$3,310,879	\$8,902,772
Frannie	61	\$3,564,071	\$1,934,473	\$5,498,544
Greybull	864	\$75,129,468	\$45,727,443	\$120,856,911
Lovell	950	\$90,779,510	\$52,358,283	\$143,137,793
Manderson	50	\$2,984,500	\$2,008,382	\$4,992,882
Unincorporated	2,095	\$249,667,366	\$157,468,168	\$407,135,534
Total	5,301	\$549,539,013	\$325,484,069	\$875,023,082

Source: Big Horn County Assessor, accessed September 2015

Table 3-2 Unincorporated County Building Asset Summary.

Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Unincorporated	Agricultural	452	\$45,349,173	\$45,349,173	\$90,698,346
	Commercial	74	\$11,112,164	\$11,112,164	\$22,224,328
	Exempt	2	\$129,487	\$129,487	\$258,974
	Industrial	5	\$6,255,982	\$9,383,973	\$15,639,955
	Residential	1,526	\$182,986,741	\$91,493,371	\$274,480,112
	Vacant Land	36	\$3,833,819	\$0	\$3,833,819
	Total		2,095	\$249,667,366	\$157,468,168

Source: Big Horn County Assessor, accessed September 2015

Table 3-3 Town of Basin Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Basin	Commercial	57	\$5,913,765	\$5,913,765	\$11,827,530
	Exempt	23	\$2,880,712	\$2,880,712	\$5,761,424
	Residential	493	\$42,209,555	\$21,104,778	\$63,314,333
	Vacant Land	16	\$6,324,394	\$0	\$6,324,394
	Total	589	\$57,328,426	\$29,899,255	\$87,227,681

Source: Big Horn County Assessor, accessed September 2015

Table 3-4 Town of Burlington Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Burlington	Agricultural	1	\$66,113	\$66,113	\$132,226
	Commercial	8	\$773,606	\$773,606	\$1,547,212
	Residential	98	\$9,761,082	\$4,880,541	\$14,641,623
	Vacant Land	4	\$216,357	\$0	\$216,357
	Total	111	\$10,817,158	\$5,720,260	\$16,537,418

Source: Big Horn County Assessor, accessed September 2015

Table 3-5 Town of Byron Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Byron	Commercial	15	\$1,494,509	\$1,494,509	\$2,989,018
	Residential	194	\$15,164,641	\$7,582,321	\$22,746,962
	Vacant Land	10	\$1,071,995	\$0	\$1,071,995
	Total	219	\$17,731,145	\$9,076,830	\$26,807,975

Source: Big Horn County Assessor, accessed September 2015

Table 3-6 Town of Cowley Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Cowley	Commercial	14	\$1,891,605	\$1,891,605	\$3,783,210
	Residential	249	\$32,176,987	\$16,088,494	\$48,265,481
	Vacant Land	14	\$1,876,884	\$0	\$1,876,884
	Total	277	\$35,945,476	\$17,980,099	\$53,925,575

Source: Big Horn County Assessor, accessed September 2015

Table 3-7 Town of Deaver Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Deaver	Agricultural	3	\$162,287	\$162,287	\$324,574
	Commercial	3	\$284,782	\$284,782	\$569,564
	Exempt	1	\$741,082	\$741,082	\$1,482,164
	Residential	73	\$4,245,456	\$2,122,728	\$6,368,184
	Vacant Land	5	\$158,286	\$0	\$158,286
	Total	85	\$5,591,893	\$3,310,879	\$8,902,772

Source: Big Horn County Assessor, accessed September 2015

Table 3-8 Town of Frannie Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Frannie	Commercial	3	\$337,481	\$337,481	\$674,962
	Residential	57	\$3,193,983	\$1,596,992	\$4,790,975
	Vacant Land	1	\$32,607	\$0	\$32,607
	Total	61	\$3,564,071	\$1,934,473	\$5,498,544

Source: Big Horn County Assessor, accessed September 2015

Table 3-9 Town of Greybull Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Greybull	Commercial	125	\$16,334,397	\$16,334,397	\$32,668,794
	Residential	737	\$58,786,092	\$29,393,046	\$88,179,138
	Vacant Land	2	\$8,979	\$0	\$8,979
	Total	864	\$75,129,468	\$45,727,443	\$120,856,911

Source: Big Horn County Assessor, accessed September 2015

Table 3-10 Town of Lovell Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Lovell	Commercial	122	\$13,694,505	\$13,694,505	\$27,389,010
	Exempt	4	\$330,213	\$330,213	\$660,426
	Residential	820	\$76,667,129	\$38,333,565	\$115,000,694
	Vacant Land	4	\$87,663	\$0	\$87,663
	Total	950	\$90,779,510	\$52,358,283	\$143,137,793

Source: Big Horn County Assessor, accessed September 2015

Table 3-11 Town of Manderson Building Asset Summary. Total Improved and Content Value by Jurisdiction.

Jurisdiction	Property Type	Building Count	Improved Value	Est. Content Value	Total Exposure
Manderson	Commercial	3	\$1,034,120	\$1,034,120	\$2,068,240
	Residential	45	\$1,948,523	\$974,262	\$2,922,785
	Vacant Land	2	\$1,857	\$0	\$1,857
	Total	50	\$2,984,500	\$2,008,382	\$4,992,882

Source: Big Horn County Assessor, accessed September 2015

Content value is estimated as a percent of structure replacement value per HAZUS 2.0:

- Industrial 150%
- Agriculture 100%
- Commercial 100%
- Residential 50%
- Vacant Land 0%
- Exempt (Schools and Govt.) 100%

Structural Vulnerability

Structural vulnerability may be a factor in consideration of high wind and tornadic events, as well seismic activity. The ability of buildings to withstand these onslaughts of nature must be considered in many types of planning, not the least of which is mitigation planning.

Table 3-12 provides information on building or construction requirements regulated by each jurisdiction. Lovell, Greybull, Cowley and Byron have adopted the International Building Code, and also have inspectors to enforce code requirements. The towns of Burlington and Deaver have adopted the International Building Code, but do not have inspectors to enforce the code. Big Horn County, Basin, Manderson, and Frannie have not adopted the International Building Code to date. Which years each participating jurisdiction adopted the code is not known.

Table 3-12 Community Building Codes - Status By Community

Community	Existing Building Codes	Building Inspectors
Big Horn County (unincorporated areas)	No	No
Lovell	Yes	Yes
Greybull	Yes	Yes
Basin	No	No
Byron	Yes	Yes
Burlington	Yes	No
Manderson	No	No
Frannie	No	No
Cowley	Yes	Yes
Deaver	Yes	No

Information Provided By Each Town/City Administrative Office.

As International Building Codes are adopted by more and more local jurisdictions, building inspectors are employed, inspections take place, and new construction under these codes occurs, vulnerability is expected to decrease. An example of regulation that helps to decrease vulnerability, would be that future buildings constructed within an identified floodplain provide that the lowest floor in new structures are elevated above stated levels to meet program requirements. These types of regulations

and codes help to decrease vulnerability as time goes on. Currently there are no known plans for subdivisions in identified non-random event hazard areas.

Vulnerable Populations

All populations are considered in this Plan. However, there are some populations that may be considered in groupings or as congregate for purposes of planning. Populations as categories of groups include incorporated towns and cities, school populations, hospitals, nursing homes, daycares, jails, and those individuals that are unable to self-evacuate (UTSE.)

Critical Facilities

Critical facilities provide a service essential to preservation of life or property, or exist as a facility critical to the welfare of the community are identified. The following table is based on information from Big Horn County GIS and list critical facilities by jurisdiction.

Table 3-13 Critical Facilities by Community

Jurisdiction	Critical Facility Type	Facility Name	Address
Basin	Ambulance	Big Horn County Rural Dist #1 and Atwood Ambulance	419 West C Street
Basin	Day Care	Absaroka Basin-Greybull Head Start	609 Rue Ave
Basin	Day Care	Children's Resource Center	117 S 4th St
Basin	Day Care	Home Away From Home	708 South 5th St
Basin	Fire Hall	Big Horn County Fire Dist #2 Basin	105 South 3rd Street
Basin	Government	Big Horn County Courthouse Annex	417 Murphy Street
Basin	Government	Big Horn County Courthouse, includes District Court of the 5th Judicial Dist and Circuit Court	420 West C Street
Basin	Government	Big Horn County Road and Bridge	412 Murphy Street
Basin	Government	Big Horn County Search and Rescue	427 Murphy Street
Basin	Government	Chamber Meeting Building	407 West C Street
Basin	Health Clinic	Big Horn Clinic	156 North 6th Street
Basin	Local Government	Basin Town Hall and Garage	209 - 211 South 4th Street
Basin	Mental Health	Big Horn County Counseling	116 South 3rd Street
Basin	Nursing Home	Wyoming Retirement Center	890 HWY 20 South
Basin	Police	Garage Shop and Police Department	309 West B Street
Basin	Pump Station	Pump Station	150 1/2 East B Street
Basin	School	Laura Irwin Elementary School	101 South 12th Street
Basin	School	NOWCAP Head Start Basin Center	965 North 6th Street
Basin	School	Riverside High AG Shop Building	919 West B Street
Basin	School	Riverside High School	919 West B Street, PO Box 151

Jurisdiction	Critical Facility Type	Facility Name	Address
Basin	School	Riverside High School Football Concessions / Press Box	Arlington Avenue
Basin	School	Riverside High School Track Football Storage Building and Track	Maloney Park
Basin	School	School District Administration Building and Bus Garages	416 South 3rd Street
Basin	School	School District Garage	4th and A Street
Basin	Sewage Treatment Building	Basin Sewage Lagoon Pond and Treatment Building (US Hwy 20 S)	290 North Street
Basin	Shelter	Laura Irwin Elementary School	101 South 12th Street
Basin	Shelter	Riverside High School	919 West B Street, PO Box 151
Basin	Sherriff	Big Horn County Sheriff's Dept. Shop	418 Murphy Street
Basin	Sherriff	Big Horn County Sheriff's Office, South Communications, and Jail	415 Murphy Street, PO Box 47
Basin	Substation	Substation (new 2010)	554 North 8th Street
Basin	Substation	Substation (South end of town)	2nd and Big Horn
Basin	Utility	Big Horn Rural Electric Company	208 South 5th Street
Basin	Water Facility	Pre-Settling Basins (old water plant)	150 East B Street
Basin	Water Facility	Raw Water Holding Tank	1600 West B Street
Basin	Water Facility	Raw Water Pump House	1500 West B Street
Basin	Water Filter Plant	Water Filter Plant	153 East B Street
Basin	Water Tank	Purified Water Tank (in town limits) West of town and S of Hwy 30	1700 West B Street
Basin	WYDOT	WYDOT District 5 Headquarters - Mechanic Shop	218 West C Street
Basin	WYDOT	WYDOT District 5 Headquarters - Office	218 West C Street
Basin	WYDOT	WYDOT District 5 Headquarters - Storage	218 West C Street
Burlington	Ambulance	Big Horn County Ambulance Dist #4	109 Main (Hwy 30)
Burlington	Fire Hall	Big Horn County Fire Dist #4 Burlington / Otto / Emblem	109 Main (Hwy 30)
Burlington	Local Government	Burlington Town Hall	101 West Poplar Avenue
Burlington	Local Government	Burlington Town Shop	101 West Poplar Avenue
Burlington	School	Burlington Schools (Elementary, JR & SR High Complex)	108 School Avenue
Burlington	Shelter	Burlington Shelter	108 School Avenue
Burlington	Shelter	LDS Church Burlington	114 Cedar Avenue
Byron	Day Care	Michele Freeman's Daycare	37 S Big Horn St

Jurisdiction	Critical Facility Type	Facility Name	Address
Byron	Local Government	Byron Town Hall	35 South Pryor Street
Byron	Police	Byron Police Department	35 South Pryor Street
Byron	School	Byron Elementary	30 East Main Street
Byron	School	Rocky Mountain High School	30 East Main Street
Byron	Shelter	Rocky Mountain High School	30 East Main Street
Byron	Water Tank	Water Tower	West Platte Avenue
Cowley	Day Care	Deb's Day Care	221 E Main St
Cowley	Day Care	Rocky Mountain Elementary Preschool	101 S Division
Cowley	Garage	Cowley Town Maintenance Shop / City Garage	81 East Main Street
Cowley	Government	Community Hall	51 East First Street South
Cowley	Government	Road and Bridge Shop and Storage	95 North 2nd Street West
Cowley	Local Government	Cowley Shop	105 North 2nd Street West / 81 east main?
Cowley	Local Government	Cowley Town Hall and Police Department	20 South Division Street
Cowley	School	Big Horn Academy Admin Building	South Division Street
Cowley	School	Big Horn County School District #1 (under construction)	Highway 310, South end of town
Cowley	School	Big Horn County School District #1 Superintendant	176 South 3 East
Cowley	School	Rocky Mountain Elementary School	101 South Division Street
Cowley	Shelter	LDS Church Cowley	52 East Main
Cowley	Shelter	Rocky Mountain Elementary School	101 Division Street
Cowley	Water Tank	Water Tower	East 1st Street North
Deaver	Fire Hall	Big Horn County Fire Dist #5	First Avenue West
Deaver	Local Government	Deaver Town Hall	180 First Street
Deaver	School	Rocky Mountain Middle School Complex	176 West 3rd Street
Deaver	Shelter	Rocky Mountain Middle School	176 West 3rd Street
Frannie	Fire Hall	Frannie Fire Hall District #5	Fifth Street
Frannie	Local Government	Frannie Town Hall	325 Cedar Street
Frannie	School	Frannie Grade School	Fifth Street and Cedar Street
Greybull	Day Care	Apple Dumpling Day Care	216 Hilltop Dr
Greybull	Day Care	Lil ' Red Wagon Childcare and Learning Center	200 3rd Ave South
Greybull	Day Care	Little Wranglers	608 Greybull Ave
Greybull	Day Care	Stepping Stones Montessori	346 Greybull Ave
Greybull	Fire Hall	Greybull Fire Hall / Emergency Medical	141 North 6th Street
Greybull	Fire Siren	Emergency Fire Siren	170 North 7th Street

Jurisdiction	Critical Facility Type	Facility Name	Address
Greybull	Fire Siren	Emergency Fire Siren	24 South 5th Street
Greybull	Government	Herb Asp Community Hall	Corner of South 6th Street and First Avenue
Greybull	Local Government	Greybull Town Hall	24 South 5th Street
Greybull	Police	Greybull Police Department	24 South 5th Street
Greybull	Public Health	Big Horn County Public Health	417 South 2nd Street
Greybull	School	Big Horn County School District #3 Admin and Bus Barn	636 14th Avenue North
Greybull	School	Greybull Elementary School	125 6th Avenue South
Greybull	School	Greybull High School Complex	600 North 6th Street
Greybull	School	Greybull Middle School Complex	600 8th Avenue North
Greybull	Senior Citizens Center	Senior Citizens Center	417 South 2nd Street
Greybull	Shelter	Greybull Elementary School	125 6th Avenue South
Greybull	Shelter	Greybull High School	600 North 6th Street
Greybull	Shelter	Greybull Middle School	600 8th Avenue North
Greybull	Shelter	Old High School Gym	-
Greybull	State Government	Wyoming Game and Fish Warden Station - Office/Residence	434 6th Avenue North
Lovell	Ambulance	North Big Horn Ambulance #53 Service Housing / Equipment	1115 Lane 12
Lovell	Day Care	-	195 E 7th St
Lovell	Day Care	Absaroka Head Start of Lovell	750 1/2 Kansas Ave
Lovell	Day Care	Children's Resource Center	435 E 5th St
Lovell	Day Care	Leonhardt Day Care	352 W Main St
Lovell	Day Care	Marie Thomas Day Care	144 W Main St
Lovell	Day Care	Teddy Bear Daycare	172 E 2nd St
Lovell	EOC	Emergency Management Building	355 East 5th Street
Lovell	Equipment	Contractor's Equipment (Bair Equipment Company)	213 East 3rd Street
Lovell	Fire Hall	Big Horn County Fire Dist #1 Lovell / Cowley / Byron	314 Nevada Avenue
Lovell	Government	Big Horn County Courthouse Annex, includes Circuit Court	355 East 5th Street
Lovell	Government	Chamber of Commerce	287 East Main Street
Lovell	Government	Search and Rescue Buildings / Equipment	256 East 5th Street
Lovell	Health Clinic	Strong Tree Clinic	342 E. Main
Lovell	Hospital	North Big Horn County Hospital and Clinic	1115 Lane 12
Lovell	Local Government	Lovell Town Office and Public Works Shop	336 Nevada Avenue

Jurisdiction	Critical Facility Type	Facility Name	Address
Lovell	Local Government	Lovell Town Shop	337 Montana Avenue
Lovell	National Guard	Wyoming National Guard Armory	360 East 5th Street
Lovell	Nursing Home	NEW HORIZONS ASS LIV/CARE CNTR	1111 LANE 12
Lovell	Police	Lovell Police Department	355 East 5th Street
Lovell	Public Health	Lovell Public Health Nurse and WIC	757 Great Western Avenue
Lovell	School	Big Horn County School District #2 Central Offices	Great Western Avenue
Lovell	School	Lovell Elementary School	520 Shoshone Avenue
Lovell	School	Lovell High School	502 Hampshire Avenue
Lovell	School	Lovell Middle School	325 West 9th Street
Lovell	School	Lovell Schools Gym	502 Hampshire Avenue
Lovell	Senior Citizens Center	Lovell Senior Citizens Center	757 Great Western Avenue
Lovell	Shelter	LDS Church Lovell	50 West Main
Lovell	Shelter	Lovell Elementary School	520 Shoshone Avenue
Lovell	Shelter	Lovell High School	502 Hampshire Avenue
Lovell	Shelter	Lovell Middle School	325 West 9th Street
Lovell	Water Tank	Water Tank	974 Shoshone Avenue
Lovell	WYDOT	WYDOT Shop / Garage	450 East 5th Street
Lovell	WYDOT	WYDOT Storage	450 East 5th Street
Manderson	Fire Hall	Big Horn County Fire Dist #3 Manderson	515 North Sherman Avenue
Manderson	Garage	Bus Garage	157 East 1st Street
Manderson	Local Government	Manderson Town Hall	100 Railway Street
Manderson	School	Cloud Peak School (Manderson Elementary and Middle Schools)	170 School Avenue
Manderson	Shelter	Cloud Peak School	170 School Avenue
Unincorporated	Airport	North Big Horn County Airport (Cowley)	600 Road 7 1/2 or 185 Park Avenue
Unincorporated	Airport	South Big Horn County Airport (Greybull)	2441 Highway 20
Unincorporated	Day Care	Little Joys Daycare	1223 Rd 11
Unincorporated	Day Care	Tammie's Childcare	1062 Lane 13
Unincorporated	Fire Hall	Shell Volunteer Fire and Ambulance Dept	Smith Avenue
Unincorporated	Government	Lovell Community Center	1910 US Highway 310
Unincorporated	Hospital	South Bighorn County Hospital, includes Midway Clinic and BlueJacket Nursing Home	388 Hwy 20 South
Unincorporated	Local Government	Shell Community Hall	Smith Avenue
Unincorporated	Mental Health	Big Horn Basin Counseling Services	1114 Lane 12

Jurisdiction	Critical Facility Type	Facility Name	Address
Unincorporated	Sewage Treatment Building	Sewer Control and Storage Building	1 Mile North of Greybull
Unincorporated	Shelter	LDS Church Basin	400 Hwy 20 South
Unincorporated	State Government	Battle Mountain Patrol Cabin	-
Unincorporated	State Government	Game and Fish Yellowtail Wildlife Habitat Management Area Warden Station	10 Mile NE of Lovell
Unincorporated	State Government	Patrol Cabin Storage Shed	-
Unincorporated	State Government	Patrol Cabin	Bald Mt 2 Mi N Lovell
Unincorporated	State Government	WY Game and Fish Tillet Springs Station / Hatchery	195 County Road 16
Unincorporated	State Government	Wyoming Game and Fish / Residence	955 Road 18
Unincorporated	Water Tank	250,000 Water Tank	2 Miles SW of Greybull
Unincorporated	Water Tank	Airport Water Tower / 650,000 Gallon	244 US Hwy 20
Unincorporated	Water Tank	Water Tank	1 Mile East of Greybull
Unincorporated	Water Tank	Water Tank	Image Drive
Unincorporated	Water Tank	Water Tank and Chlorinator House	Trapper Creek (Shell Area)
Unincorporated	Water Tank	Water Tower	Ash Street
Unincorporated	Water Tank	Well Head and Water Tank	3 Miles East of Greybull
Unincorporated	Water Well Building	Burlington Water Well Building	760 Lane 39
Unincorporated	WYDOT	Pole Creek - Well House	912 US 14, West of Burgess Jct, Milepost 64.3
Unincorporated	WYDOT	WYDOT Pole Creek - Storage	912 US 14, West of Burgess Jct, Milepost 64.3
Unincorporated	WYDOT	WYDOT Storage	450 East 5th Street

Source: Big Horn County GIS

Dam Failure

Narrative

Dam failure can be described as “the unintended release of impounded waters” and can fail for one or a combination of reasons. An unintended release can occur as a result of:

- A component failure of a structure that does not result in a significant reservoir release, or
- An uncontrolled breach failure that leads to a significant release. With an uncontrolled breach failure of a manmade dam there is a sudden release of the impounded water, sometimes with little warning. The ensuing flood wave and flooding have enormous destructive power.

Dams rarely fail, either completely or partially, but when they do they may be a life and safety hazard for those downstream. Overtopping failures result from uncontrolled flow of water over, around, and adjacent to the dam. Approximately 70% of dam failures are from floods and overtopping. Older dams are most susceptible to overtopping failure. Foundation and structural failures are usually tied to seepage through the foundation of the main structure of the dam. Seepage or piping accounts for about 12% of dam failure. Deformation of the foundation or settling of the embankment can also result in dam failure.

Federally-Controlled Dams

In 1981, the U.S. Army Corps of Engineers completed an inspection program for non-federal dams under the National Dam Inspection Act (P.L. 92-367). This was a four-year work effort and included compiling an inventory of about 50,000 dams and conducting a review of each state’s capabilities, practices, and regulations regarding design, construction, operation, and maintenance of dams. There were 1,458 dams in Wyoming that were reviewed by the Corps at that time. Part of the inspection included evaluating the dams and assigning a hazard potential based on the effects downstream should one of the dams fail. The dams were rated (1) high, (2) significant, and (3) low hazard. The Corps of Engineers based the hazard potential designation on such items as acre-feet capacity of the dam, distance from the nearest downstream community, population density of the community, and age of the dam. High hazard dam failures would involve property losses over \$1 million and have probable loss of life. Significant hazard dam failures would cause over \$1 million in property damage and involve possible loss of life.

These classifications are based on the consequences if a dam were to fail, not on the potential of failure, or the existing condition of a dam. Hazard potential classification is not a guarantee of safety.

State-Inspected Dams

The Wyoming State Engineer’s Office (WSEO) is in charge of inspecting dams throughout the State that are over 20 feet high or with a storage capacity of 50 acre-feet or more and are not federally inspected. As a part of the regulatory process the WSEO inspects these dams once every five years.

The State of Wyoming has adopted FEMA’s risk classifications as set forth in FEMA’s *Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams*. These classifications describe potential losses and damages anticipated in down-stream areas that could be attributable to failure of a dam during typical flow conditions.

High Hazard Potential - Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life. There are three high hazard potential dams located in Big Horn County, and an additional 21 high hazard potential dams located outside Big Horn County that have the potential to negatively affect the planning area.

Significant Hazard Potential - Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure. There are four significant potential dams located in Big Horn County, and an additional 12 significant potential dams located outside Big Horn County that have the potential to negatively affect the planning area.

Low Hazard Potential - Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property. There are 35 low hazard potential dams located in Big Horn County.

Big Horn County is part of Water Division #3 under the WSEO regional office in Riverton. WSEO field hydrographers reside in the Big Horn Basin and are assigned to the six water districts that are a part of Big Horn County. Copies of all inspection reports for each of the dams are available at the WSEO headquarters office in Cheyenne. Inspection reports are also available at the WSEO District Offices for dams and structures located in their specific district.

Past Occurrences

Rarely do dams completely or partially fail to become a significant downstream hazard. There has been one catastrophic dam failure within the U.S. Rocky Mountain region in recent history. This event occurred 250 miles west of Big Horn County over the Wyoming state line, and was due to an engineering and structural failure of Idaho's Teton Dam. A 305-foot high U.S. Bureau of Reclamation earth-filled structure, situated near the Montana and Wyoming borders on the Teton River. It failed completely as it was being filled for the first time over a period of several months. When it was filled to near capacity, it released the contents of its reservoir at 11:57 AM on June 5, 1976. Eleven people perished and over 13,000 cattle were killed. Inundation areas were 40 miles wide in some places. The Bureau of Reclamation set up claims offices and by January 4, 1977, disaster victims filed over 4,800 claims totaling \$194 million. Originally scheduled to end in July 1978, the Claims Program continued into the 1980s. At the end of the Claims Program in 1987, the federal government had paid 7,563 claims for a total amount of \$322 million. Total damage estimates have ranged up to \$2 billion, and the dam was never rebuilt.

There is no known occurrence of a past dam failure in Big Horn County, or of dams upstream from county boundaries that affected Big Horn County. However, dams identified outside of the county whose complete or partial failure would have a negative impact on Big Horn County will be discussed as significant hazards for the purposes of this Plan. The dams that are of biggest concern to the County are discussed below. Figures XX and XX show the locations of these dams within and around the county.

Vulnerability

There are at least four reservoirs and dams that, should they be compromised, have the capacity to cause loss of life and property destruction throughout Big Horn County or at least minor property

damage. There are 39 secondary dams scattered throughout the county that are less critical, but should also be recognized as having a potential for impacting downstream populations or property.

Primary Dams

Dam sites whose failure would have potentially the biggest impact on Big Horn County and its towns and cities actually lie outside the County boundaries. Those sites are listed below:

Roach Gulch Reservoir and Dam (also known as the Greybull Valley Dam) is physically located in Park County, immediately west of the Big Horn County boundary on the Greybull River. The dam is an earthen dam, 151 feet in height; owned and maintained by the Greybull Valley Irrigation District and serving over 400 shareholders. Its purpose is to divert and store water from the Greybull River for downstream crop irrigation and agricultural use. The reservoir's surface area is 691 acres and its capacity is rated at 33,169 acre feet. Roach Gulch Dam is located in Park County, just above the western edge of the Big Horn County line.

Roach Gulch Dam is classified as a high hazard dam by the Wyoming State Engineers Office, based on predicted consequences if a dam failure were to occur. At average capacity, the Sunshines and Roach Gulch Reservoir combined hold approximately 140,000 acre feet of water.

The Farmer's and Bench Canal diversion structure is located below Roach Gulch Reservoir, 1.5 miles west of the Big Horn County line and one half mile south of County Road 40.

Upper and Lower Sunshine Reservoirs and Dams collect and store water high above the town of Meeteetse in Park County for agricultural irrigation use. The dam releases water into the Greybull River on its journey down into the Big Horn Basin and east to Roach Gulch Dam and Reservoir, from which water is again regulated for irrigation practices. The water continues through Big Horn County on its way to the Bighorn River. The Sunshines are owned and maintained by the Greybull Valley Irrigation District, and are inspected every five years by the Wyoming State Engineers Office or as necessary.

Buffalo Bill Dam and Reservoir, six miles west of Cody in Park County, regulates the Shoshone River and provides incidental flood control on the Shoshone River. Described as a concrete arch structure of constant radius, the structural height is 325 feet and the volume is 82,900 cubic yards. This was one of the first high concrete dams built in the United States. It began storing water in 1910. The Shoshone River flows west to east from the dam, eventually traveling just north of the town of Lovell and emptying into Big Horn Lake and the Big Horn River. The Buffalo Bill Dam provides the irrigation water supply for 93,113 acres, supplemental service for 14,561 acres, and produces power that is fed into a grid system serving an area that extends into three States.

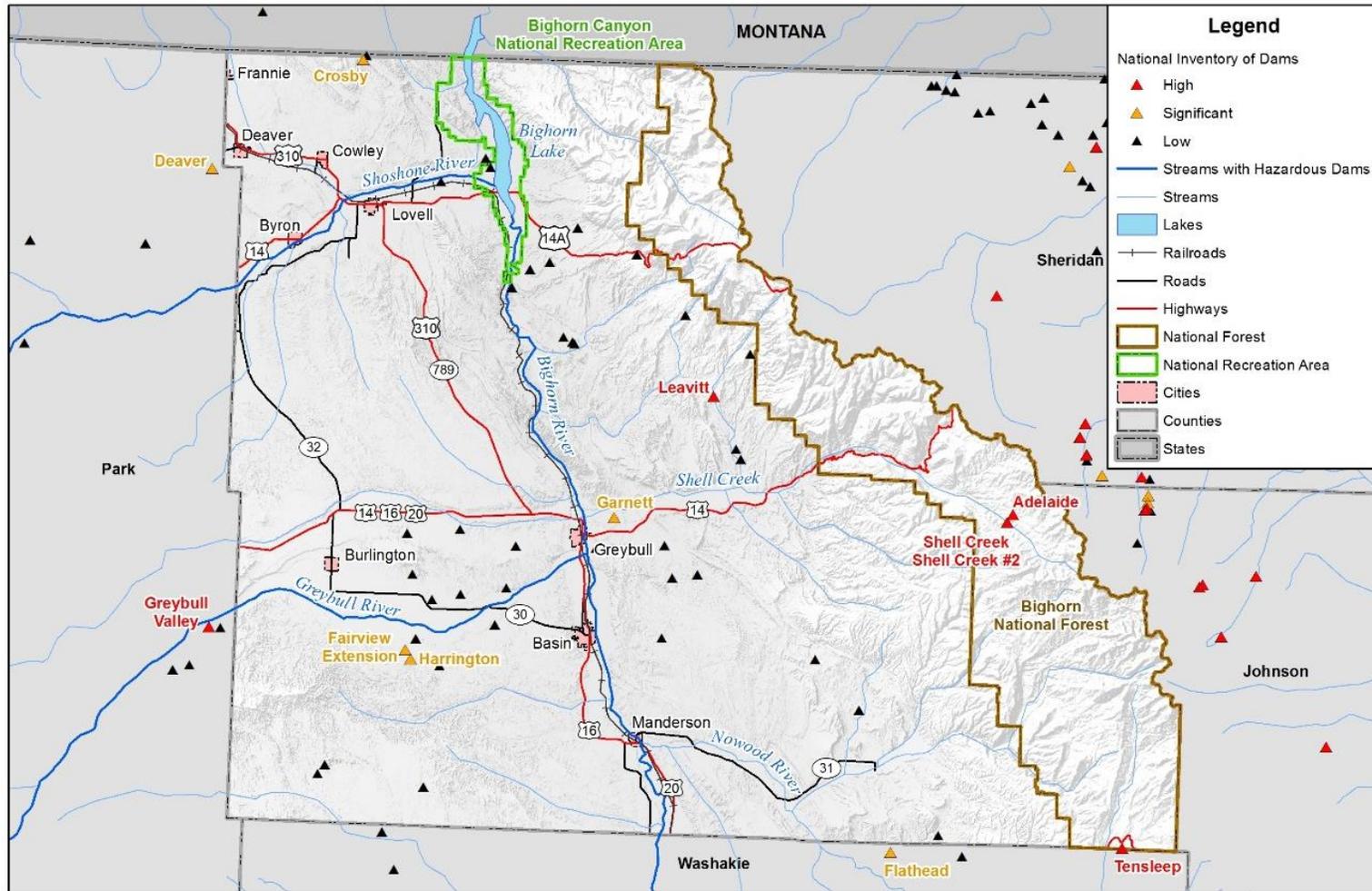
Boysen Dam and Reservoir is an earthen dam located on the Wind River, approximately 20 miles south of Thermopolis in Fremont County. The Wind River becomes known as the Big Horn River downstream from the reservoir; eventually, the river flows into Manderson in southern Big Horn County.

The first dam in the Boysen area was constructed of concrete in 1908, and was replaced by a second structure which became operational in December, 1952. The current dam is operated by the U.S. Federal Bureau of Reclamation, and is an earth-filled dam with a structural height of 220 feet. Hydroelectric power is tied into the transmission lines to Alcova, Thermopolis, and Pilot Butte-Thermopolis, and provides irrigation water through storage for lands below and above the reservoir.

Total flood damages reduced by the reservoir since construction totaled about \$75.0 million by the end of 1998.

Shell Reservoir and Adelaide Lake are located in eastern Big Horn County, high above the unincorporated town of Shell, collecting water from snow melt and small streams located in the Big Horn Mountains. Waters from the lake and reservoir contribute to Shell Creek, which flows west approximately 15 miles after leaving the town of Shell, eventually joining the Big Horn River several miles north of the town of Greybull.

Figure 3-1 Big Horn County Dams



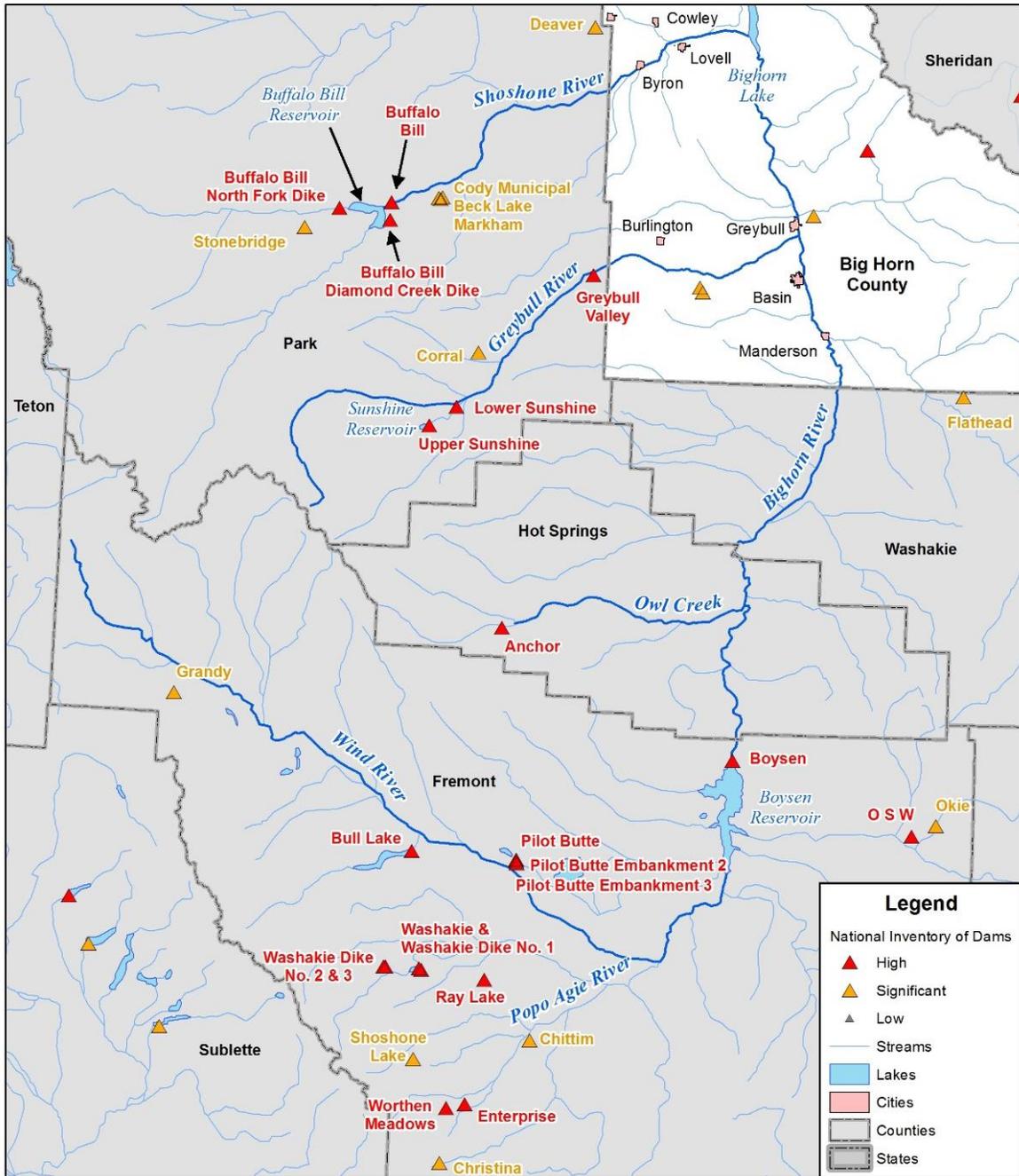
3-24



Map compiled 8/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, NID



Figure 3-2 Dams Located Outside Big Horn County



Map compiled 9/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, NID



Downstream Emergency Action Plans (EAPs) for Roach Gulch and Sunshine Reservoirs were completed during Fall 2009 by the Greybull Valley Irrigation District. EAPs for both Boysen and Buffalo Bill Bureau of Recreation dams include inundation maps and downstream warning and notification plans, including local emergency services agencies and municipal contacts to be used in the event of a breach or imminent threat.

Secondary Dams

There is an extensive network of secondary downstream reservoirs, dams, canals, water control structures, and ditches used to convey water from primary canals. Most canals, secondary dams and smaller reservoirs are serviced by the Buffalo Bill, Boysen, Roach Gulch, or Upper and Lower Sunshine Reservoirs and Dams.

Three of these secondary dams have been designated by the Wyoming State Engineers Office to be high risk dams, and four to be significant risk dams.

The Wyoming State Engineers Office submitted a list of WSEO-inspected secondary dam structures existing within Big Horn County. The Big Horn County Emergency Management Coordinator can provide lists of WSEO-inspected dams upon request.

Potential Impact

Although earthquake or seismic activity has received a very low priority rating in terms of a detrimental impact to Big Horn County, active faults lie very close to both Boysen and Buffalo Bill Cody Dams. The Buffalo Bill Cody Dam exists near what is known to be one of the most seismically active areas of the United States, that of the Yellowstone Caldera. This geothermal region experiences 1000 to 2000 measurable earthquakes each year, and has been known to experience as many as 3,000 such events in a matter of months. A swarm of small earthquakes occurred January 17, 2010 to February 1, 2010, documenting 1620 measurable seismic occurrences in that two-week period. The largest of these shocks registered a magnitude of 3.8.

It is difficult to predict the larger impact to life and property that may occur as a result of secondary washouts and breaches of these smaller water storage and conveyance systems downstream, should any of the aforementioned five primary dams actually fail. It is conceivable that a “domino effect” could be experienced should one of the major dams breach, compromising some of the smaller downstream dams.

Finally, Bureau of Reclamation and the Greybull Irrigation District’s predictions are based on a “sunny day” breach. Any event may be influenced by already bank full streams, rivers, and canals that occur in most years, at various times of the year due to spring run-off or heavy rains in the mountains, compounded by a sudden influx of water from a dam failure.

Table 3-14 briefly presents flood water crest predictions in a worst-case breach in a “sunny day” event for each of the three dams for which inundation predictions have been made available. These predictions do not take into account variables such as downstream river and canal capacity at time of breach, ground saturation, or seasonal factor. Nor do they address possible secondary impacts from smaller irrigation reservoir and waterway damage.

Table 3-14 Worst Case Predictions from Dam Emergency Plans for Big Horn County

(Buffalo Bill, Roach Gulch, Boysen)

Projected depth of water at cross points are predicted maximum depth of flood waters.

	2 Mile Corner @ Burlington SBE 4,404 ft	Otto Area SBE 3,891 ft	Manderson SBE 3,891 ft	Greybull River Road/Hwy 30 Intersection Basin SBE 3,878 ft	Greybull SBE 3,793 ft	Byron SBE 4,029 ft	Lovell SBE 3,832 ft
Buffalo Bill Cody Dam on the Shoshone (SBE 5,125 ft.)						2.5 hrs 27 ft	3.1 hrs 15 ft
Roach Gulch Dam Greybull River (SBE 4,815 ft.)	1.5 hrs 18 ft	2.6 hrs 9 ft		4.5 hrs 11 ft		6 hrs 10 ft	10.73 hrs 16 ft
Boysen Dam, Fremont County Big Horn River (SBE 4,608 ft)			8 hrs 45 ft		9 hrs 45 ft	11 hrs 59 ft	

SBE – Stream Bed Elevation

Sources: 2010 Hazard Mitigation Plan; Boysen Dam EAP; Buffalo Bill Dam EAP; Roach Gulch Emergency Preparedness Plan

Besides rural farm and ranch operations and residences along the Greybull, Nowood, Shoshone and Big Horn Rivers, the most vulnerable concentrated populations in terms of a dam failure of Roach Gulch Dam, Buffalo Bill, or Boysen Dam are the City of Greybull or the Town of Manderson.

Boysen Dam Impact Description

Emergency Action Plans (EAPs) published by the Bureau of Reclamation vary somewhat from HAZUS 100-year flood predictions regarding a breach of the Boysen Dam. While Town of Basin expression is very similar for either a dam breach or 100-year flood event. However, Town of Manderson, and City of Greybull expressions differ in that regard.

Manderson

In the 100-year flood mapping, public buildings appeared to be unaffected in the Town of Manderson. However, Bureau of Reclamation inundation maps indicate the town as being entirely inundated, including Cloud Peak Middle School and the Town Hall. At 100% inundation, public property at risk is predicted to be the Fire Hall, the Middle School, and the Town Hall and sewage lagoons. A bar and

restaurant, the federal post office, and as many as 100 private residences within the town may be involved in a 100 year-flood. The value of public property exposed is \$11.7 million. Flooding of Cloud Peak School could impact as many as 120 students and staff.

Greybull

While the Greybull Middle and High School is not included in 100-year flood mapping, Bureau of Reclamation inundation maps display the city as being entirely inundated, including Greybull Middle and High Schools. The population of Greybull is 1,815. Based at 100% inundation of the incorporated city, \$41.5 million worth of public buildings and equipment may be exposed to flood waters. Identified public property includes the Greybull Fire Station & Ambulance, City Hall, Municipal Police Dept, Community Center, Library, Greybull Elementary School, the middle and high schools, and the Herb Asp Community Center. The exposure figure does not include private property valuation and should be considered to be a low end valuation for maximum damage from a potential failure of the Boysen Dam.

Numerous private residences would be exposed to flood waters. In addition to the assets listed above, other property identified and not included in a valuation are two banks, the federal post office, the USDA Service Center, a historic hotel, BNSF offices, three bulk petroleum products distributors, several auto parts stores, restaurants, flower shops, quilting & clothing stores, several bars, numerous churches, several doctor's offices, a lumber yard, an agricultural farm products store, hair salons and numerous other private sector businesses. Values are not available for bridges, roads, culverts and other infrastructure that may be affected in a severe flooding event.

Buffalo Bill Cody Dam Impacts

The Bureau of Reclamation published and released an updated EAP for the Buffalo Bill Dam and Reservoir in 2007, which supersedes all past EAPs for that structure. The updated EAP included at least one major change impacting Big Horn County and the City of Lovell.

Past inundation mapping indicated that at least 85% of the City of Lovell would be flooded and probably destroyed. 2007 EAP has softened this prediction drastically due to a change in prediction methodology and calculations. 2007 inundation maps express that the sewage lagoons, several homes, and a lime stockpile behind the Western Sugar Factory would be of concern. The lime stockpile may be of significant environmental concern should it get into a waterway. Western Sugar is involved in ongoing efforts to decrease the stockpile.

Roach Gulch Dam Impacts

Roach Gulch Reservoir and Upper and Lower Sunshine Reservoirs are held by dams that have the potential to cause downstream damage on the Greybull River should a breach occur. This group of three reservoirs and dams residing in Park County are privately owned and maintained by the Greybull Valley Irrigation District, and inspected and permitted by the Wyoming State Engineer's Office. Each dam has a dam tender that lives on-site. However, surveillance systems on the dams are basically non-existent.

Greybull Valley Irrigation District inundation mapping and the downstream notification list involve at least 74 families and well over 200 people who reside in the inundation areas. Ranches north and east of Roach Gulch Dam would be the first residences to be inundated following a breach of the dam, with as little as 19 minutes notice. The next 7 miles of ranch residences may have 90 minutes to relocate or try to protect their families and employees, or evacuate their homes. The city of Greybull may be

severely impacted. Time predictions were calculated by the Denver firm that engineered the dam. Roach Gulch flood crest depth predictions are uncertified and non-engineered.

Sunshine Reservoirs & Dam Impacts

Upon examination of inundation predictions and mapping, Greybull Valley Irrigation District personnel express that a breach of the Sunshine Dams would inundate downstream Big Horn County residents and property as described in inundation impact predictions for a Roach Gulch breach.

Shell Reservoir and Adelaide Lake

The dams for both the reservoir and lake are owned and maintained by the Shell Irrigation District. Both classified as high risk structures by the WSEO, due to the impact to people below the dams should one or both fail. There are no inundation maps available; however the minimum amount of exposure may be considered to be to the City of Greybull's well house, chlorinator house and water tank, located in the Trapper Creek area. The Town of Shell is unincorporated, and includes a rural volunteer fire department, a community center, and several eating establishments, as well as numerous residences, ranches, and small acreages.

Specific Concerns

An artificial embankment exists below the confluence of the Greybull and Big Horn Rivers, and within the Town of Greybull. This earth-filled structure is inspected for maintenance every year by the Army Corp of Engineers and currently provides significant protection. However, the levee does encircle the town almost three sides to protect the town from flooding on the Greybull River. Should either the Roach Gulch or Boysen Dams fail, it is difficult to anticipate whether this levee will be able to withstand the impending crest of water. Currently the structure as it exists is pending certification as stipulated under Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10).

The well providing the Town of Burlington with domestic water is located within the flood plain for an occurrence of flooding caused by a breach of the Roach Gulch Dam. The well is located on Lane 39.

Future Development

Future development around Big Horn County should take into account the impact of any nearby dam breach. Inundation maps and emergency action plans should be consulted in the planning of new development, where applicable.

Summary

The Boysen, Roach Gulch, and Buffalo Bill Dams will impact Big Horn County should the structural integrity be compromised. Failure to notify downstream populations within the county may lead to hundreds of millions of dollars in damage and loss of life.

Further consideration must be given to the fact that water control afforded by these dams and reservoirs serve a very important role for Big Horn County's economic base. Secondary impacts and crop damage may result from the loss of downstream water control structures and diversions taking quite some time to replace.

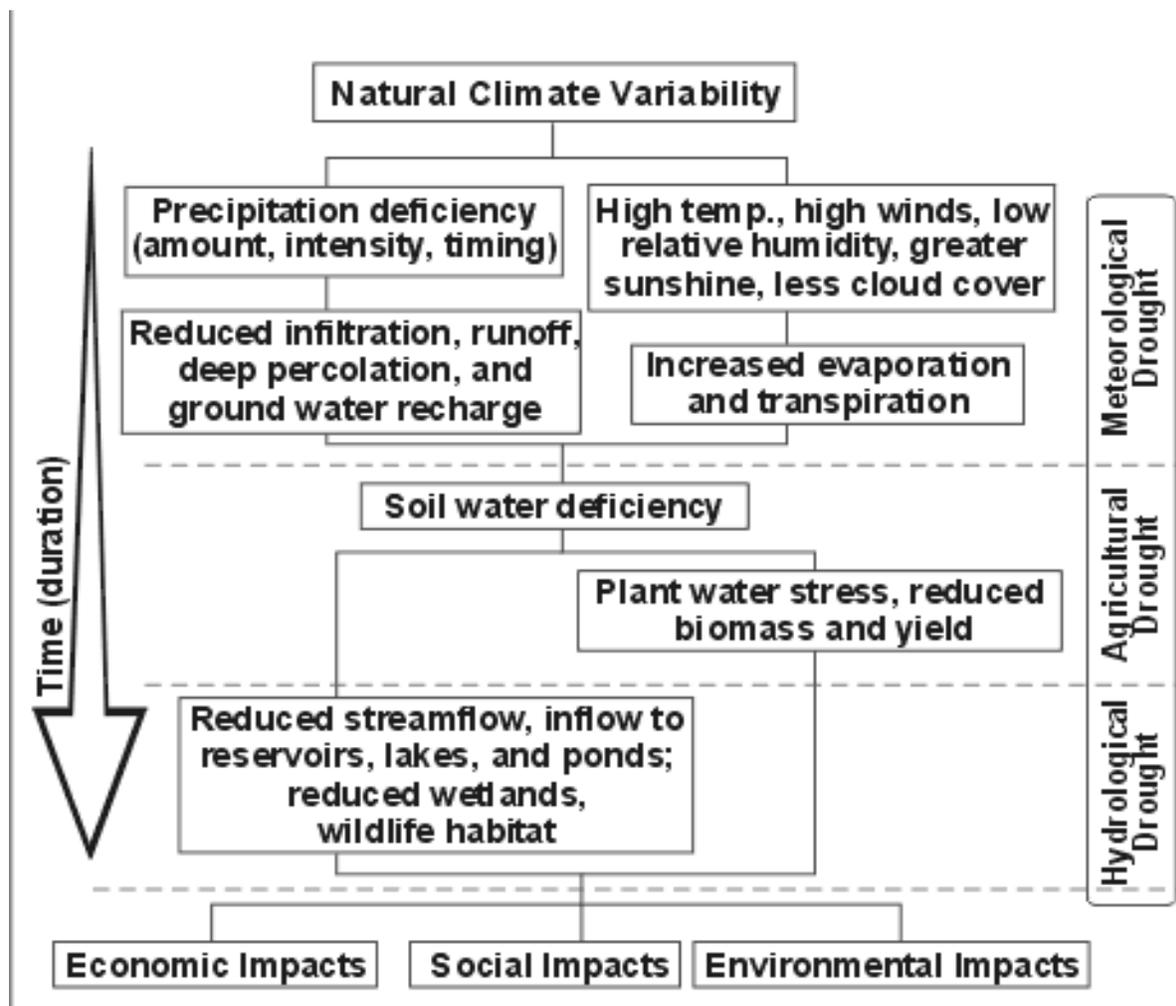
Loss Potential: High
Population Impacted: High
Probability: Low
Jurisdictions at Risk: All towns and properties in pre-identified inundation areas

Drought

Narrative

Drought is human society's most costly, natural weather-related disaster by far. It indirectly kills more people and animals than the combined effects of hurricanes, floods, tornadoes, blizzards, and wildfires. Unlike other disasters that quickly come and go, drought's long-term unrelenting destruction has been responsible for mass migrations and lost civilizations. The 1980 and 1988 droughts in the U.S. resulted in approximately 17,500 heat-related deaths and an economic cost of over \$100 billion. Drought occurs in four stages and is defined as a function of its magnitude (dryness), duration, and regional extent. Severity, the most commonly used term for measuring drought, is a combination of magnitude and duration.

Figure 3-3 Drought Progression Chart



Source: www.nws.noaa.gov

The first stage of drought is known as a meteorological drought. The conditions at this stage include any precipitation shortfall of 75% of normal for three months or longer. This criterion can be misleading if all the precipitation falls in a very short time period resulting in floods.

The second stage is known as agricultural drought. Soil moisture is deficient to the point where plants are stressed and biomass (yield) is reduced.

The third stage is the hydrological drought. Reduced stream flow (inflow) to reservoirs and lakes is the most obvious sign that a serious drought is in progress.

The fourth stage is the socioeconomic drought. This final stage refers to the situation that occurs when physical water shortage begins to affect people (**Figure 3-3**).

Past Occurrences

The nation's fifth driest state, drought is a reoccurring hazard in Wyoming. Wyoming was gripped by a drought cycle described as moderate to severe from 1999 until conditions eased in mid-2008, according to the State Climate Office; drought returned again to the state in 2012-2013. Winter precipitation in the state of Wyoming is usually two to six times less than summer precipitation and these so-called seasonal droughts are normal in Wyoming's semi-arid climate. Conditions are often made worse with high temperatures, high winds, low humidity, and greater sunshine. All of these factors contribute to increased evaporation and transpiration and result in reduced soil infiltration, runoff, deep percolation, and groundwater recharge (*Source: Wyoming Multi-Hazard Mitigation Plan, 2014*).

The Dust Bowl era of the 1930s affected 50,000,000 acres of land across the West, including most of Wyoming. In the 1950s, the Great Plains again suffered a severe water shortage. The worst drought in 50 years occurred in 1988 and affected 35 states including Wyoming. As direct result of this, large fires burned across large parts of the American West in 1988, including the conflagration in Yellowstone Park (*Source: National Weather Service*). Big Horn County was part of the larger area affected by these earlier droughts.

Figure 3-4 Percentage of Wyoming in Drought by Category, 2000 - 2015

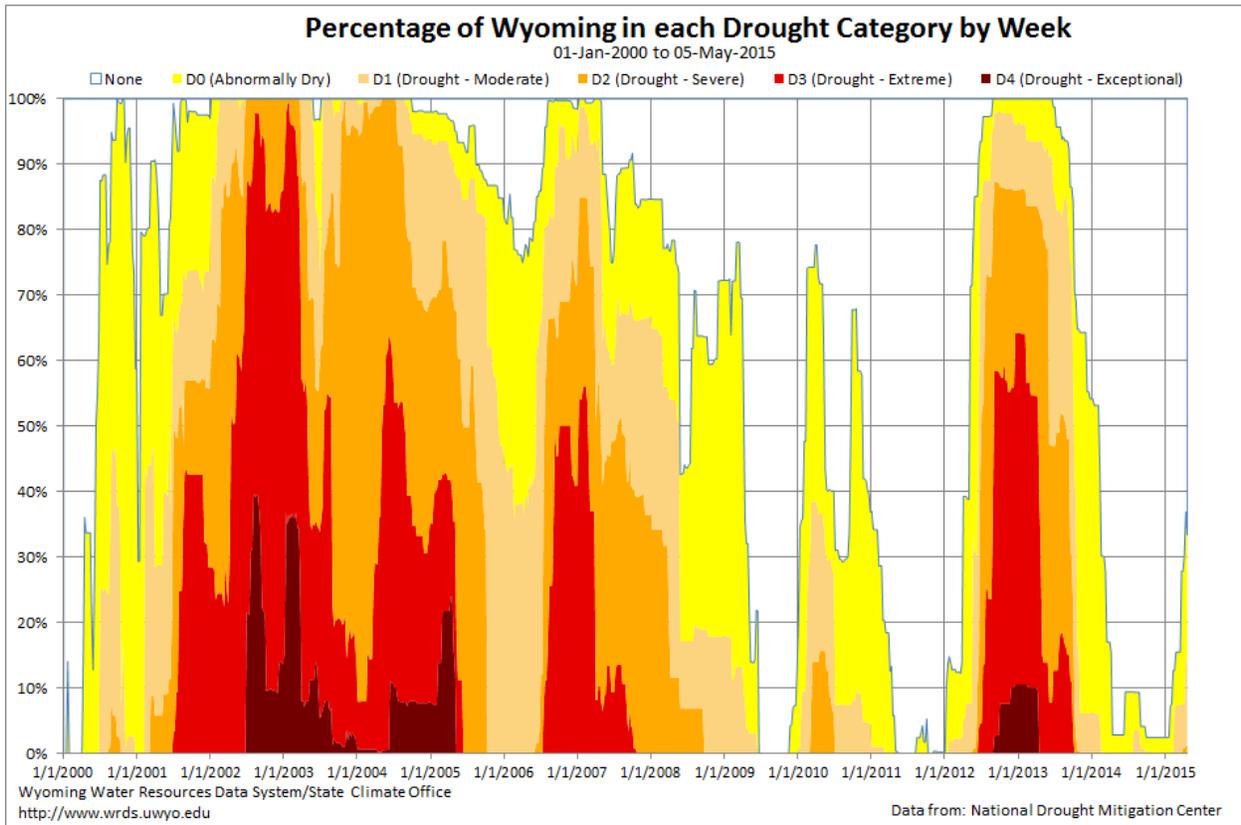


Figure 3-4 from the National Drought Mitigation Center shows that at the peak of the most recent (2013) drought, more than 10% of Wyoming fell in the ‘Exceptional Drought’ (D4 or dark red) category, and 100% of Wyoming experienced at least ‘Abnormally Dry’ conditions. The U.S. Drought Monitor also provides maps of historic drought conditions by state. The U.S. Department of Agriculture (USDA), the National Oceanic and Atmospheric Administration (NOAA), and the National Drought Mitigation Center (University of Nebraska-Lincoln) collaborate on this weekly product, which is released each Thursday. Multiple drought indicators, including various indices, outlooks, field reports, and news accounts are reviewed and synthesized. In addition, numerous experts from other agencies and offices across the country are consulted. The result is the consensus assessment presented on the USDM maps. The image is color-coded for four levels of drought intensity. An additional category, ‘Abnormally Dry,’ (D0 or yellow) is used to show areas that might be moving into a drought, as well as those that have recently come out of one. USDM map data dating from 2000 reveal that Big Horn County experienced drought conditions at least as severe as the rest of the State of Wyoming for the past three drought periods in 2013, 2007 and 2003 (**Figure 3-5**, **Figure 3-6** and **Figure 3-7**, respectively).

Figure 3-5 State of Wyoming Drought Conditions, January 2013. Big Horn County in Circle.

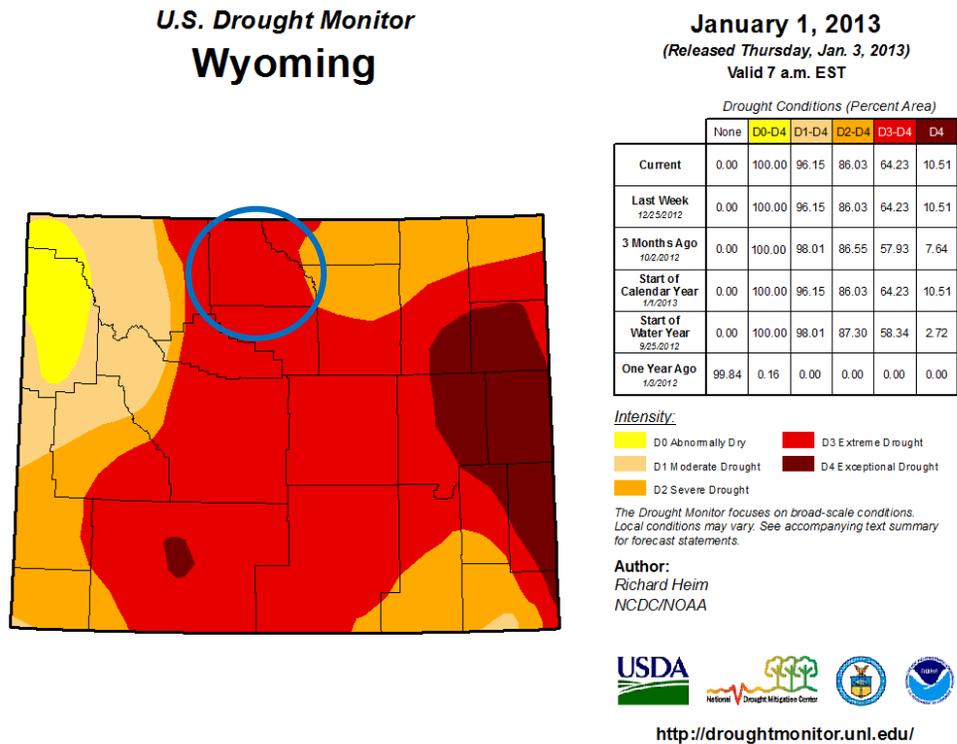


Figure 3-6 State of Wyoming Drought Conditions, January 2007. Big Horn County in Circle.

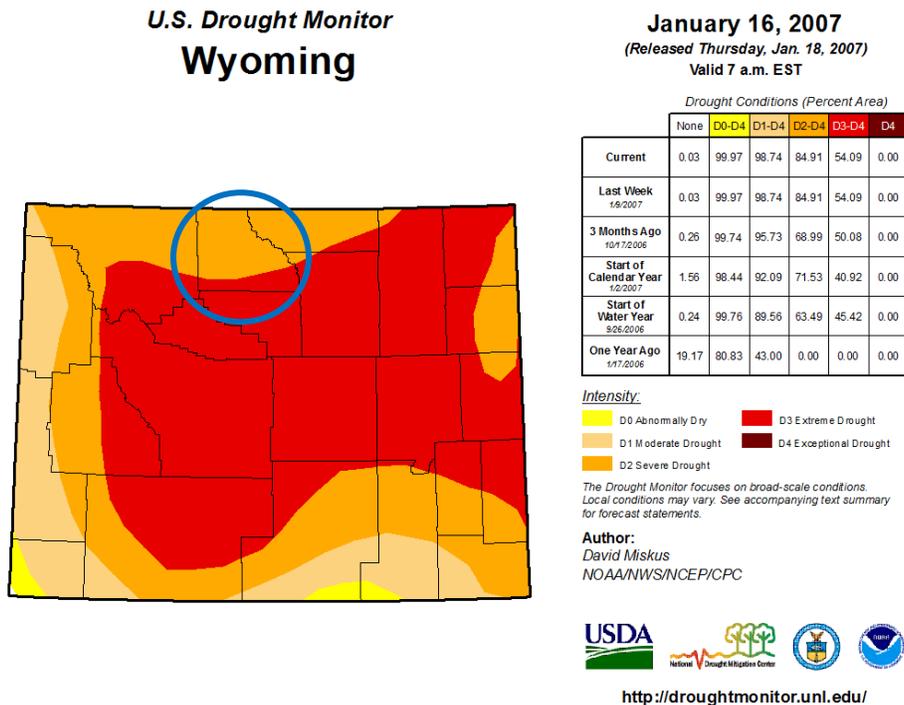


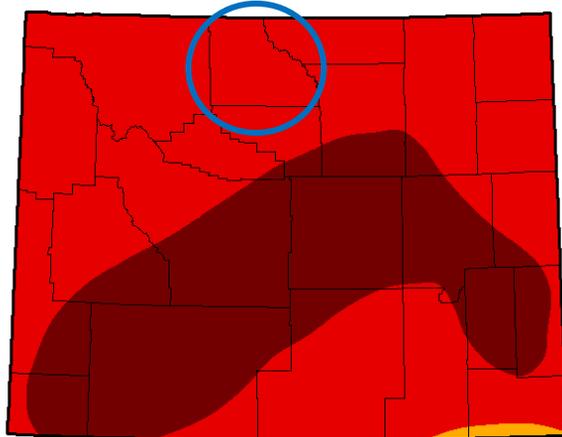
Figure 3-7 State of Wyoming Drought Conditions, January 2003. Big Horn County in Circle.

U.S. Drought Monitor Wyoming

January 28, 2003
(Released Thursday, Jan. 30, 2003)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	99.41	36.50
Last Week <i>1/21/2003</i>	0.00	100.00	100.00	100.00	99.26	34.84
3 Months Ago <i>10/29/2002</i>	0.00	100.00	100.00	100.00	83.99	9.92
Start of Calendar Year <i>12/01/2002</i>	0.00	100.00	100.00	100.00	86.03	13.58
Start of Water Year <i>10/1/2002</i>	0.00	100.00	100.00	100.00	93.18	21.28
One Year Ago <i>1/29/2002</i>	0.00	100.00	86.87	62.60	23.47	0.00



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

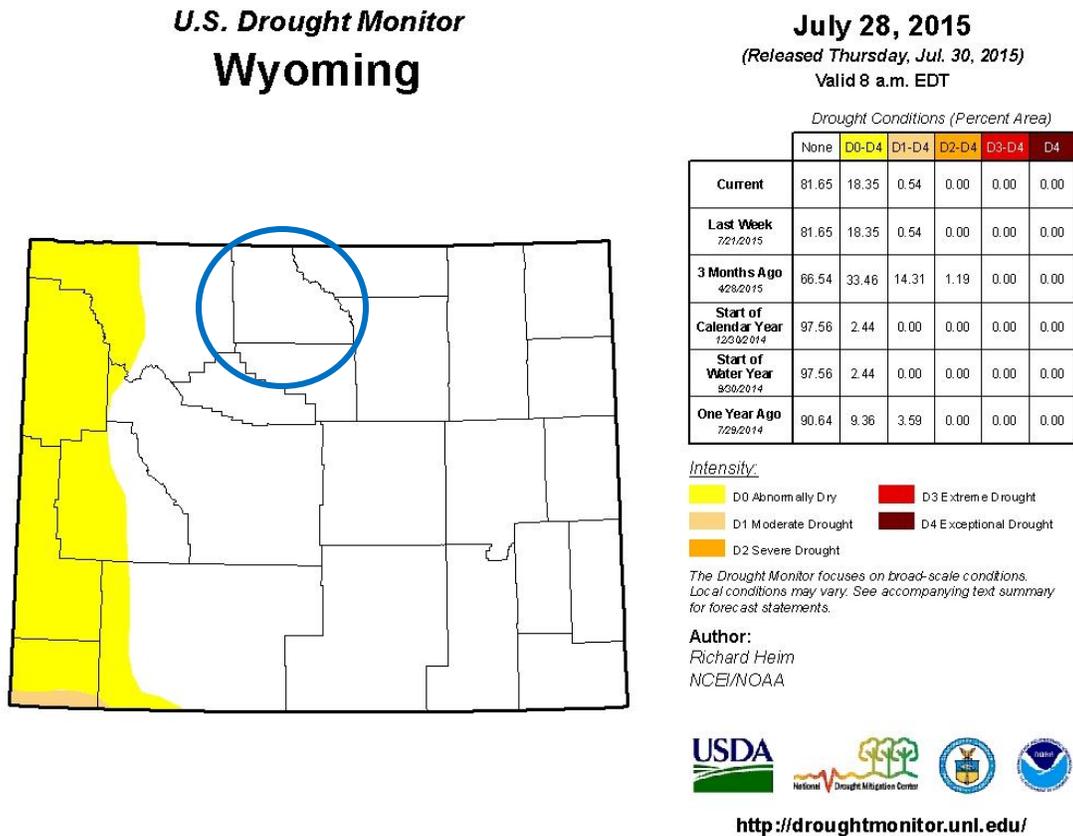
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brad Rippey
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>

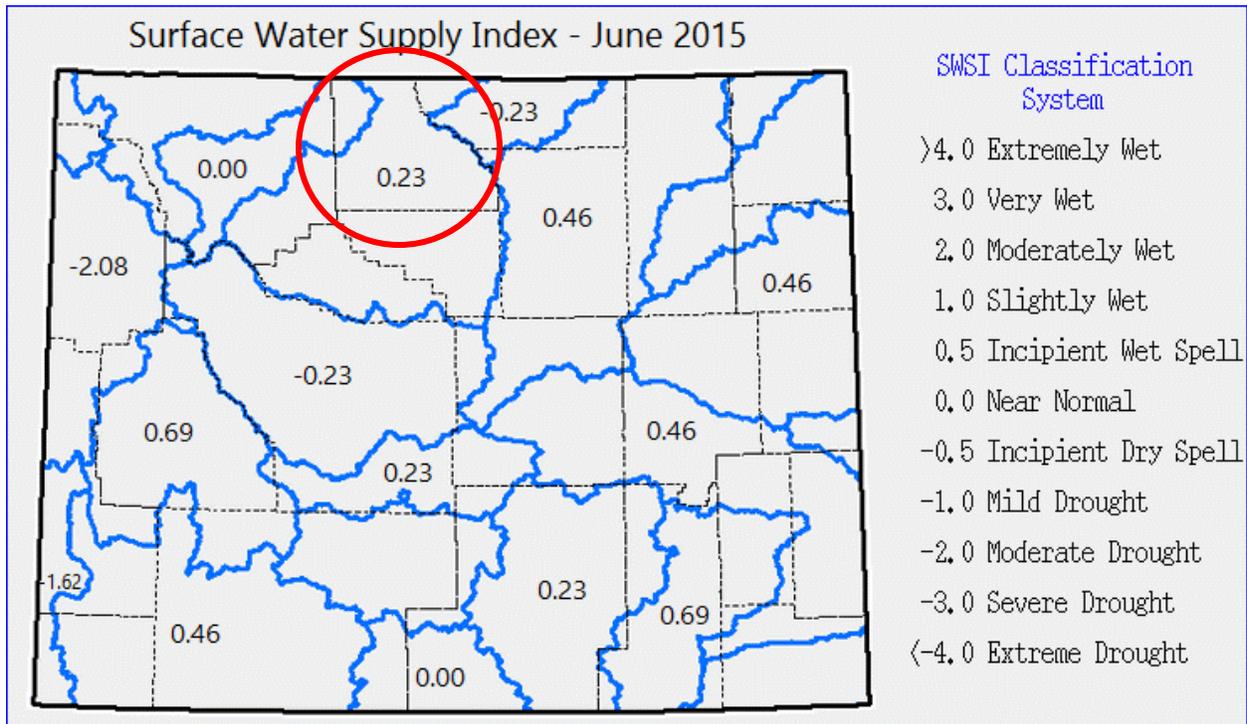
Figure 3-8 State of Wyoming Drought Conditions, July 2015. Big Horn County in Circle.



Source: <http://droughtmonitor.unl.edu/>

As of July 28th, 2015 approximately 18% of the State of Wyoming qualifies as 'Abnormally Dry' (D0 or yellow) with less than 1% in the 'Moderate Drought' (D1 or light orange) category, see **Figure 3-8**. As of this same timeframe, there were no drought conditions in Big Horn County

Figure 3-9 State of Wyoming Drought Conditions by Surface Water Supply. Big Horn County in Circle.



Source: <http://www.wrds.uwyo.edu/wrds/nrcs/swsimap/swsimap.html>

This observation is corroborated by current data from the Surface Water Supply Index (SWSI) from the Water Resources Data System (WRDS) at the University of Wyoming. The Surface Water Supply Index is computed using only surface water supplies for the drainage (shown in blue). The computation includes reservoir storage, if applicable, plus the forecast runoff. The index is purposely created to mirror the Palmer Drought Index (PHDI, **Figure 3-9**), with near normal conditions centered at zero.

Adequate and excessive supply has a positive number and deficit water supply has a negative values. Soil moisture and forecast precipitation are not considered as such, but the forecast runoff may consider these values. The watershed basins within and around Big Horn County (circled in red) are all in positive territory, describing near normal conditions.

Impacts

Impacts from drought can include the following:

- Economic losses to agricultural producers (crops and livestock)
- Physical and mental health issues in those suffering losses
- Water supply interruption for business and industry
- Water quality problems
- Reduced soil and vegetation moisture
- Vegetation mortality, insect infestations
- Impacts to fish and wildlife populations
- Increase in wildland fires and associated losses

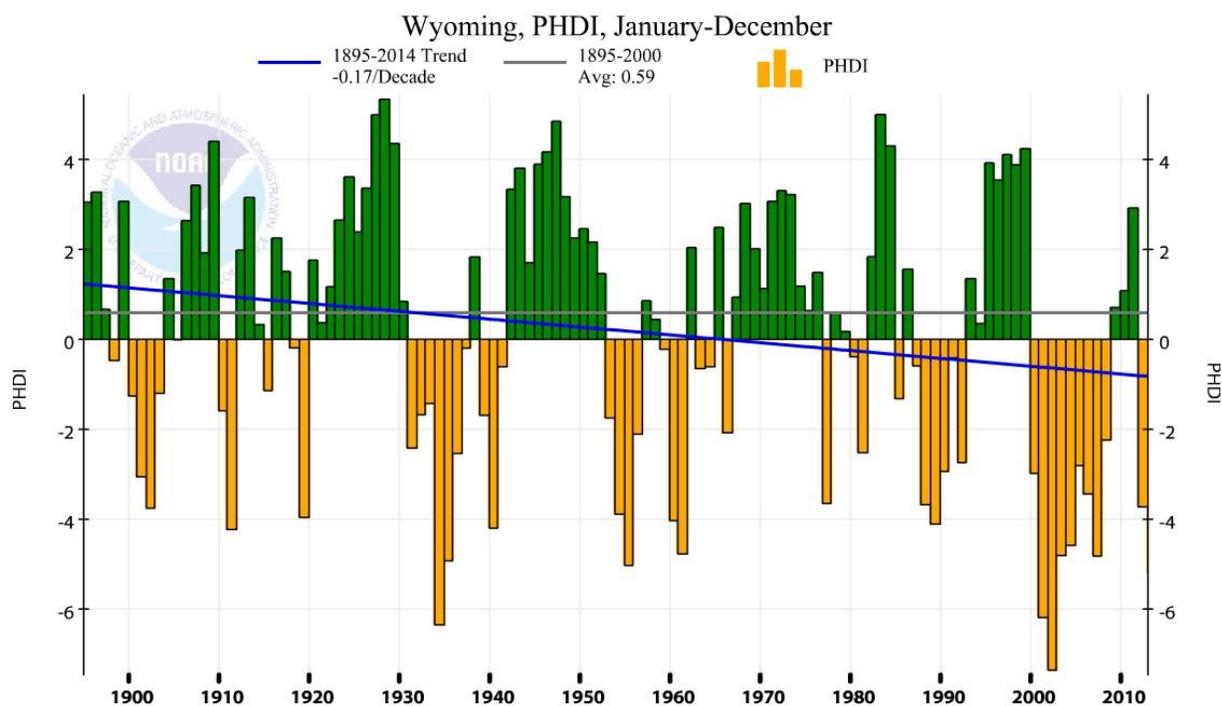
Frequency

Despite the near normal current conditions in Big Horn County, the American West (including all of the State of Wyoming) remains extremely vulnerable to cyclical drought conditions.

Figure 3-10 Palmer Drought Index

4.00 to 6.00	3.00 to 3.99	2.00 to 2.99	1.00 to 1.99	0.50 to 0.99
Extremely wet	Very wet	Moderately wet	Slightly wet	Incipient wet spell
0.49 to -0.49				
Near normal				
-0.50 to -0.99	-1.00 to 1.99	-2.00 to -2.99	-3.00 to 3.99	-4.00 to -6.00
Incipient dry spell	Mild drought	Moderate drought	Severe drought	Extreme drought

Figure 3-11 Wyoming Palmer Hydrological Drought Index 1895-2014



Source: www.ncdc.noaa.gov

According to over 100 years of precipitation data from the National Climate Data Center (NCDC) the State of Wyoming experiences negative Palmer Hydrological Drought Index years at least once every decade and, in some decades (like 2000 through 2010), negative years outnumber positive years.

The average PHDI in Wyoming from 1895-2000 was calculated at 0.59, or slightly wetter than normal conditions (the grey trend line in **Figure 3-11**). However, when accounting for the years between 2000 and 2014, the average PHDI is shown to be decreasing at a rate of 0.17 PHDI points per decade (the blue trend line in **Figure 3-11**). If this trend continues, Big Horn County must be prepared for drier conditions in the future.

Vulnerability

Big Horn County's mountain forests are more vulnerable to timber fires during sustained periods of drought. As water storage and collection reservoirs located in the mountains for crop irrigation deplete, crop production in the county can decrease 35 to 65% each year, as evidenced in Table 4.15. In an area where six inches of precipitation annually is all that can be expected, a sustained drought is devastating as water tables begin to regress. Drought may greatly increase the number of wildfire events, and brings on secondary problems such as insect infestations, plant disease, wind erosion and other secondary biological impacts. The recovery period even after drought periods begin to diminish can be lengthy. The agricultural community may take years to restock and recover financially. Towns and cities may take some time to attract industry back to the area and reestablish local business.

Big Horn County’s economy is based on mining interests, agribusiness, rail transportation, gas and oil production, and employment by schools and local government. The economic blow of drought on agriculture has been somewhat softened by insurance resources made available to producers. It should also be noted that Big Horn County has an extensive network of irrigation canals connected to other areas. Rainfall is only one factor for the amount of water available for irrigation for agriculture; melting snowpack in other areas can produce enough water to continue irrigation even if the county itself is dry. Even with this added water source, the county’s economic base is extremely vulnerable to extended drought periods and extended recovery from those cycles.

Agricultural data is generally used as a way to measure the negative economic impacts due to drought, however this model has limitations because it does not take into account the potential dollar losses caused by wildfires due to drought or losses in tourism revenue. In addition, there are limitations in determining agricultural losses. Facts to be considered are:

- USDA Agricultural Survey Statistics rely entirely on the willingness and availability of producers within a county to respond to quarterly surveys. Participation can be unreliable.
- Federal crop disaster declarations are most often multi-county, multi-hazard declarations, covering a variety of events in any given year (i.e., grasshoppers, hail, drought, etc.) thus these agencies cannot provide drought-attributed losses directly to each county.
- Policies have changed drastically regarding requirements by the USDA. Producers are now required to carry some level of crop disaster coverage in order to be eligible for future federal disaster dollars.

Potential Losses

The following graphs illustrate the relationship between agricultural production and drought conditions by comparing pre-drought (1996-2000) crop output to drought (2001-2008) crop output. 2012 production is also included as it was the most recent year data was available. All data is from <http://quickstats.nass.usda.gov> and the U.S. Agricultural Census.

Figure 3-12 Pre and Post Drought Production of Barley, Big Horn County

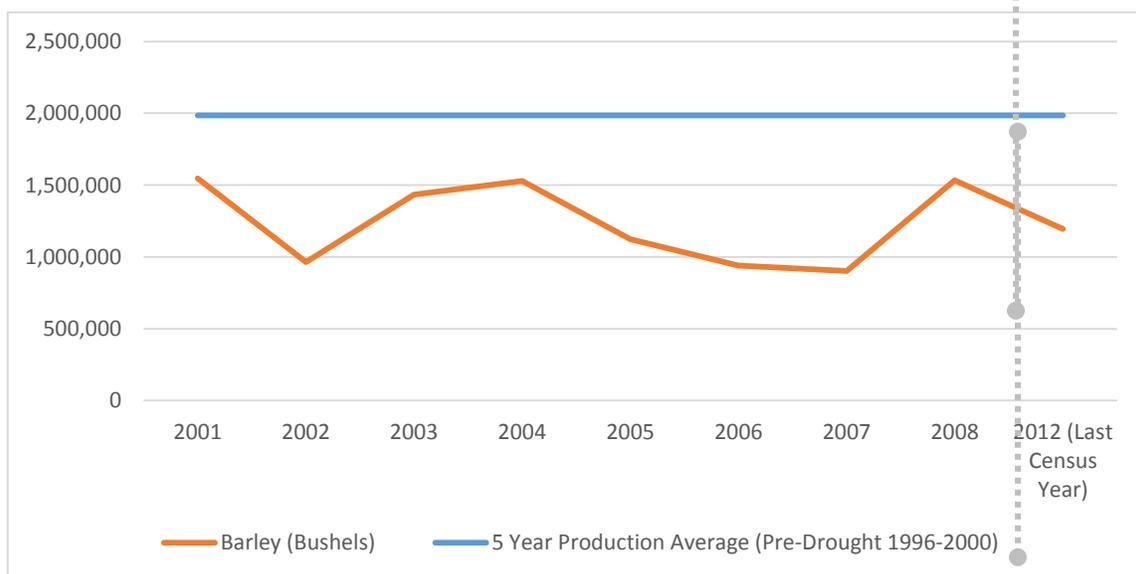


Figure 3-13 Pre and Post Drought Production of Beans, Big Horn County

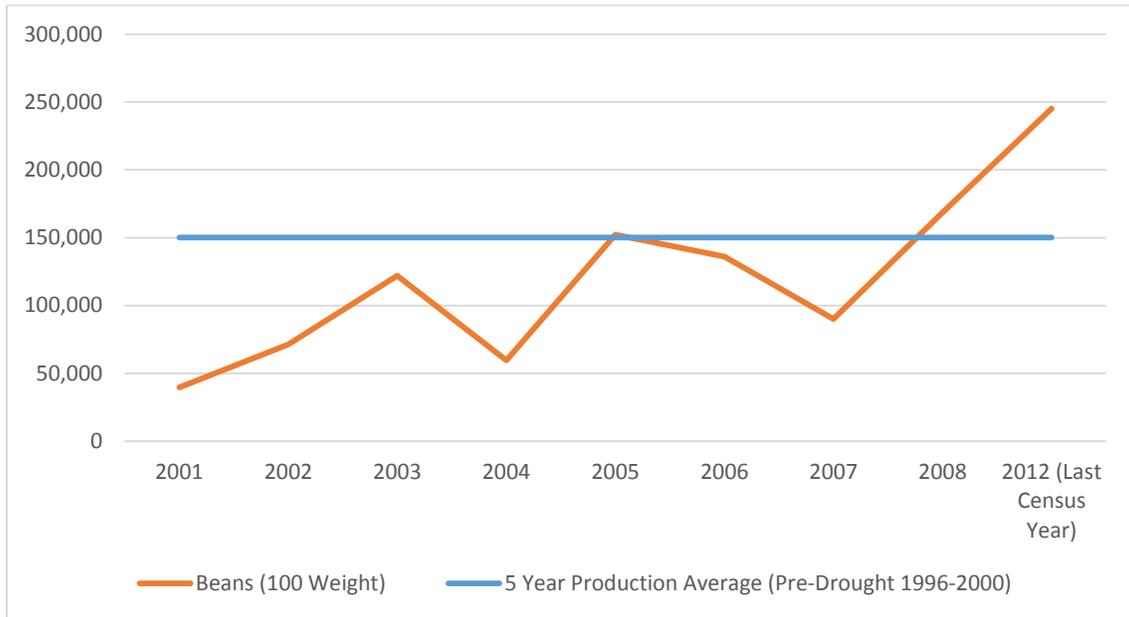


Figure 3-14 Pre and Post Drought Production of Corn for Silage, Big Horn County

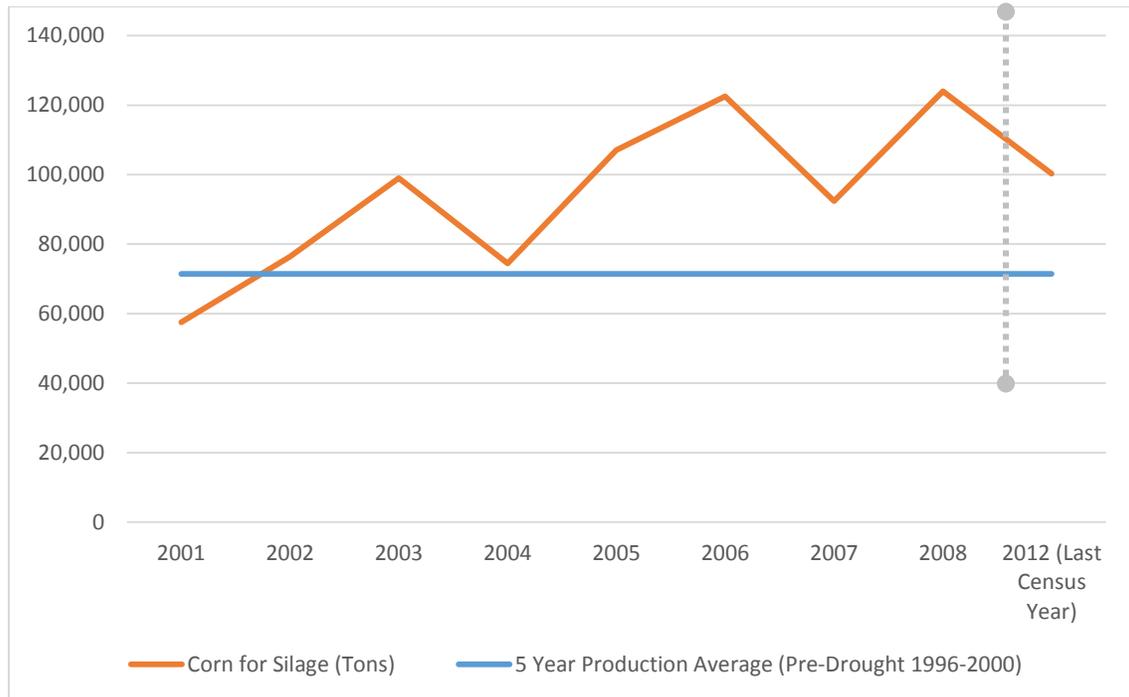


Figure 3-15 Pre and Post Drought Production of Corn for Grain, Big Horn County

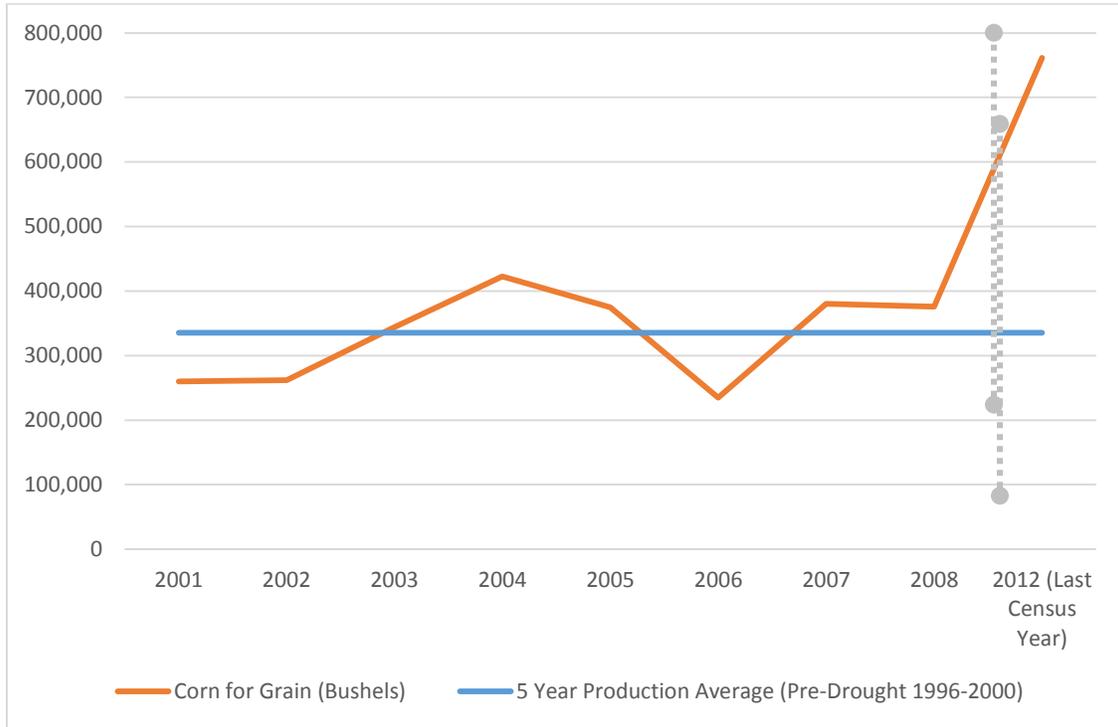


Figure 3-16 Pre and Post Drought Production of Oats, Big Horn County

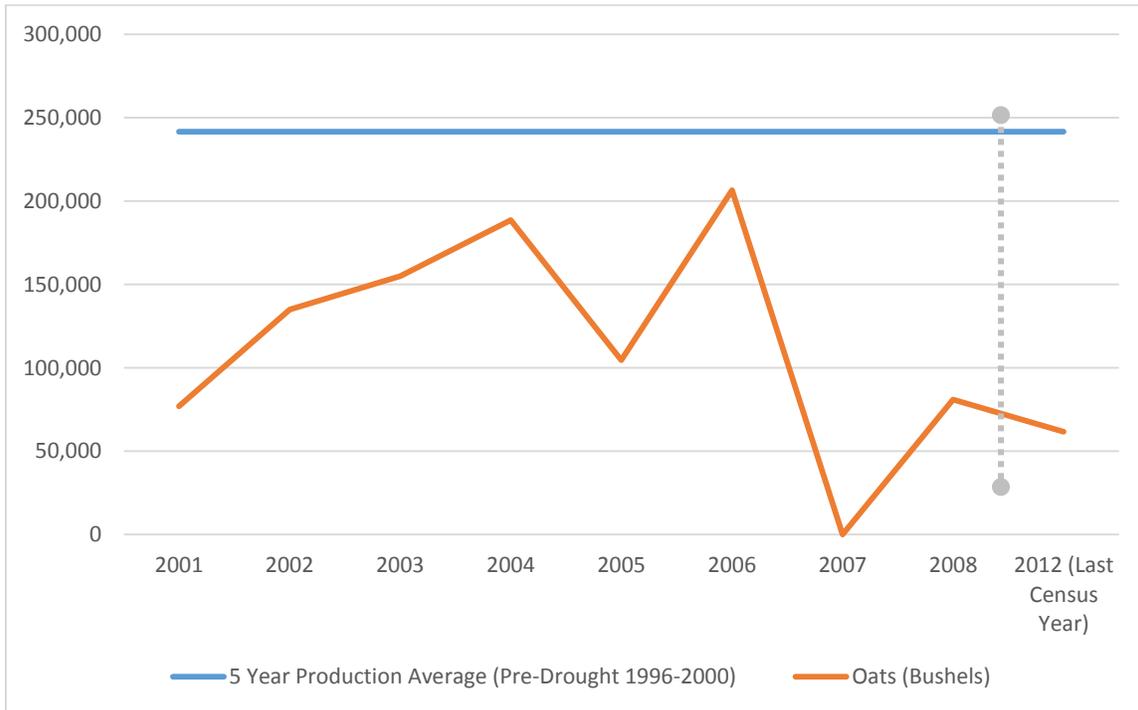


Figure 3-17 Pre and Post Drought Production of Sugarbeets, Big Horn County

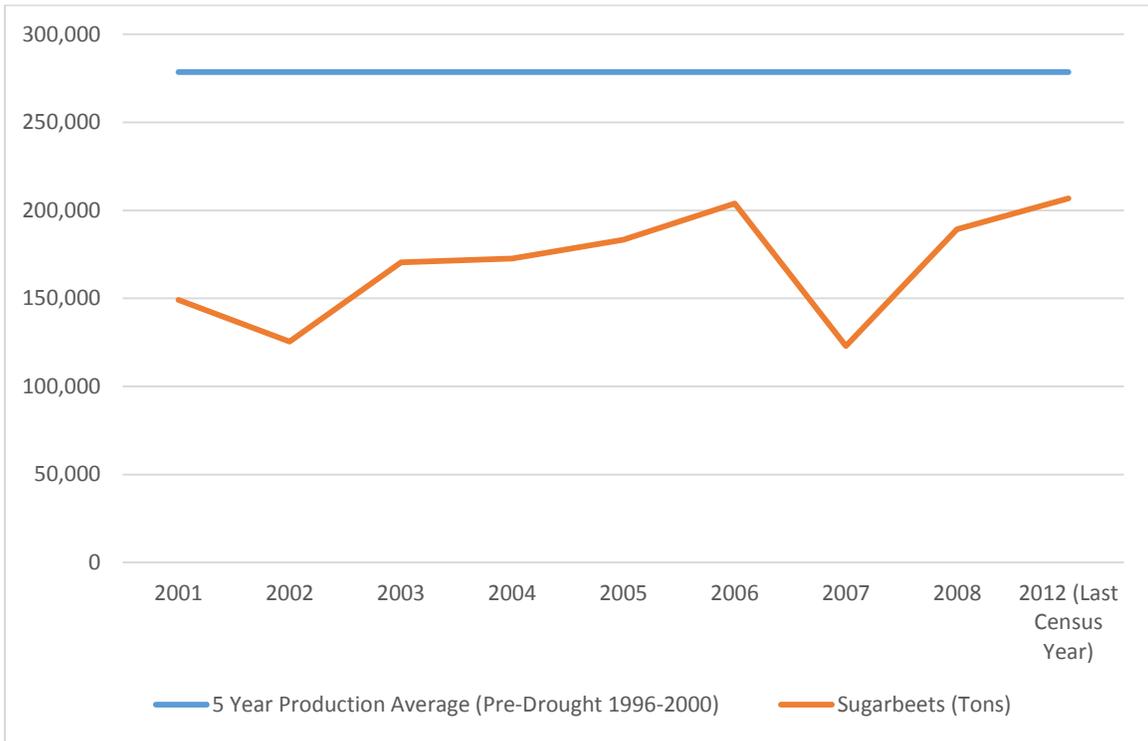


Figure 3-18 Pre and Post Drought Production of All Wheat, Big Horn County

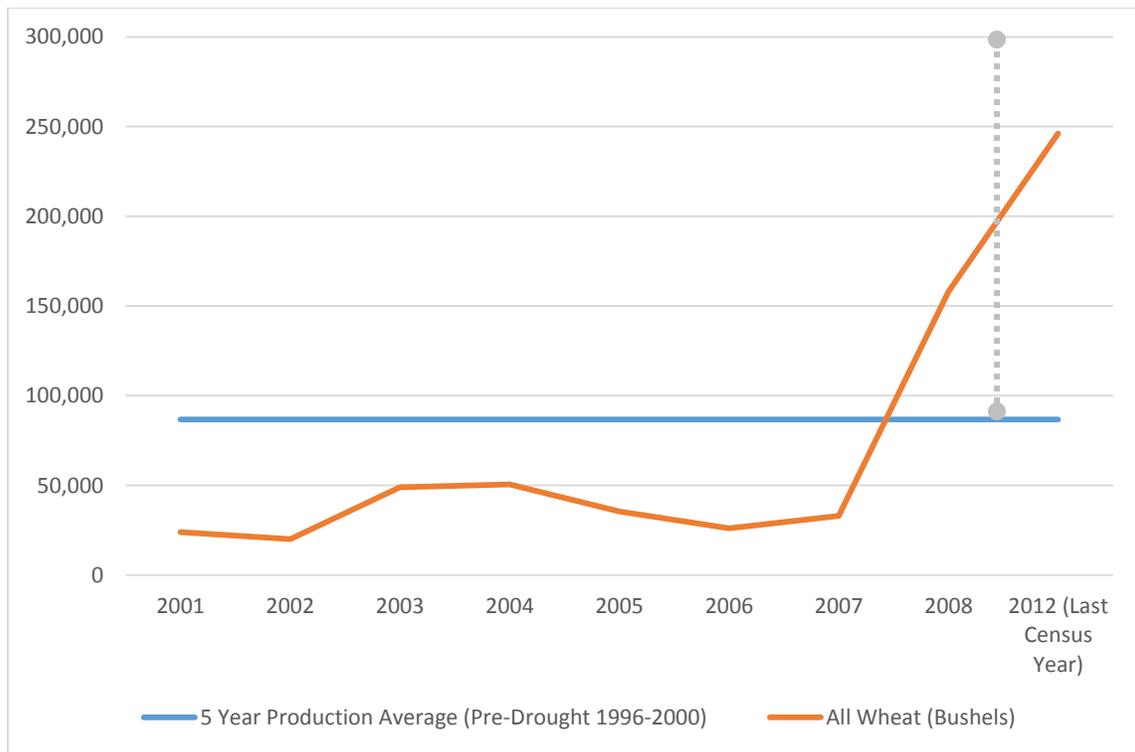


Table 3-15 Summary of Agricultural (Crop) Impacts to Drought, Big Horn County

	5 Year Production Average (Pre-Drought 1996-2000)	8 year Production Average (Drought 2001-2008)	Change in Production (Pre-Drought to Drought)	% Change in Production (Pre-Drought to Drought)	2012 Production (Last Census Year)
Barley (Bushels)	1,986,000	1,247,163	-738,838	-37.20%	1,194,746
Beans (100 Weight)	150,020	104,888	-45,133	-30.08%	245,031
Corn for Silage (Tons)	71,440	94,150	22,710	31.79%	100,231
Corn for Grain (Bushels)	335,300	331,813	-3,488	-1.04%	761,569
Oats (Bushels)	241,500	135,357	-106,143	-43.95%	61,587
Sugarbeets (Tons)	278,600	164,650	-113,950	-40.90%	206,850
All Wheat (Bushels)	86,750	49,500	-37,250	-42.94%	246,270

Source: <http://quickstats.nass.usda.gov> and the US Agricultural Census

As the graphs and summary chart above identify, there are significant impacts to crops in a drought versus a non-drought period. All key commodities, with the exception of corn, have negative production numbers when comparing drought versus non-drought averages. The 2015 dollar value of the losses for barley, oats, sugarbeets, and wheat during this 8 year period is nearly \$1B or \$11.6M per year. This equals roughly 10% of all agricultural output for Big Horn County (Sources: <http://www.agcensus.usda.gov>, <http://www.indexmundi.com/commodities>).

As mentioned previously, there are limitations when using agricultural production as a proxy to measure impacts due to drought, however the data illustrate a strong relationship between the two and the County should be aware of the potential losses in this sector.

Agricultural production losses do not reflect the loss of grazing or rangeland, a staple of sheep and cattle production in Big Horn County. Most agricultural livestock growers in Big Horn County depend on rangeland grazing to produce a calf crop each year.

Future Development

Drought vulnerability will increase with future development as there will be increased demands for limited water resources. Given that population growth, number of farms and associated new development is limited in Big Horn County, future development is unlikely to exacerbate drought conditions in the short term (*Source: www.agcensus.usda.gov*)

Summary

The likelihood of a future drought occurring in Big Horn County is 100%. According to NOAA interpretations using the Wyoming Palmer Hydrological Drought Index, Wyoming will experience multi-year drought cycles every 25 years, averaging 10 years in duration. Drought years are often accompanied by an increase in wildfire activity, which occur due to both human and natural causes and at every elevation throughout the county. The county's agricultural production, agribusiness, and support services are vulnerable to severe drought cycles.

Loss Potential: High

Population Impacted: Medium

Probability: High

Jurisdictions at Risk: All

Earthquake

Narrative

An earthquake (also known as a quake, tremor or temblor) is the perceptible shaking of the surface of the Earth, which can be violent enough to cause loss of life and property. They result from the sudden release of energy in the Earth's crust that creates seismic waves. The most common types of earthquakes are caused by movements along faults or by volcanic forces, although they can also result from explosions, cavern collapse, and other minor causes not related to slowly accumulated strains. The seismicity, or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time.

Earthquake intensity is measured by the Modified Mercalli Scale (see Table 5-16) which quantifies effects felt by an earthquake, and is different than moment magnitude, which is measured by the Richter Scale.

Table 3-16 Modified Mercalli Scale

Modified Mercalli Scale	Perceived Shaking	Potential Damage	Description
I	Not Felt	None	Not felt except by a very few under especially favorable circumstances
II	Weak	None	Felt only by a few persons at rest, especially on upper floors of buildings; delicately suspended objects may swing
III	Weak	None	Felt quite noticeably indoors, especially on upper floors of buildings, but many don't recognize it as an earthquake; standing automobiles may rock slightly; vibration like truck passing; duration estimated
IV	Light	None	During the day felt indoors by many, outdoors by few; some awakened at night; dishes, windows, doors disturbed; walls make creaking sound; sensation like heavy truck striking building; standing automobiles rocked noticeably
V	Moderate	Very Light	Felt by nearly everyone, many awakened; some dishes, windows, and so broken; cracked plaster in a few places; unstable objects overturned; disturbances of trees, poles, and other tall objects sometimes noticed; pendulum clocks may stop
VI	Strong	Light	Felt by all, many frightened and run outdoors; some heavy furniture moved; a few instances of fallen plaster and damaged chimneys; damage slight
VII	Very Strong	Moderate	Everybody runs outdoors; damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken; noticed by persons driving cars
VIII	Severe	Moderate to Heavy	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures; panel walls thrown out of frame structures; fall of chimneys, factory stacks, columns, monuments, walls; heavy furniture overturned; sand and mud ejected in small amounts; changes in well water; persons driving cars disturbed
IX	Violent	Heavy	Damage considerable in specially-designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse; buildings shifted off foundations; ground cracked conspicuously; underground pipes broken
X	Extreme	Very Heavy	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked; rails bent; landslides considerable from river banks and steep slopes; shifted sand and mud; water splashed, slopped over banks
XI	Extreme	Very Heavy	Few, if any, masonry structures remain standing; bridges destroyed; broad fissures in ground; underground pipelines completely out of service; earth slumps and land slips in soft ground; rails bent greatly

XII Extreme Very Heavy Damage total; waves seen on ground surface; lines of sight and level distorted; objects thrown into the air

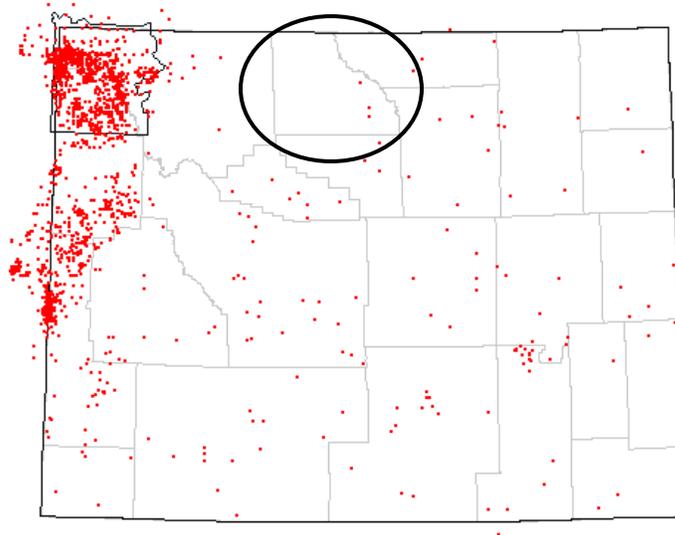
Past Occurrences

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

Since 1871, the state has logged some 47,000 earthquakes, with the majority of the events taking place in the western third of the state (see **Figure 3-19**) where the majority of the active, or Quaternary Period, faults are identified.

Figure 3-19 Wyoming Earthquake Epicenters > 2.5 Magnitude, 1871 to 2015.

Yellowstone NP in Outline, Big Horn County in Circle.



Source: <http://www.wrds.uwyo.edu>

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

There are approximately 80 Quaternary faults mapped in Wyoming, with 26 considered active and none located in Big Horn County. (*Source: www.wsgs.wyo.gov*) Many of the exposed active faults, including the Teton fault, Star Valley fault, Greys River fault, Rock Creek fault, and the Bear River fault system in

western Wyoming are capable of generating magnitude 7.0 to 7.5 earthquakes, and are considered to be overdue for reactivation. In central Wyoming, the Stagner Creek fault system near Boysen Reservoir and the South Granite Mountain fault system near Jeffrey City, are both capable of generating magnitude 6.5 to 6.75 earthquakes. Earthquake risks related to Boysen Dam are of concern to Big Horn County as explained in the dam failure section of this plan. The Cedar Ridge-Dry Fork fault system near Lysite has limited evidence indicating it may be active, and may be capable of a magnitude 6.7 to 7.1 earthquake. The Chicken Springs fault system near Baroil is capable of generating magnitude 6.5 to 6.7 earthquakes. Despite the lack of faults in the northern part of the state, it is estimated that an earthquake of 6.5 magnitude is possible anywhere in the state, including Big Horn County (Source: Wyoming Multi-Hazard Mitigation Plan, 2014).

Figure 3-20 Exposed Known or Suspected Active Faults in Wyoming

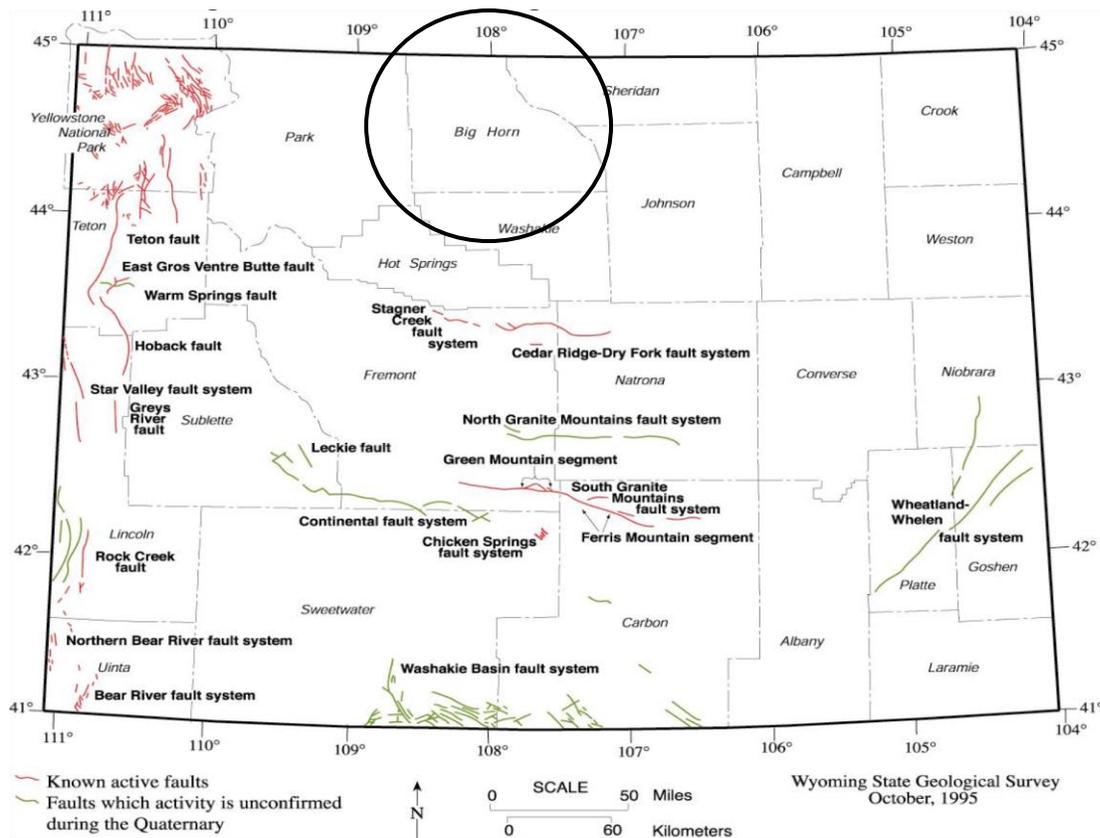


Table 3-17 List of Seismic Events, Big Horn County 1967 - 2014

Location	Date	Moment Magnitude (Richter)	Damage or Injuries
12 MI ENE of Hyattville	11/17/25	N/A	NO
Dome Lake Area	11/18/25	N/A	NO
12 MI ENE of Shell	9/2/62	N/A	NO
15 MI S of Hyattville	9/19/74	4.4	NO
10 MI N of Hyattville	2/13/98	3.0	NO
20 MI SW of Hyattville	9/7/10	2.3	NO
28 KM N of Greybull	8/13/13	2.3	NO
10 KM ENE of Worland	3/2/14	2.9	NO

Source: <http://earthquake.usgs.gov>

Eight magnitude 2.5 and greater earthquakes have been recorded in or near Big Horn County since the mid-1920s (see **Table 3-17**). The first was recorded on November 17, 1925. This intensity V event was located in the southeastern portion of the county, approximately 12 miles north/northeast of Hyattville. People in Sheridan, Fort McKenzie, and at Dome Lake Resort in the Big Horn Mountains reported feeling the earth-quake tremors. The tremors shook cabins, pictures, and furniture. A “distinct roar” heard at Dome Lake was attributed to a possible earthquake induced landslide (Casper Daily Tribune, November 18, 1925). One day later, on November 18, 1925, people in the Dome Lake area reported feeling another tremor (Sheridan Post Enterprise, November 19, 1925). No damage was reported from either event.

On September 2, 1962, an earthquake was recorded 12 miles east-northeast of Shell. No one reported damage or feeling this event. (U.S.G.S. National Earthquake Information Center).

On February 12, 1998, in approximately the same location as the 1925 event. No one reported feeling this magnitude 3.0 event (U.S.G.S. National Earthquake Information Center).

Impacts

Impacts from earthquakes identified include the following:

- Injury/loss of life
- Loss of utilities (gas, electric, water, wastewater, etc.)
- Increased risks to emergency responders
- Injuries associated with loss of utilities
- Transportation interruption
- Damage to buildings/structures

Frequency

Based on past occurrences since 1974, Big Horn County is likely to experience one 3.0 or greater earthquake approximately every fifteen years; however also based on past occurrences, the earthquakes are likely to cause little to no damage.

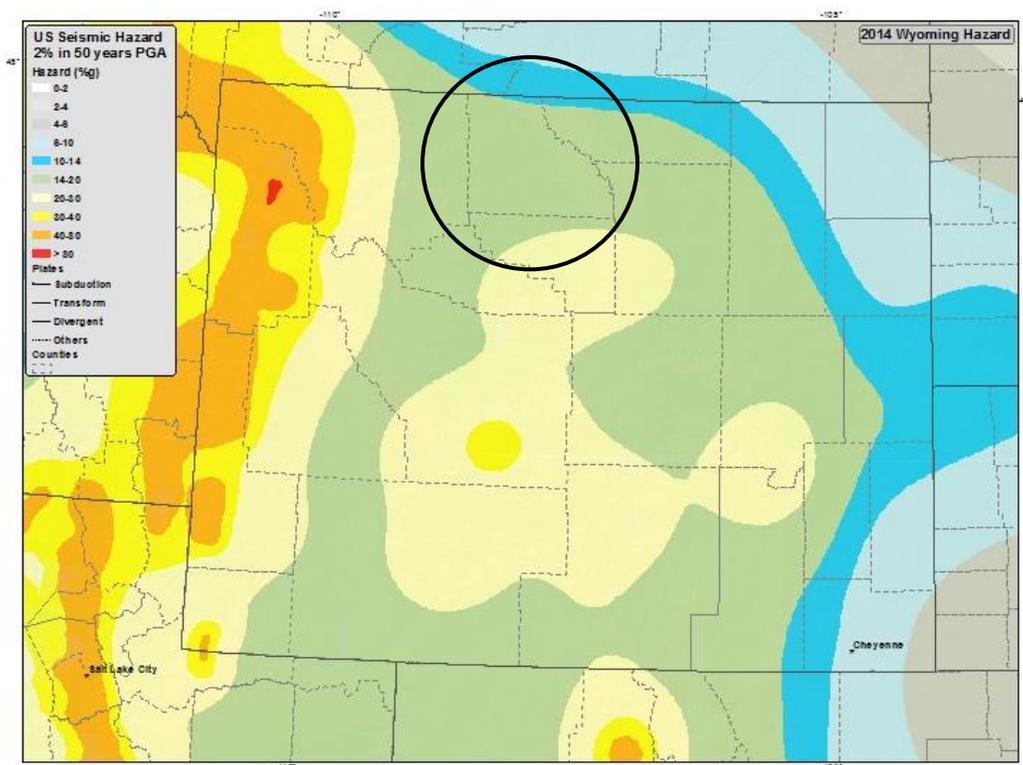
Vulnerability

Because of the limited historic record, it is possible to underestimate the seismic hazard in Big Horn County if historic earthquakes are used as the sole basis for analysis. Earthquake and ground motion probability maps give a more reasonable estimate of damage potential in areas without exposed active faults at the surface, such as Big Horn County. There are no known exposed active faults with a surficial expression in the county. As a result, no fault-specific analysis can be generated for Big Horn County.

According to the United States Geological Survey, a 2,500 year probabilistic seismic event in Big Horn County would produce a Peak Ground Acceleration (PGA, see **Figure3-21**) between 14% to 20% of g (gravity). This scenario takes into account various seismic sources and represents a more worst-case scenario.

Figure 3-21 2% in 50 year Seismic Hazard Measured in Peak Ground Acceleration (M/s).

Big Horn County in Circle.



Source: USGS.gov

Many federal regulations require an analysis of the earthquake potential in areas where active faults are not exposed, and where earthquakes are tied to buried faults with no surface expression. Regions with a uniform potential for the occurrence of such earthquakes are called tectonic provinces. Within a tectonic province, earthquakes associated with buried faults are assumed to occur randomly, and as a result can theoretically occur anywhere within that area of uniform earthquake potential. In reality, that random distribution may not be the case, as all earthquakes are associated with specific faults. If all buried faults have not been identified, however, the distribution has to be considered random. “Floating earthquakes” are earthquakes that are considered to occur randomly in a tectonic province.

The U.S. Geological Survey (USGS) publishes probabilistic acceleration maps for 500, 1000, and 2,500-year time frames. As the historic record is limited, it is nearly impossible to determine when a 2,500-year event last occurred in the county. Because of the uncertainty involved, and based upon the fact that the International Building Code utilizes 2,500-year events for building design, it is suggested that the 2,500-year probabilistic maps be used for Big Horn County analyses. This conservative approach is in the interest of public safety.

The probability-based worst-case scenario could result in the following damage at locations throughout the county:

Intensity VI Earthquake Areas: Intensity VI earthquakes are characterized by strong shaking with light damage. Some heavy furniture can move and there may be some instances of fallen plaster and damaged chimneys.

- Basin
- Burlington
- Byron
- Emblem
- Greybull
- Hyattville
- Lovell
- Manderson
- Otto

Intensity V Earthquake Areas: Intensity V earthquakes are characterized by moderate shaking with very light damage. Dishes and windows can break and plaster can crack. Unstable objects may overturn. Tall objects such as trees and power poles can be disturbed.

- Cowley
- Deaver
- Frannie

Potential Losses

The Wyoming State Geological Survey conducted a study in 2011 to model loss estimations for 16 earthquake scenarios in order to quantify the magnitude of earthquake impacts around the state. The scenarios included four random event scenarios run on the basis of data from historic earthquakes that occurred near Casper, Gillette, Laramie Peak, and Estes Park, Colorado. Each of the historic, random event earthquake scenarios registered a 6.0 magnitude. The Estes Park Scenario was based on an event occurring in 1882, the Casper area event in 1897, and the Gillette and Laramie Peak events in 1984 (Source: Wyoming Geological Survey, "Wyoming Earthquake Hazard and Risk Analysis: HAZUS-MH Loss Estimations for 16 Earthquake Scenarios, 2011")

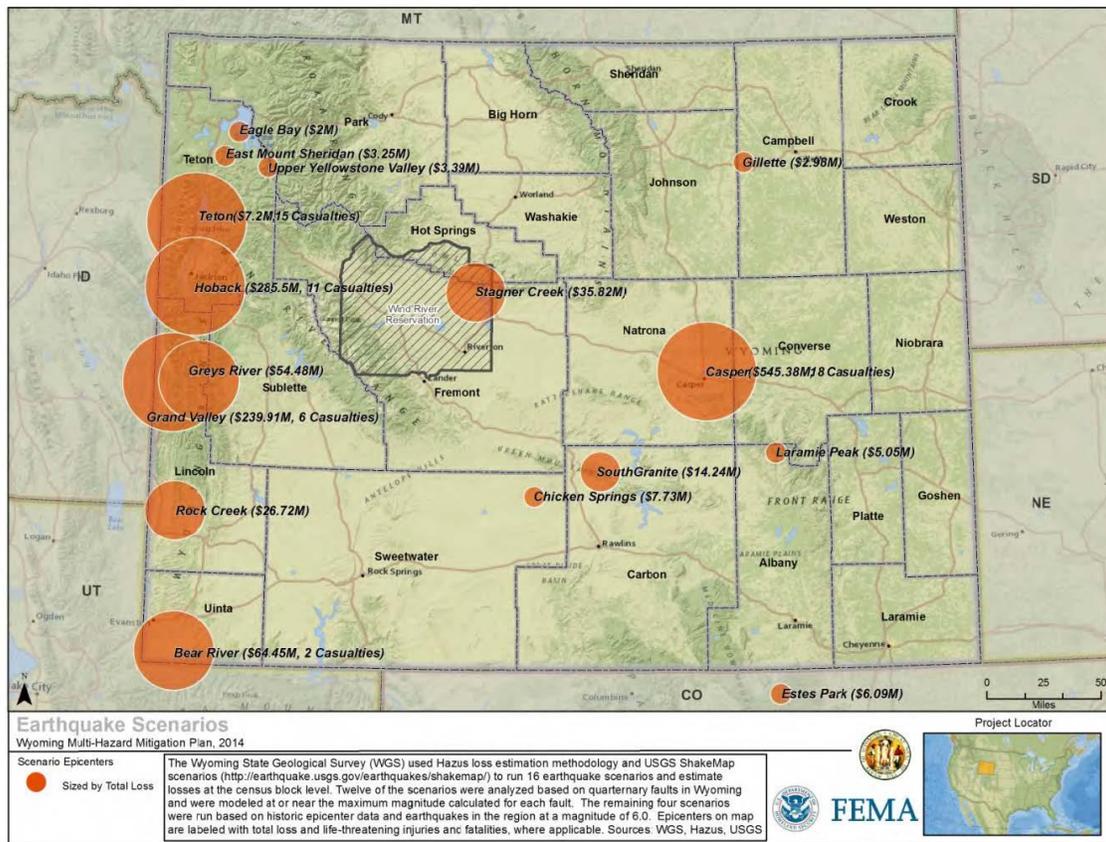
HAZUS (Hazards U.S.) is a nationally standardized, GIS-based, risk assessment and loss estimation computer program that was originally designed in 1997 to provide the user with an estimate of the type, extent, and cost of damages and losses that may occur during and following an earthquake. It was developed for the FEMA by the National Institute of Building Sciences (NIBS). There have been a number of versions of HAZUS generated by FEMA, with HAZUS-MH (HAZUS - Multi-Hazard) being the most recent release.

The study included information regarding the likelihood of damage to local and regional infrastructure, including fire stations, police stations, sheriffs' departments, schools, and hospitals. The scenarios reflect anticipated functionality of each infrastructure system immediately following the scenario earthquake, on day seven following the earthquake and one month after the earthquake. Additional information

provided includes anticipated households displaced or seeking temporary shelter, electrical outages anticipated, number of households without potable water, debris generated by the scenario and economic losses resulting from three categories: buildings, transportation and utilities.

The map in **Figure 3-22** shows epicenter locations of the scenarios, sized by total loss. Epicenters on map are labeled with total loss and if applicable, life-threatening injuries and fatalities. None of the scenarios modeled indicated losses in Big Horn County

Figure 3-22 HAZUS-MH Earthquake Scenarios for Wyoming, 2014



(Source: Wyoming Multi-Hazard Mitigation Plan, 2014)

In the Wyoming Multi-Hazard Mitigation Plan, HAZUS 2.1 was used to develop losses associated with a 2,500 year probabilistic earthquake scenarios for each county in the State of Wyoming. This scenario uses USGS probabilistic seismic contour maps to model ground shaking with a 2% probability of being exceeded in 50 years (or a 2,500 year event). Total losses include building, contents, inventory, and income-related losses.

There are two methods for ranking counties to determine where earthquake impacts may be the greatest. Either loss ratios or total damage figures can be used. The loss ratio is determined by dividing the sum of the structural and non-structural damage by the total building value for the County. The loss ratio is a better measure of impact for a County, since it gives an indication of the percent of damage to buildings.

Casualty severity levels are described as follows:

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

In this model, Big Horn County ranked 16th (out of 23 counties) in potential losses (see **Table 3-18**).

Table 3-18 HAZUS 2.1 Model, Big Horn County Potential Losses

Rank	Total Losses	Loss Ratio	Level 1	Level 2	Level 3	Level 4
16th	\$25.9M	4%	0-10	0	0	0

Wyoming Multi-Hazard Mitigation Plan, 2014

The total damage figure by itself does not reflect the percentage of building damage, since small damage to a number of valuable buildings may result in a higher total damage figure than may be found in a County with fewer, less expensive buildings, with a higher percentage of damage.

In this scenario, South Big Horn County Hospital located at 388 United States Highway in the town of Basin is the only critical facility at risk. It is estimated that the facility would remain at 73% functionality on day one after the disaster, and would reach 95% functionality by day 14.

In summary, it is estimated that if a worse case event occurred in Big Horn County, \$25.9M in building related damage could occur. The probability of such an event is 2% in 50 years, or once every 2,500. Though the probability is low, WSGS studies indicate the possibility of a 6.5 magnitude could occur anywhere in the state.

A critical asset within the county and serving many thousands of people are the South Big Horn Water Supply Pipeline and the Northern Supply Pipeline, under the management of the Big Horn Regional Joint Powers Board (BHRJPB). Other water systems that could be impacted are the Shoshone Municipal Pipeline, Shell Pipeline System and Cowley Water Supply. Shifting of the earth in a seismic event, causing an alteration in aquifer characteristics and artesian well-functioning or pipeline breaks, could cause interruption of potable water supplies to several hundred or many thousands of people.

Consideration may be given to the higher seismic risk of Boysen Dam located in Fremont County and the Buffalo Bill Cody Dam in Park County and bordering Yellowstone National Park. Should either of those Bureau of Reclamation dam structures fail, impact to Big Horn County through flooding on the Big Horn or Shoshone Rivers would result in minor to significant damage to Big Horn County and the various residents and towns along those waterways. Readers should refer to the Dam Failure Profile of this Plan for further discussion.

Future Development

Growth in the County in recent years is exposing more buildings, infrastructure, and people to the earthquake hazard, though buildings built to modern codes and standards should, in general, be more resilient. Future development and in particular critical facilities should consider seismic hazards during design and construction.

Summary

The documented history of seismic activity in Big Horn County is negligible. If an event were to occur in Big Horn County, HAZUS-MH predictions indicate monetary impacts of \$25.9M in terms of structure, contents, and income losses. Based on USGS 2500 Year Probabilistic Peak Acceleration predictions, and corresponding Modified Mercalli Intensity Scale values of intensity levels V and VI, injury and loss of life would be limited in the event of seismic occurrence.

Loss Potential: **Low**

Population Impacted: **Low**

Probability: **Low**

Jurisdictions at Risk: **All**

Flooding

Narrative

Floods have caused significant damage in Wyoming, and are one of the more significant natural hazards in the state. They can cause loss of life and millions of dollars in damage in just a few hours or days. Every county and many communities in the state have experienced some kind of flooding after spring rains, heavy thunderstorms, winter snow thaws or ice jams. A flood, as defined by the National Flood Insurance Program (NFIP), is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from overflow of waters, unusual and rapid accumulation or runoff of surface waters from any source, or a mudflow. Floods can be slow or fast rising, but generally develop over a period of many hours or days.

Floods generally fall into one of these three categories:

Riverine Flooding: Riverine flooding occurs on rivers, creeks, and streams as water levels rise, either from excessive precipitation, rapid snowmelt, dam failure, or ice jams. An ice jam is a stationary accumulation of ice that restricts flow. Ice jams can cause considerable increases in upstream water levels, while at the same time downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. These types of floods can be slow or fast rising, but generally develop over a period of many hours or days.

Flash Floods: Unlike riverine flooding, flash flooding can happen anywhere. Flash floods occur with little or no warning and can reach full peak in only a few minutes. A flash flood usually results from intense storms dropping large amounts of rain within a brief period.

Urban Flooding: Urban flooding is the result of the construction of impervious surfaces (roads, parking lots, building footprints, etc.) and the ground’s decreased ability to absorb rainfall. Urban flooding is the result of sustained periods of rainfall and the inability of urban storm water systems to effectively drain the water. This can result in anything from minor flooding in basements and crawlspaces to entire streets being inundated with flowing water.

Past Occurrences

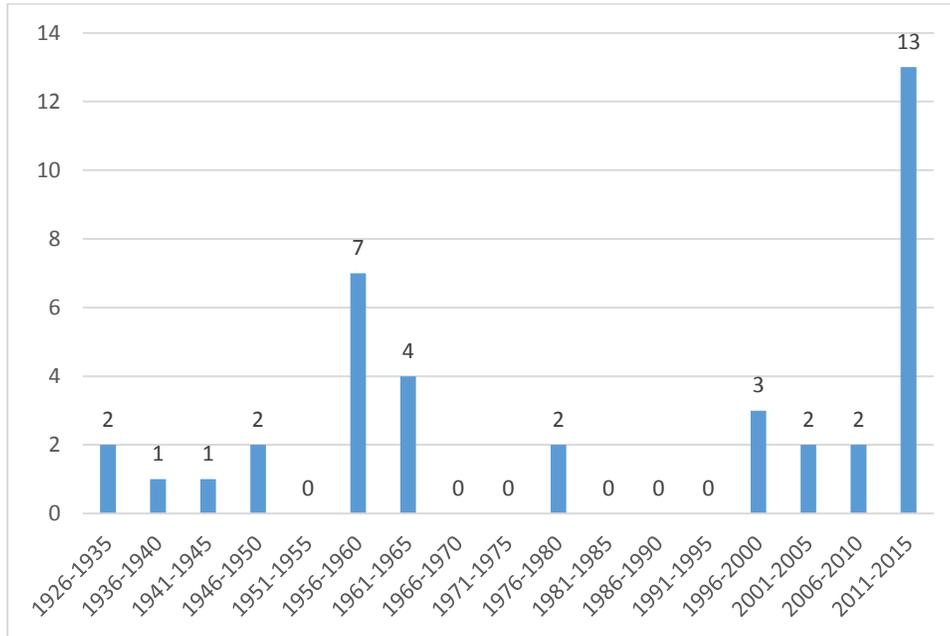
Flooding events occurring within the boundaries of Big Horn County are generally attributed to three factors (1) winter thaws and spring break up on the Big Horn River (sometimes with associated ice jams), (2) rapid snow melt and or heavy rains in higher elevations, and (3) spring or summer deluges that result in flash flooding. The most damaging flood occurred in July of 1962 in northern Big Horn Basin when severe thunderstorms and heavy rains of 4 to 6 inches with 6 to 9 inches of hail and high gusty winds caused widespread damage and flash flooding in the Cowley, Byron, Penrose, and Lovell areas. Total damage was estimated at \$2,475,000. Below is a summary of flood and flash flood data in Big Horn County from 1928 to 2014, a full list of flood events can be found in **Appendix A**.

Table 3-19 Summary of Flood Events, Big Horn County 1928 - 2014

Total Events	39
Total Reported Deaths/Injuries	0
Total Damage (Crops)	\$180,000
Total Damage (Property)	\$5,618,250

Source: Nation Climatic Data Center, National Oceanic and Atmospheric Administration-NOAA, Wyoming Emergency Management Agency Storm Data

Figure 3-23 Flood Events by Year in Big Horn County, 1928 – 2014



Source: <http://www.ncdc.noaa.gov>

Major flooding has occurred in September 1928, February 1948, and both February and July of 1962.

The flood of 1928 occurred when a cloudburst in the Cold Creek area just south of Thermopolis caused an unusual amount of water to flow down the Bighorn River, under the Burlington Northern Railroad Bridge, and into the town of Manderson.

On February 19, 1948, an ice jam formed at the mouth of the Nowood River causing the river to back up and cover the town of Manderson with floodwaters.

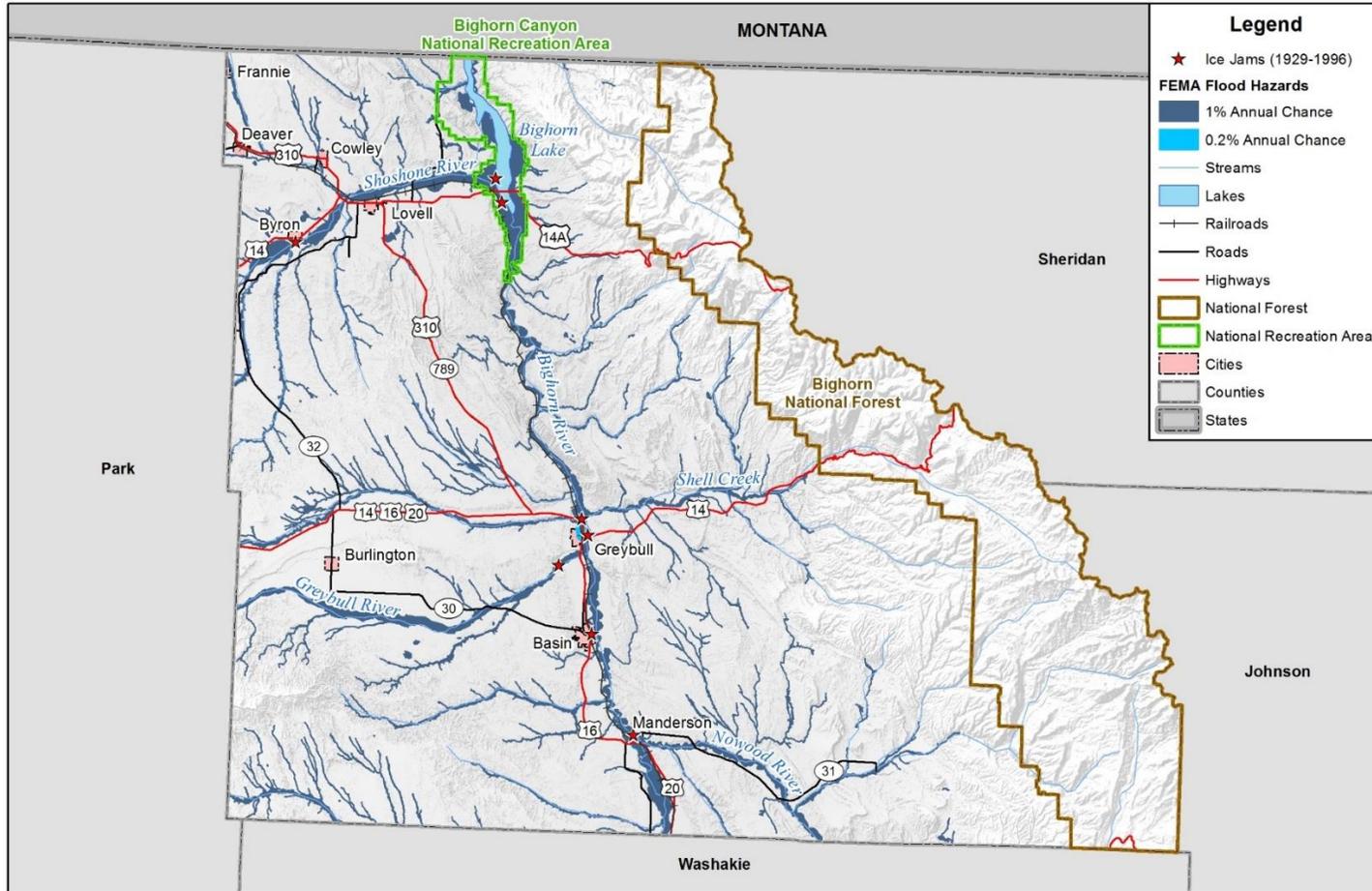
The February 15, 1962 flood was also caused by an ice jam by ice formed on the Bighorn River. Manderson received the brunt of the flood on a Monday and was still under water early on Wednesday. The U.S. Bureau of Reclamation closed the Boysen Dam (upstream on the Bighorn River) to hold all water from the area until the flood danger had passed. Exceedance frequencies cannot be applied to floods created by ice jams; but, in 1944, the Bighorn River recorded a flow of 17,900 cubic feet per second (cfs). This flow could be classified as a 75-year flood, but there is no record of damage in the community from this flood. Sheet flow flooding results only when flooding is due to ice jamming effects.

On March 7, 2014, a two-mile long ice jam along the Bighorn River caused significant rises in river stages from Worland to Greybull. Water levels rose to within two feet of the top of the Greybull levee on March 9th. Overall, the levee performed as designed enduring the ice jamming without breach and experiencing no visible damage from the chunks and slabs of ice that had caused water levels to rise. Even where the river reached its closest point to the top of the levee, the jam itself prevented the slabs of ice, which had settled along the levee’s riverside bank, from moving and gouging into the levee embankment. (Source: <http://www.nwo.usace.army.mil/>)

In the Town of Manderson, the area north of the Burlington Northern Railroad and west of Sherman Avenue is subject to shallow sheet flow flooding. This comes as a result of shallow overtopping of the railroad from the old highway crossing. That water which overtops the railroad near the business section of Manderson will travel northerly through town, but should stay on the west side of Sherman Avenue. Velocities and depths should be low in this area, with depths less than 2.0 feet during flooding conditions. See **Figure 3-24** for a map of ice jams in Big Horn County

Figure 3-24 Big Horn County FEMA Flood Hazards

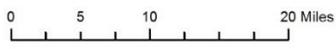
Big Horn County FEMA Flood Hazards



3-58



Map compiled 8/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014,
National Climatic Data Center Storm Event Database



Impacts

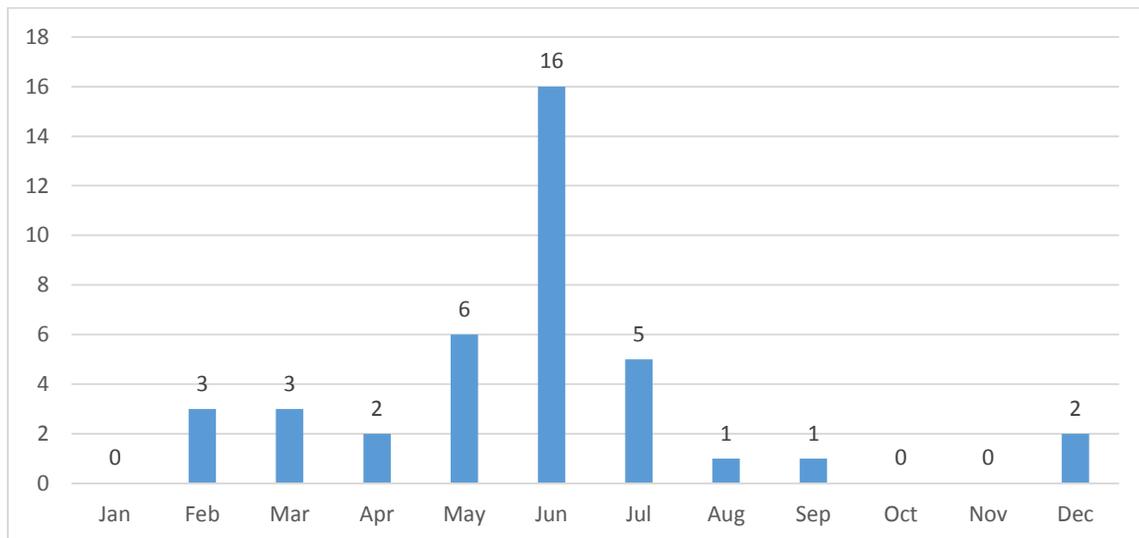
Impacts that could occur from flooding include:

- Injury
- Loss of life
- Injury and loss of life to livestock, pets, fish and wildlife
- Damage to and loss of property and infrastructure
- Interruption of transportation and commerce
- Contamination of surface and ground waters

Frequency

Historic data show that late spring through early summer is the most likely timeframe for flood events in Big Horn County, with a clear peak in the month of June. During this timeframe, snowmelt from the higher elevations of the Bighorn Mountains can inundate the Greybull and Bighorn Rivers that are fed from the various draws and creeks.

Figure 3-25 Summary of Flood Events by Month, Big Horn County 1928 - 2014



Source: Nation Climatic Data Center

Based on documented historical events, including estimates of reported infrastructure and agricultural losses to Big Horn County, the County experiences a flood event approximately once every 2.2 years. These events can usually be attributed to high intensity spring thunderstorms in the foothills that can cause flash flooding in the riverine valleys below.

Vulnerability

Flash flooding is the largest source of concern in Big Horn County since 1962, according to NCDC reports. Since records started being kept (c. 1950) around 50% of flood impacts have been the result of flash floods.

Flash flooding is perilous and is somewhat difficult to predict. Big Horn County Road and Bridge has identified the following areas in the county as those with perennial flood problems due to either flash flooding, or flooding due to snowmelt and heavy spring rains:

- Greybull River Road between Hwy. 30 and Greybull
- Road 8 south of Burlington,
- Bear and Beaver Creek Areas
- Crystal Creek and Crooked Creek.

There is also concern regarding the proliferation of dense vegetation along primary rivers in Big Horn County (Big Horn, Greybull, Nowood, and Shoshone Rivers) and various associated tributaries to those rivers. Tributaries include, but are not limited to Shell, Dry, Elk, and Sage Creeks.

This dense vegetation, consisting primarily of an overgrowth of Russian Olive trees, could be a detrimental factor and increase flood impacts by inhibiting the flow of flood waters in a flood plain or in some cases contributing to deeper channels and higher velocity flows. Russian Olive is a non-native tree that can out-compete native vegetation, interfere with natural plant succession and nutrient cycling, and tax water reserves, similar to the problems salt cedar presents. The State of Wyoming declared the Russian Olive a noxious weed in 2007.

Eradication efforts are necessarily a collaborative effort between federal, state, and local government agencies and private landowners. The Wyoming Natural Resources Conservation Service (NRCS) and the Wyoming Game and Fish Department (WGF) will assist landowners in removing the initial biomass. It is the up to local landowners to replant the areas and develop a weed management strategy to maintain control.

Future control measures are loosely planned to attack the infestation on smaller tributaries and canals first, ultimately reaching the Big Horn River to control the prolific growth of these invasive, non-native species covering vast acres along that primary river.

The Big Horn County Weed and Pest Control District provides numerous resources for landowners to permanently eliminate groves of Russian Olive trees on private property. The District, part of the County government, provides a cost share program for eradication, a guide for best management practices in replanting treated areas as well as landowner agreements that allow the land managers to treat high priority areas on private property. (Source: <http://www.bhcountyweedandpest.com/>)

Flood Control Measures and Specific Concerns

In Manderson, an embankment constructed by the Chicago, Burlington and Quincy Railroad (now Burlington Northern Railroad) along their right-of-way affords some protection from open-water floods on the Bighorn River. This embankment is approximately 1,700 feet long with an average height of six feet and a top width of six to eight feet. A levee that is approximately 1,800 feet long and has an average height of four feet and a six-foot top width is located on the east side of the town along the Nowood

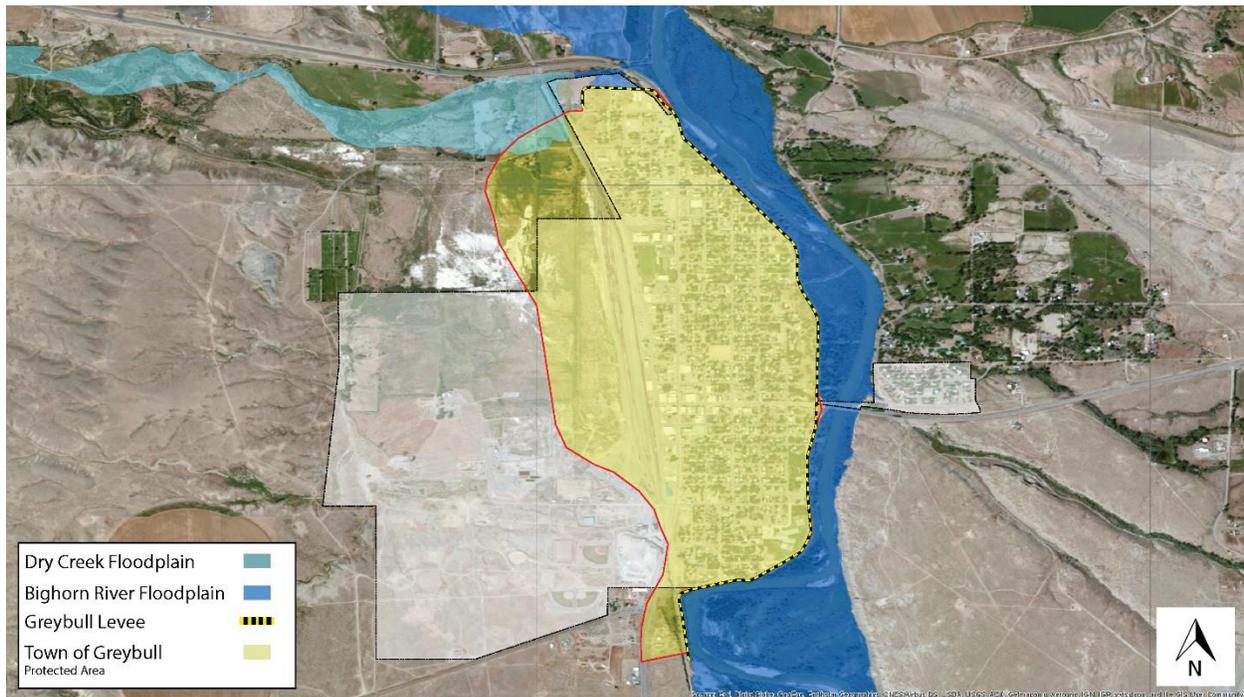
River. This levee affords partial protection from floods on that stream. These levees are not federally certified.

An emergency flood-fighting plan was formulated by the U.S. Army Corps of Engineers in 1956 for the Town of Manderson. This plan set up a program to establish central headquarters and a chain of command to organize a flood-fighting team from local volunteers. The Manderson levees are of little value in the event of an ice jam flood, as evidenced by the 1962 flood. The levee along the Nowood River is overtopped and flanked in any major flood. Lack of local equipment and rapid rise of water would make it impractical to construct an emergency levee of the length required for protection. The left bank of the Nowood River at Manderson is subject to erosion during floods. This would cause additional problems when attempts were made to construct an emergency dike in this area.

The Boysen Reservoir, which is located approximately 70 miles south of Manderson, has 673,330 acre-feet of storage that is reserved for flood control on the Bighorn River. This storage is used to retain flood peaks until they can be released slowly after the passage of the storm.

The threat of ice jams as a precursor to flooding is monitored closely by Big Horn County and municipalities contained within the boundaries of the county. However, the occurrence of flooding in Big Horn County in correlation with ice jams has greatly decreased following the creation of the Yellowtail Dam on the Big Horn River, upstream of the Town of Lovell.

Figure 3-26 Town of Greybull, Levee Structure and Protected Area



Source: US Army Corps of Engineers National Levee Database

The entire Town of Greybull is adjacent to the Bighorn River (see **Figure 3-26**), but is protected from the 1% annual chance flood by a levee. Construction of the Greybull levee was authorized in 1950 by the

Flood Control Act. Construction, contracted by the U.S. Army Corps of Engineers, began in June 1958 and was completed in July 1959. The Town of Greybull fully assumed operations and maintenance responsibility for the levee in November 1959.

This earthen structure is inspected for maintenance every year by the Army Corp of Engineers and provides significant protection. The Town underwent a levee certification process in 2013. This included an engineering study to provide data and information certified by a licensed engineer demonstrating the levee meets, and will continue to meet, the minimum standards of Title 44, Code of Federal Regulations Section 65.10 (44 CFR §65.10). FEMA’s standards address hydrologic, hydraulic, geotechnical, operational, and maintenance aspects of levee performance. When a levee is accredited by FEMA, the levee is recognized as providing flood protection for the base flood (1% annual chance or 100 year flood). As a result of this effort the levee was accredited for base flood protection. The levee is now in need of recertification and the town is committed to working towards that goal. The 2014 DFIRM shows the Town as in the Shaded X or 0.2% annual chance zone, indicating that there is still susceptibility to floods greater than the 100 year event.

National Flood Insurance Program Participation

Flooding is different from most other hazards in that riverine flooding problems are managed through a national insurance system called the National Flood Insurance Program (NFIP) under the Federal Emergency Management Agency (FEMA). FEMA conducts a Flood Insurance Study (FIS) of a region to identify the community's risk levels. The FIS includes statistical data for river flow, rainfall, topographic surveys, as well as hydrologic and hydraulic analyses. After examining the FIS data, FEMA creates Flood Insurance Rate Maps (FIRMs) delineating the different areas of flood risk. Land areas that have a 1% annual chance for flooding are called Special Flood Hazard Areas (SFHAs), or floodplains.

The 2010 Big Horn County Multi-Hazard Mitigation Plan incorporated a HAZUS flood loss analysis provided by the WOHS. In 2013, FEMA performed a flood mapping study and Risk MAP Flood Risk Report for the County. The Risk Report, most recent FEMA Flood Insurance Study (February 2014), and GIS analysis using the 2014 FIRM maps were used to update the flood risk analysis.

Table 3-20 FEMA NFIP and FIRM Map Data, Current September 2015

Community Name	Initial FHBM or FIRM Identification Date	FIRM Effective Date	NFIP Participation and date joined
Town of Basin	19-Feb-14	19-Feb-14	Yes – 2/19/14
Big Horn County (Unincorporated Areas)	2-Aug-77	19-Feb-14	Yes – 11/01/98
Town of Burlington	No SFHA	No SFHA	Not in NFIP; no SFHA identified
Town of Byron	19-Feb-14	19-Feb-14	Not in NFIP Sanctioned on 2/19/15

Town of Cowley	19-Sep-75	19-Feb-14	Not in NFIP Sanctioned on 9/19/1976
Town of Deaver	19-Feb-14	19-Feb-14	Not in NFIP Sanctioned on 2/19/15
Town of Frannie	19-Feb-14	19-Feb-14	Not in NFIP Sanctioned on 2/19/15
Town of Greybull	21-Jun-74	19-Feb-14	Yes – 2/19/80
Town of Lovell	8-Aug-75	19-Feb-14	Yes – 10/01/86
Town of Manderson	13-Sep-74	19-Feb-14	Yes – 4/16/79

Source: Big Horn County Flood Insurance Study, 2014 and FEMA Community Status Book

According to FIS and Community Status Book data, the communities of Byron, Cowley, Deaver and Frannie do not participate in the NFIP which makes them ineligible for flood insurance through the program. The community of Burlington does not participate either, but there are no flood hazard areas identified in the community so they are not required to.

Potential Losses

As the most recent Digital Flood Insurance Rate Maps (DFIRMs) illustrate, all communities in Big Horn County (with the exception of Burlington) have some vulnerability to the 1% annual chance flood or in some cases the 0.2% or 500 year flood. In terms of total dollar damage due to flooding, Big Horn is the third most vulnerable county in Wyoming, behind Natrona and Sweetwater, based on the HAZUS study completed by WOHS.

An updated GIS-based flood risk assessment was completed with the 2015 update of this plan. The overlay analysis utilized parcel data with assessed values and the current DFIRM. **Table 3-21** shows improved values at risk in the 1% and 0.2% annual chance flood zones.

Content values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for agricultural, commercial, exempt, and utility, 50% for residential, 150% for industrial and 0% for vacant land use classifications. Flood damage or loss is proportional to the depth of flooding in the structure. A 25% damage factor was applied to each flood zone’s total value of improvements and estimated content to obtain a loss estimate. This analysis is based on FEMA depth-damage loss curves, and assumes a two foot deep flood. Land value was not included in this analysis as the land itself is usually not a loss.

The entire county has 1,020 buildings at risk to flooding, with a total improved value of \$92,603,872, a content value of \$63,031,685, a total value of \$155,635,557 and a loss estimate of \$38,908,889. The majority of the loss would be associated with a 0.2% annual chance flood. The following section details this loss in further detail by jurisdiction.

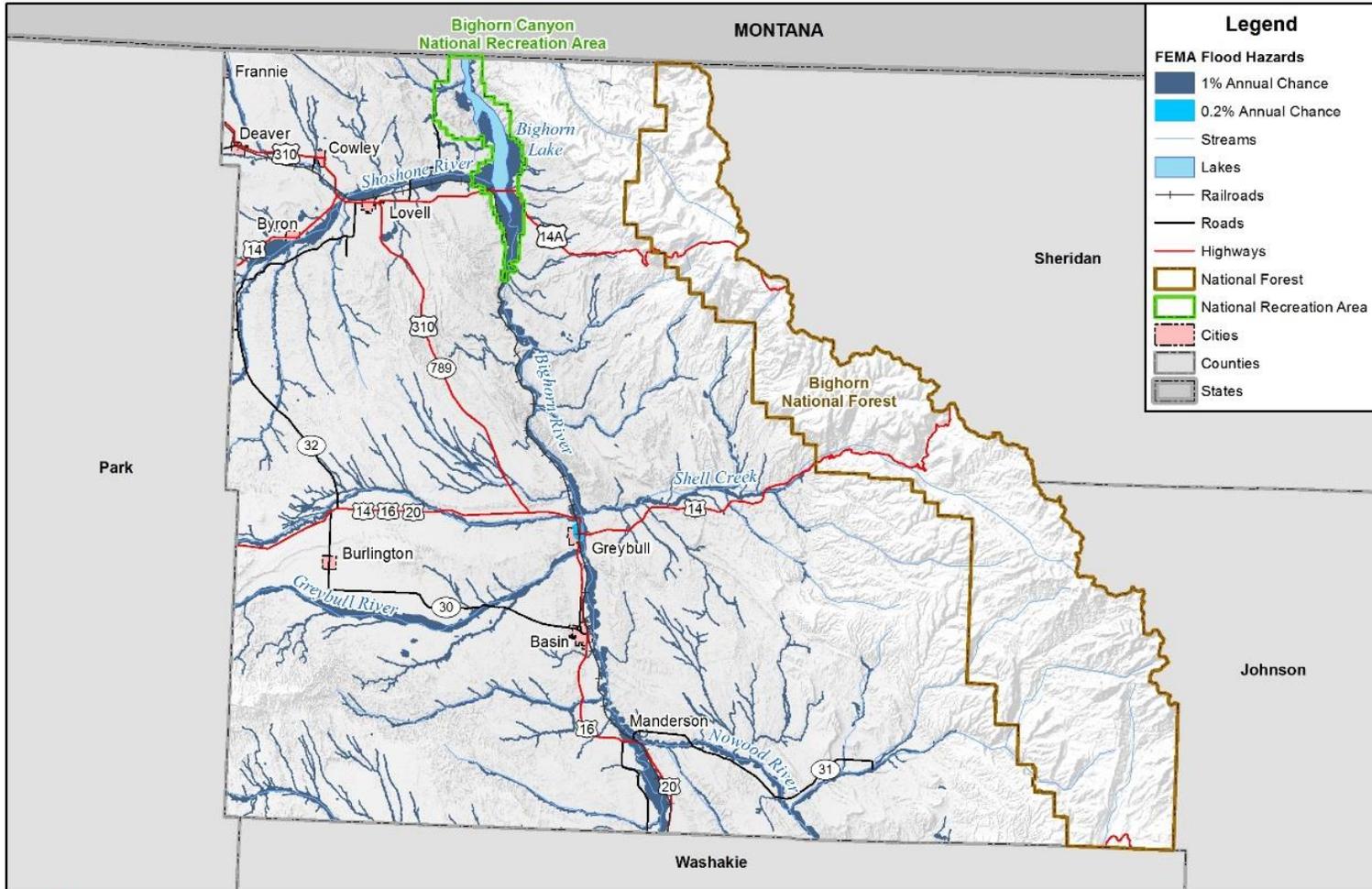
Table 3-21 Potential Loss Summary for Flood Scenarios. All Big Horn County.

DFIRM Zones	Property Count	Improved Value	Content Value	Total Value	Potential Loss at 25%
1% Annual Chance	241	28,258,559	\$23,890,582	\$52,149,141	\$13,037,285
0.2% Annual Chance	779	64,345,313	\$39,141,103	\$103,486,416	\$25,871,604
Total	1,020	\$92,603,872	\$63,031,685	\$155,635,557	\$38,908,889

Source: Amec Foster Wheeler GIS analysis using Big Horn County Assessor data and 2014 DFIRM

Figure 3-27 Bighorn County FEMA Flood Hazards

Big Horn County FEMA Flood Hazards



Legend

FEMA Flood Hazards

- 1% Annual Chance
- 0.2% Annual Chance

— Streams

■ Lakes

— Railroads

— Roads

— Highways

■ National Forest

■ National Recreation Area

■ Cities

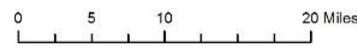
■ Counties

■ States

3-65



Map compiled 8/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014



Unincorporated Big Horn County

Unincorporated Big Horn County entered into the emergency NFIP on April 4th, 1997 and entered into the regular NFIP program on November 1st, 1998. The County has a FIRM effective date of April 4th, 1997. As of April 16, 2015 the County has 16 policies in force totaling \$3,189,200. Three claims have been paid since inception totaling \$47,439.55 with no repetitive losses.

Table 5-22 below shows improved values at risk in the 1% and 0.2% annual chance flood zones.

Unincorporated Big Horn County has 178 buildings at risk with a total improved value of \$24,190,632, a content value of \$21,216,795, a total value of \$45,407,427 and a loss estimate of \$11,351,857, mostly to residential and agricultural structures. According to the 2013 Flood Risk Report produced for Big Horn County by FEMA, the unincorporated county faces a potential displaced population of 200 residents, seven of whom would need emergency housing assistance.

Table 3-22 Potential Loss Summary for Flood Scenarios. Unincorporated Big Horn County.

DFIRM Zones	Property Type	Property Count	Improved Value	Content Value	Total Value	Potential Loss at 25%
1% Annual Chance	Agricultural	63	\$7,502,537	\$7,502,537	\$15,005,074	\$3,751,269
	Commercial	1	\$976,201	\$976,201	\$1,952,402	\$488,101
	Industrial	2	\$4,882,110	\$7,323,165	\$12,205,275	\$3,051,319
	Residential	112	\$10,829,784	\$5,414,892	\$16,244,676	\$4,061,169
	Vacant Land	178	\$24,190,632	\$21,216,795	\$45,407,427	\$11,351,857
0.2% Annual Chance	-	-	-	-	-	-
	Total	-	-	-	-	-
	Total Flood	178	\$24,190,632	\$21,216,795	\$45,407,427	\$11,351,857

Source: Amec Foster Wheeler GIS analysis using Big Horn County Assessor data and 2014 DFIRM

There are 14 critical assets at risk in unincorporated Big Horn County:

- The BNSF Railway Company's Commercial Land Mobile Towers at BNSF MP 397.7 Greybull East E AEI
- The Lamax Construction Private Land Mobile Towers at 4402 Orchard Bench Road
- The Greybull Public School District 3 Private Land Mobile Towers at 636 14Th Ave N
- The Wyo-Ben Inc Private Land Mobile Towers
- The M-I LLC Private Land Mobile Towers
- The Greybull Private Land Mobile Towers at WW PS - 0.38 MI NE OF CR26 & US14 Intersection
- The Sewer Control and Storage Building one mile North of Greybull

- M-I SWACO LLC Teir II Hazmat at PO BOX 832
- The Private Land Mobile Towers owned by Lovell, City Of at 336 Nevada Ave
- The Private Land Mobile Towers owned by Fire Protection District 1 at 8 Km S US 310 & US 42 3 Km W
- Marathon Oil’s Private Land Mobile Towers at Byron Field 1.5 mi ENE
- Marathon Oil’s Private Land Mobile Towers at Garland Battery 2
- Marathon Oil’s Private Land Mobile Towers at 1.5 mi E
- The Greybull Valley Irrigation District’s Diversion Dam at Greybull River 8 1/2 mi SW

Sources: Big Horn County Assessor, www.cama.state.wy.us/

Town of Basin

The Town of Basin entered into the emergency NFIP program on June 30th of 2000 and entered into the regular NFIP on February 19th, 2014 with the same FIRM effective date (see **Figure 3-28** on next page). As of April 16th, 2015 the Town has no policies in force, no claims and no repetitive losses.

Table 3-23 below shows improved values at risk in the 1% and 0.2% annual chance flood zones.

The town has two buildings at risk with a total improved value of \$143,430 and a loss estimate of \$53,786. According to the 2013 Flood Risk Report produced for Big Horn County by FEMA, the Town of Basin faces a potential displaced population of eight residents. There are no critical facilities in the 1% annual chance flood zone.

The 2010 Big Horn County Hazard Mitigation Plan also noted the potential vulnerability of the town river pump house, the Big Horn River Bridge and the town sewer lagoon, however none of these facilities appeared in the flood analysis performed for this plan as they did not appear in any flood hazard area.

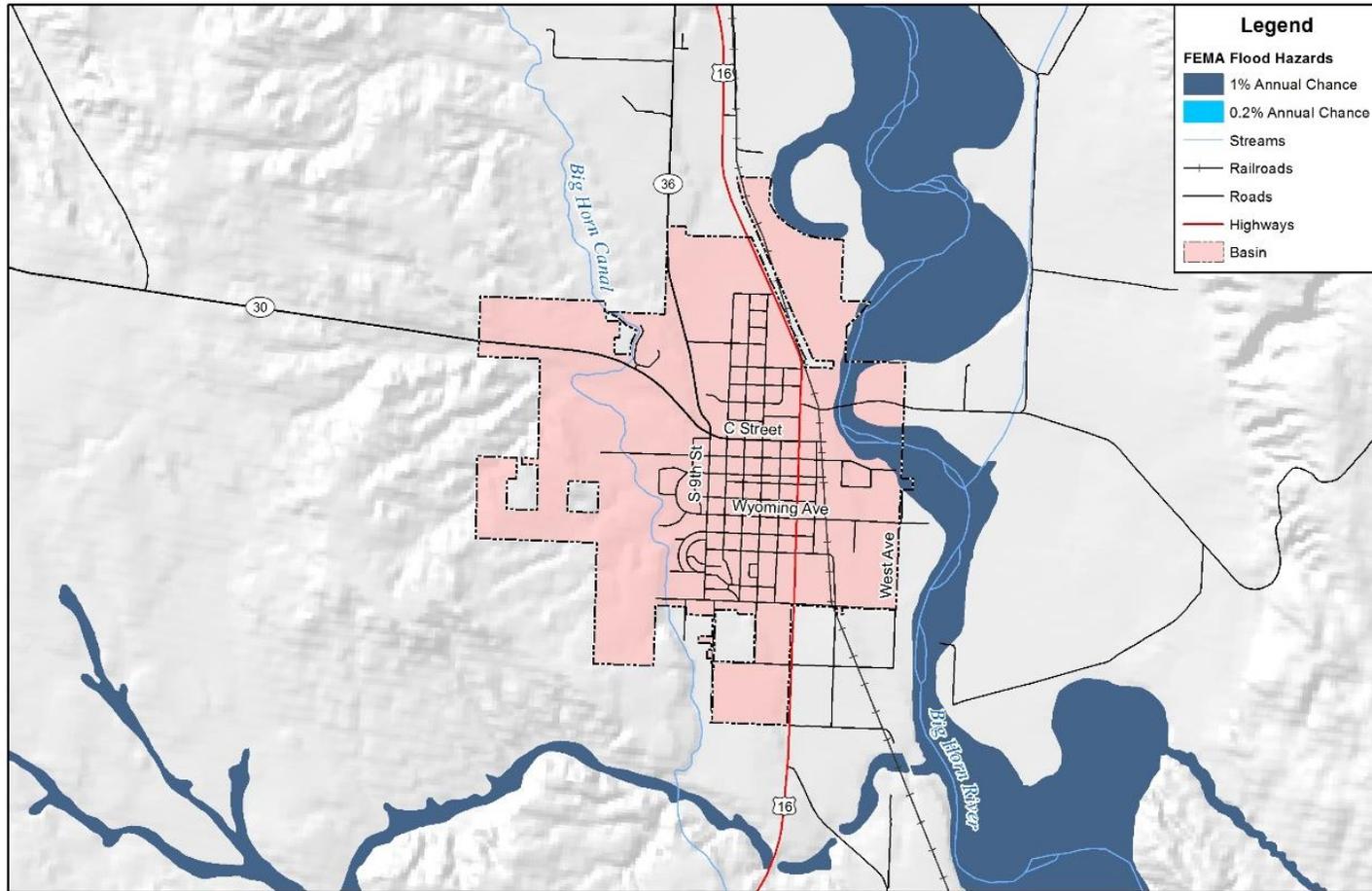
Table 3-23 Potential Loss Summary for Flood Scenarios, Town of Basin

DFIRM Zones	Property Type	Property Count	Improved Value	Content Value	Total Value	Potential Loss at 25%
1% Annual Chance	Residential	2	\$143,430	\$71,715	\$215,145	\$53,786
	Total	2	\$143,430	\$71,715	\$215,145	\$53,786
0.2% Annual Chance	-	-	-	-	-	-
	Total	-	-	-	-	-
	Total Flood	2	\$143,430	\$71,715	\$215,145	\$53,786

Source: Amec Foster Wheeler GIS analysis using Big Horn County Assessor data and 2014 DFIRM

Figure 3-28 Basin FEMA Flood Hazards

Basin FEMA Flood Hazards



Map compiled 9/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014

0 0.5 1 2 Miles

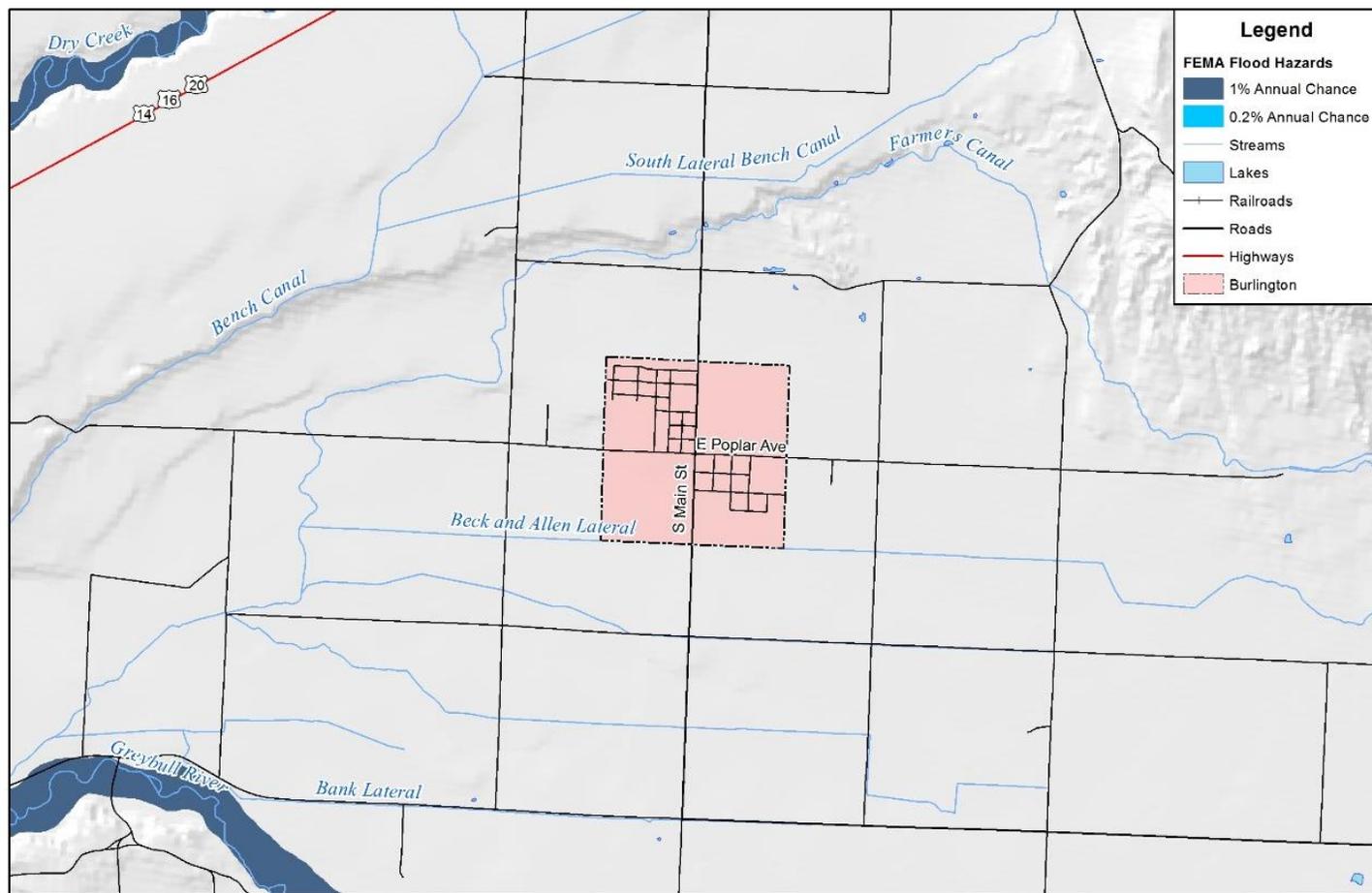


Town of Burlington

As the most recent FIRM maps indicate (see **Figure 3-29** on next page), the Town of Burlington has no special flood hazard areas (SFHAs) in the municipal boundary.

Figure 3-29 Burlington FEMA Flood Hazards

Burlington FEMA Flood Hazards



3-70



Map compiled 9/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014

0 0.5 1 2 Miles



Town of Cowley

As the most recent FIRM maps indicate (see **Figure 3-30** on next page), the Town of Cowley has some municipal area in the 1% annual chance flood zone. One commercial property is indicated at risk. As of September 19, 1976 the town has been sanctioned by the NFIP.

According to the 2013 Flood Risk Report produced for Big Horn County by FEMA, the Town of Cowley does not have a displaced population risk. There are no critical facilities identified as at risk.

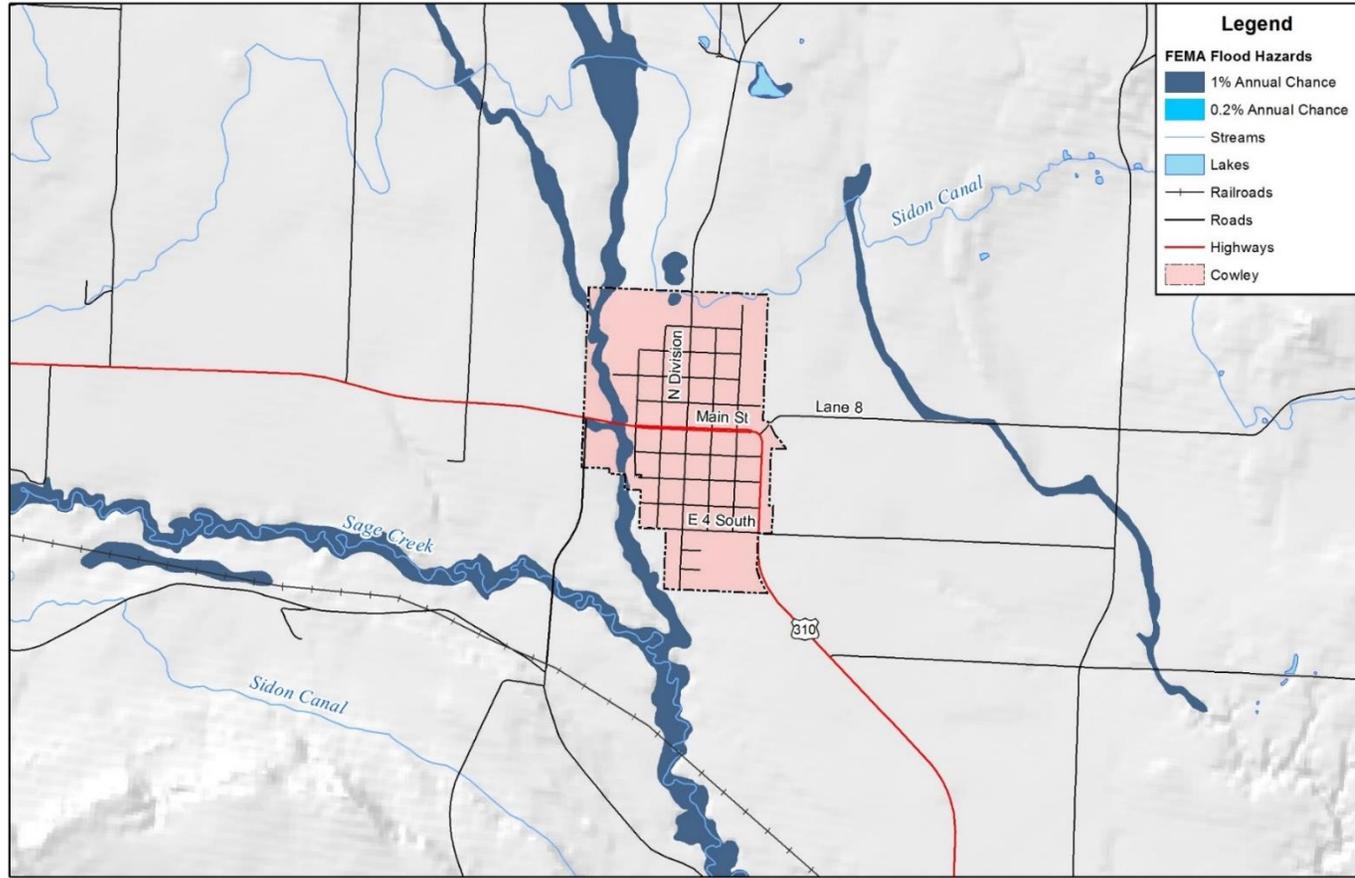
Table 3-24 Potential Loss Summary for Flood Scenarios, Town of Cowley

DFIRM Zones	Property Type	Property Count	Improved Value	Content Value	Total Value	Potential Loss at 25%
1% Annual Chance	Commercial	1	\$71,015	\$71,015	\$142,030	\$35,508
	Total	1	\$71,015	\$71,015	\$142,030	\$35,508
0.2% Annual Chance	-	-	-	-	-	-
	Total	-	-	-	-	-
	Total Flood	1	\$71,015	\$71,015	\$142,030	\$35,508

Source: Amec Foster Wheeler GIS analysis using Big Horn County Assessor data and 2014 DFIRM

Figure 3-30 Cowley FEMA Flood Hazards

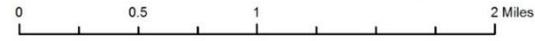
Cowley FEMA Flood Hazards



3-72



Map compiled 9/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014



Town of Frannie

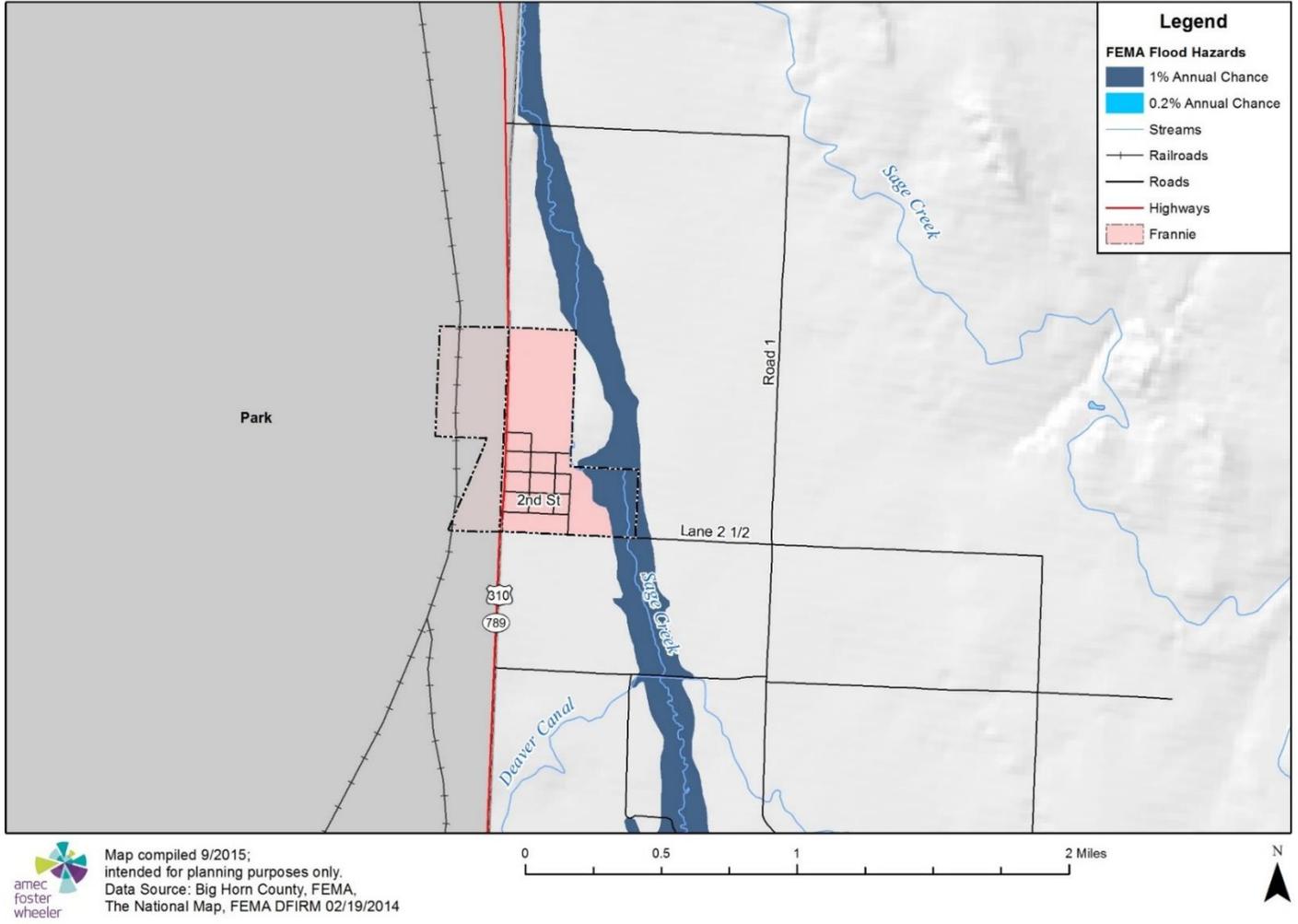
As the most recent FIRM maps indicate (see **Figure 3-31** on next page), the Town of Frannie has some municipal area in the 1% annual chance flood zone. As of February 19, 2015 the town has been sanctioned by the NFIP.

According to the 2013 Flood Risk Report produced for Big Horn County by FEMA, the Town of Frannie faces a potential displaced population of five residents, none of whom would need emergency housing assistance.

There are no critical facilities at risk.

Figure 3-31 Frannie FEMA Flood Hazards

Frannie FEMA Flood Hazards



Town of Greybull

The Town of Greybull entered into the emergency NFIP on March 16th, 1978 and entered into the regular NFIP program on February 19th, 1980 with a FIRM effective date of the same (see **Figure 3-32**). As of April 16, 2015 the Town has seven policies in force totaling \$1,393,200. One claim has been paid since inception for \$12,212.92 with no repetitive losses.

Table 3-25 below shows improved values at risk in the 1% and 0.2% annual chance flood zones. Most of the risk in the Town is within the 0.2% annual chance zone. The Town of Greybull has 782 buildings at risk with a total improved value of \$64,463,003, a content value of \$39,199,948, a total value of \$103,662,951 and a loss estimate of \$25,915,738.

According to the 2013 Flood Risk Report produced for Big Horn County by FEMA, the Town of Greybull faces a potential displaced population of 19 residents, one of whom would need emergency housing assistance in the case of a 1% chance flood. If the levee were to be breached, however, the Town would face a potential displaced population of 1,240 residents, 758 of whom would need emergency housing assistance.

Table 3-25 Potential Loss Summary for Flood Scenarios, Town of Greybull

DFIRM Zones	Property Type	Property Count	Improved Value	Content Value	Total Value	Potential Loss at 25%
1% Annual Chance	Residential	3	\$117,690	\$58,845	\$176,535	\$44,134
	Total	3	\$117,690	\$58,845	\$176,535	\$44,134
0.2% Annual Chance	Commercial	111	\$13,927,914	\$13,927,914	\$27,855,828	\$6,963,957
	Residential	666	\$50,408,420	\$25,204,210	\$75,612,630	\$18,903,158
	Vacant Land	2	\$8,979	\$8,979	\$17,958	\$4,490
	Total	779	\$64,345,313	\$39,141,103	\$103,486,416	\$25,871,604
	Total Flood	782	\$64,463,003	\$39,199,948	\$103,662,951	\$25,915,738

Source: Amec Foster Wheeler GIS analysis using Big Horn County Assessor data and 2014 DFIRM

There are no critical facilities in the 1% annual chance flood zone.

There are 40 critical facilities in the 0.2% annual chance flood (levee) zone:

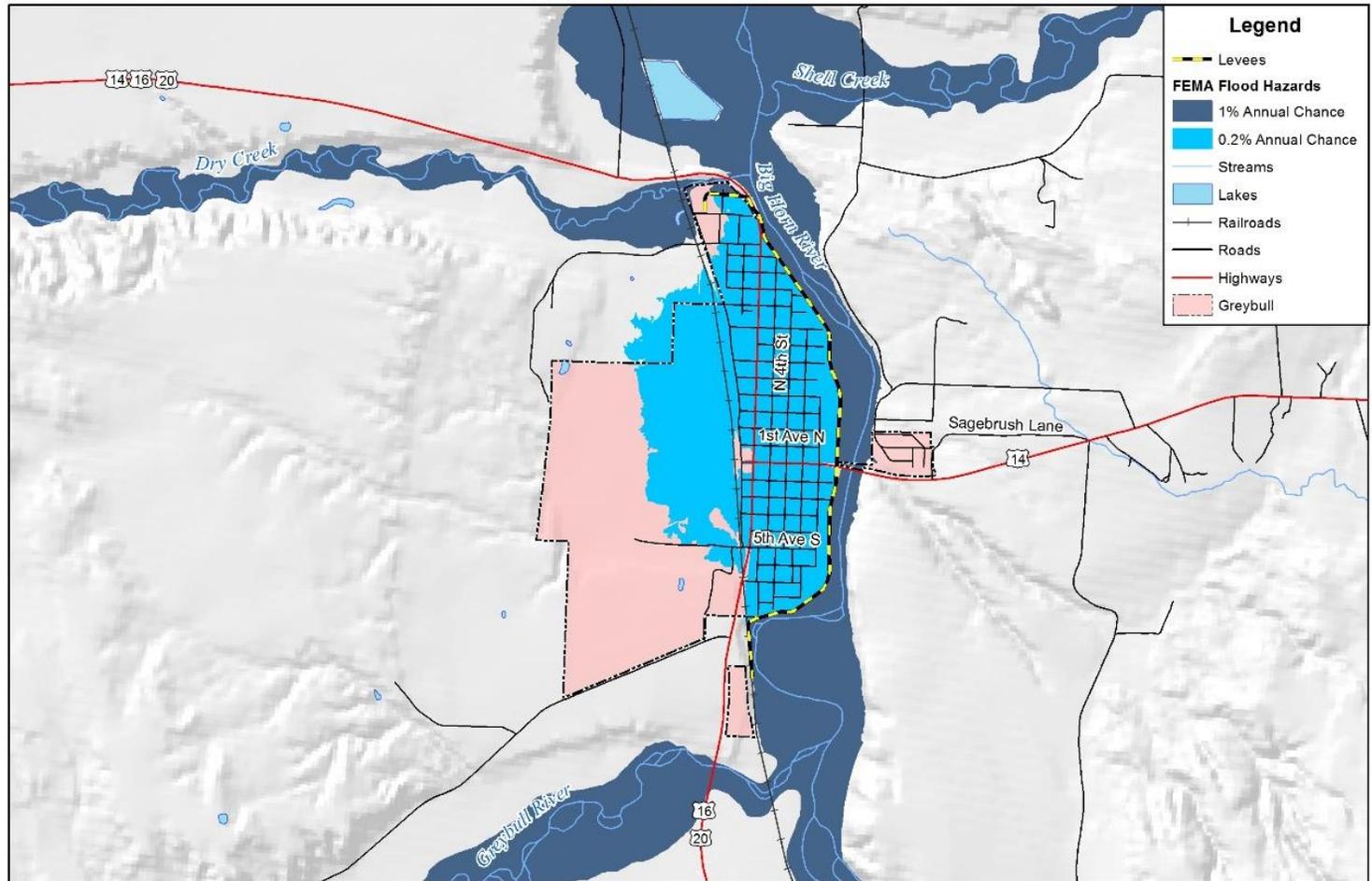
- Antenna owned by WWC Holding Co., Inc. at 519 1st Ave. South
- Call Center owned by Wyoming Call Center at 648 5th Avenue North
- Community Center owned by Herb Asp Community Hall at Corner of South 6th Street and First Avenue
- Daycare owned by Stepping Stones Montessori at 346 Greybull Ave

- Daycare owned by Lil ' Red Wagon Childcare and Learning Center at 200 3rd Ave South
- Fire Hall owned by Greybull Fire Hall / Emergency Medical at 141 North 6th Street
- Fire Siren owned by Emergency Fire Siren at 24 South 5th Street
- Fire Siren owned by Emergency Fire Siren at 170 North 7th Street
- Library owned by Greybull Public Library at 325 Greybull Avenue
- Microwave Tower owned by Greybull, Town of
- Museum owned by Greybull Museum at 325 Greybull Avenue
- Park owned by City Park Restrooms at 300 Block South 2nd Street
- Police owned by Greybull Police Department at 24 South 5th Street
- Post Office owned by US Postal Service at 401 Greybull Avenue
- Private Land Mobile Towers owned by Greybull, Town of at 24 South 5Th St
- Private Land Mobile Towers owned by BNSF Railway Co BNSF Depot at 600 2nd Ave.
- Private Land Mobile Towers owned by Armadillo Express
- Private Land Mobile Towers owned by Greybull, Town Of at 24 South 5Th
- Private Land Mobile Towers owned by Mountain Construction Company
- Private Land Mobile Towers owned by Big Horn School District #3
- Private Land Mobile Towers owned by Big Horn County school District #3 at 125 5th Ave S
- Private Land Mobile Towers owned by BNSF Railway Co at 600 2nd Ave. N.
- Private Land Mobile Towers owned by Greybull, City Of City Hall at 24 S. 5Th Street
- Private Land Mobile Towers owned by Greybull, City Of at 24 South 5Th Street
- Public Health owned by Big Horn County Public Health at 417 South 2nd Street
- School owned by Greybull Elementary School at 125 6th Avenue South
- School owned by Greybull Middle School Complex at 600 8th Avenue North
- School owned by Greybull High School Complex at 600 North 6th Street
- School owned by Big Horn County School District #3 Admin and Bus Barn at 636 14th Avenue North
- Senior Citizens Center owned by Senior Citizens Center at 417 South 2nd Street
- Shelter owned by Greybull Elementary School at 125 6th Avenue South
- Shelter owned by Greybull Middle School at 600 8th Avenue North
- Shelter owned by Greybull High School at 600 North 6th Street
- Shelter owned by Old High School Gym at 600 North 6th Street
- Teir II Hazmat owned by Greybull Bulk Plant
- Town Hall owned by Greybull Town Hall at 24 South 5th Street
- US Department of Agriculture owned Natural Resources Conservation Service - Greybull Field Office at 408 Greybull Avenue
- US Forest Service owned US Forest Service Work Center at 1220 North 8th Street
- US Forest Service owned US Forest Service at 1220 North 8th Street
- WY Game and Fish owned Wyoming Game and Fish Warden Station, Office/Residence at 434 6th Avenue North

Sources: Big Horn County Assessor, www.cama.state.wy.us/

Figure 3-32 Greybull FEMA Flood Hazards

Greybull FEMA Flood Hazards

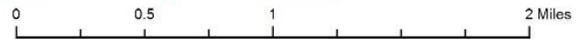


Legend

- Levees
- FEMA Flood Hazards**
 - 1% Annual Chance
 - 0.2% Annual Chance
- Streams
- Lakes
- Railroads
- Roads
- Highways
- Greybull



Map compiled 9/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014



Town of Lovell

The Town of Lovell entered into the emergency NFIP on August 30th, 1976 and entered into the regular NFIP program on October 1st, 1986. The Town has a FIRM effective date of November 12th, 1991 (see **Figure 3-33** on next page). As of April 16th, 2015 the Town has no policies in force, no claims and no repetitive losses.

Table 3-26 below shows improved values at risk in the 1% and 0.2% annual chance flood zones.

The Town of Lovell has six buildings at risk with a total improved value of \$644,276, a content value of \$353,449, a total value of \$997,725 and a loss estimate of \$249,431. According to the 2013 Flood Risk Report produced for Big Horn County by FEMA, the Town of Lovell does not have a displaced population risk.

Table 3-26 Potential Loss Summary for Flood Scenarios, Town of Lovell

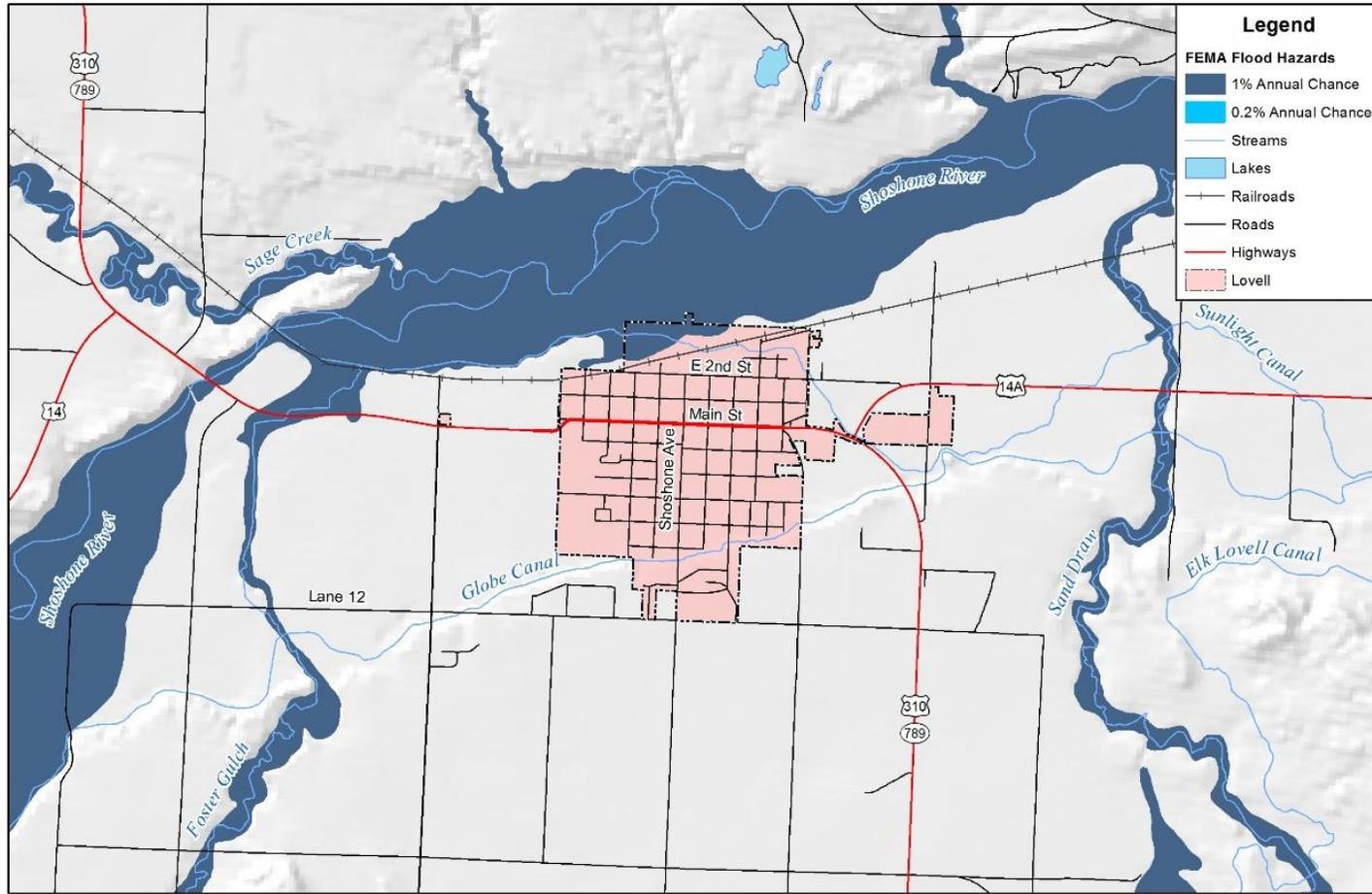
DFIRM Zones	Property Type	Property Count	Improved Value	Content Value	Total Value	Potential Loss at 25%
1% Annual Chance	Commercial	2	\$62,621	\$62,621	\$125,242	\$31,311
	Residential	4	\$581,655	\$290,828	\$872,483	\$218,121
	Total	6	\$644,276	\$353,449	\$997,725	\$249,431
0.2% Annual Chance	-	-	-	-	-	-
	Total	-	-	-	-	-
	Total Flood	6	\$644,276	\$353,449	\$997,725	\$249,431

Source: Amec Foster Wheeler GIS analysis using Big Horn County Assessor data and 2014 DFIRM

There are no critical facilities in the 1% annual chance flood zone:

Figure 3-33 Lovell FEMA Flood Hazards

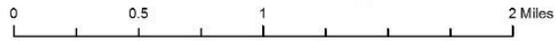
Lovell FEMA Flood Hazards



3-79



Map compiled 9/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014



Town of Manderson

The Town of Manderson entered into the emergency NFIP on April 29th, 1976 and entered into the regular NFIP program on April 16th, 1979 with a FIRM effective date of the same (see **Figure 3-34**). As of April 16, 2015 the Town has 11 policies in force totaling \$6,541,900. Two claims have been paid since inception totaling \$47,347.75 with no repetitive losses.

Table 3-27 below shows a number of improved values at risk in the 1% annual chance flood zones. The Town of Manderson has 49 buildings at risk with a total improved value of \$2,981,483, a content value of \$2,008,730, a total value of \$4,990,231 and a loss estimate of \$1,247,553. According to the 2013 Flood Risk Report produced for Big Horn County by FEMA, the Town of Manderson faces a potential displaced population of 69 residents, 16 of whom would need emergency housing assistance.

Table 3-27 Potential Loss Summary for Flood Scenarios, Town of Manderson

DFIRM Zones	Property Type	Property Count	Improved Value	Content Value	Total Value	Potential Loss at 25%
1% Annual Chance	Commercial	3	\$1,034,120	\$1,034,120	\$2,068,240	\$517,060
	Residential	44	\$1,945,506	\$972,753	\$2,918,259	\$729,565
	Vacant Land	2	\$1,857	\$1,857	\$3,714	\$929
	Total	49	\$2,981,483	\$2,008,730	\$4,990,213	\$1,247,553
0.2% Annual Chance	-	-	-	-	-	-
	Total	-	-	-	-	-
	Total Flood	49	\$2,981,483	\$2,008,730	\$4,990,213	\$1,247,553

Source: Amec Foster Wheeler GIS analysis using Big Horn County Assessor data and 2014 DFIRM

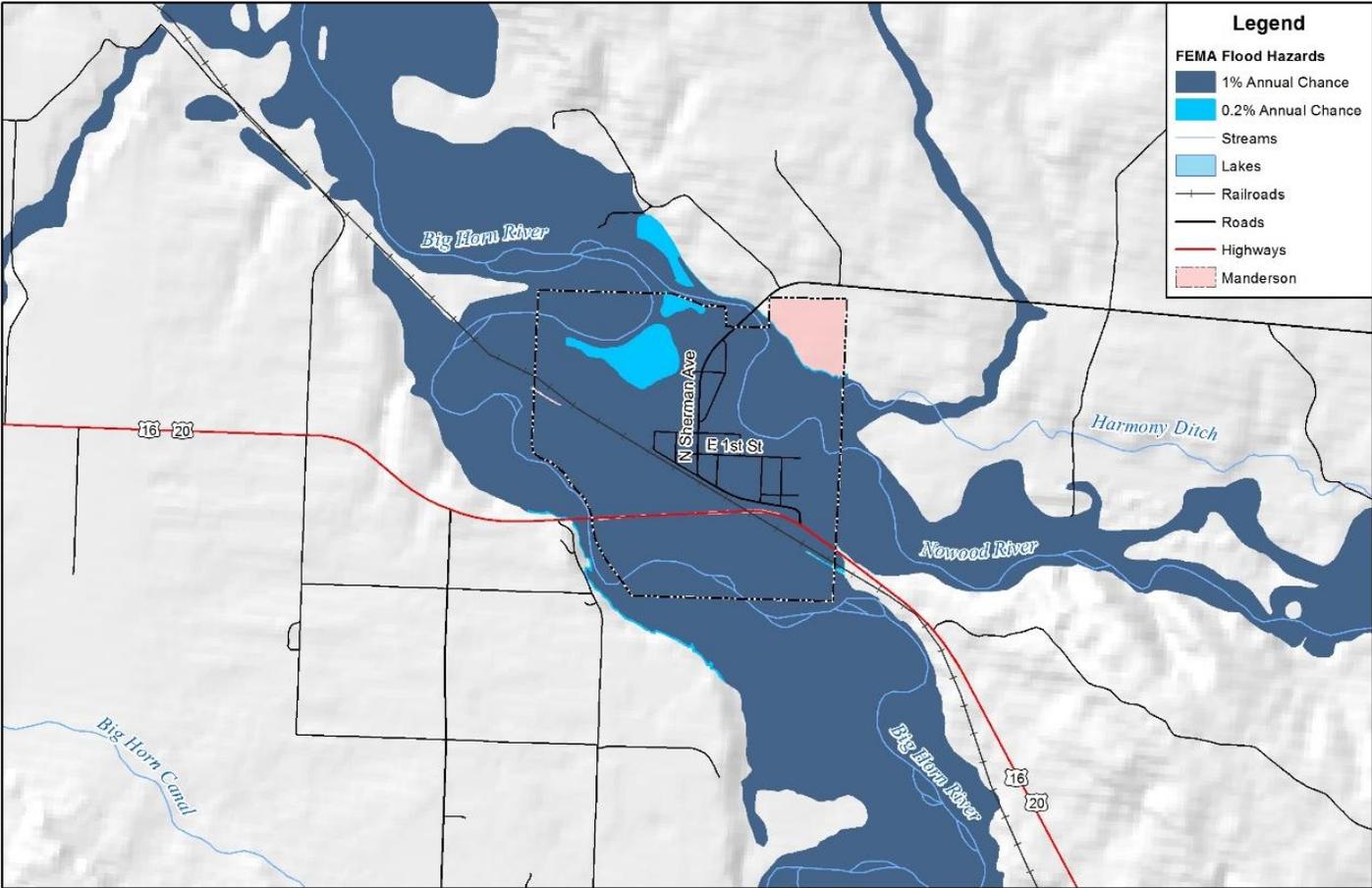
There are seven critical facilities in the 1% annual chance flood zone:

- Bus Barn owned Bus Garage at 157 East 1st Street
- The Fire Hall owned by Big Horn County Fire Dist #3 at 515 North Sherman Avenue
- The Post Office owned by the US Postal Service at 193 North Sherman Avenue
- The Private Land Mobile Towers owned by the Big Horn Regional Joint Powers Board at Flow Control Near Intersection Of Railway Street And Pauly A
- School Cloud Peak School owned by Manderson Elementary and Middle Schools at 170 School Avenue
- The Shelter Cloud Peak School at 170 School Avenue
- The Manderson Town Hall at 100 Railway Street

Sources: Big Horn County Assessor, www.cama.state.wy.us/

Figure 3-34 Manderson FEMA Flood Hazards

Manderson FEMA Flood Hazards



3-81



Map compiled 9/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, FEMA DFIRM 02/19/2014

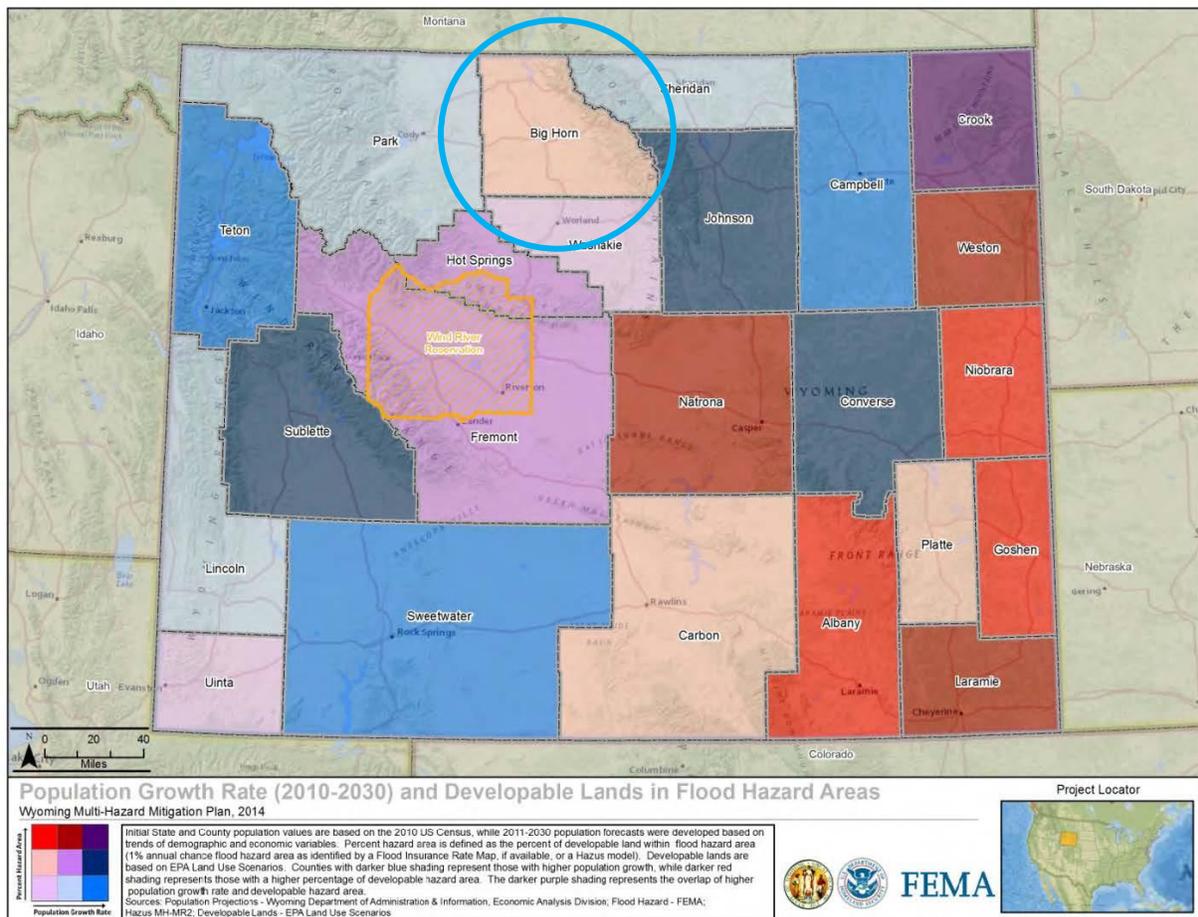
0 0.5 1 2 Miles



Future Development

Since nearly 90% of Big Horn County is federal and/or public land, most future development is likely to occur in areas that are already urbanized. Given that the County grew by an estimated 262 residents from April 2010 to July 2014, any development in a floodplain is likely to be limited and negligible. Nevertheless, towns should be aware of their flood hazard areas when granting building permits especially in towns like Frannie and Cowley where there are some identified flood hazard areas but the town does not participate in the NFIP.

Figure 3-35 Future Flood Hazard in Future Growth Area Wyoming, 2014. Big Horn County in Circle.



Source: Wyoming Multi-Hazard Mitigation Plan, 2014

The 2014 Wyoming Multi Hazard Mitigation Plan published an analysis of future flood hazard risk by developing a matrix that synthesized population growth projections with developable lands in flood hazard areas.

With this matrix approach, counties with darker blue shading represent those with higher population growth rates, while dark red shading represents those with a higher percentage of developable hazard

area. The purple shading represents overlap of high population growth rates and developable hazard areas.

Big Horn County, while having a significant amount of developable land in high hazard areas, has a low projected population growth rate to 2030. This means that flood hazard risks in Big Horn County are unlikely to change significantly in the next 15 years.

Summary

Based on documented historical events, including estimates of reported infrastructure and agricultural losses to Big Horn County, the County suffers a damaging flood event approximately every nine years. These events are typically spring or summer flooding that results when streams and rivers are already full and high temperatures or sudden rains in the mountains cause rapid snow melt to occur, causing flooding problems downstream, or sudden flash floods following in the wake of summer storms. Ice jams during the winter and spring months have also been problematic.

When water levels increase on the Big Horn River and flood watches commence, the Town of Manderson, the Town of Greybull, and rural homes and property along the river are the greatest concern. The less frequent 0.2% annual chance flood would have a significant impact on the County.

Loss Potential:	High
Population Impacted:	Medium
Probability:	Medium
Jurisdictions at Risk:	All, with Manderson, Greybull and unincorporated areas higher risk.

Damaging Hail

Narrative

Damaging hail events occur on a regular basis throughout the Big Horn Basin, usually associated with severe summer storms and wind events. Hailstones form when a super-cooled droplet collects a layer of ice and continues to grow, sustained by an updraft. Once the hailstone cannot be held up any longer by the updraft, it falls to the ground. Hail up to 2.5 inches in diameter has been reported in Big Horn County. Hail causes more than a billion dollars of property damage nationally each year, mostly to crops, but also can decimate structural sidings, take out windows, peel paint, and severely damage automobiles and equipment not protected or stored inside.

History

A comprehensive history of damaging hailstorms historically affecting Big Horn County is included in **Table 3-28**. The data was derived from the monthly Storm Data reports generated and released by the National Oceanic and Atmospheric Administration's National Climate Center. Other sources are unpublished reports from the Wyoming Office of Homeland Security, newspaper accounts, and periodicals from public libraries.

The NCDC records any hail events with hailstones that are $\frac{3}{4}$ inch or larger in diameter, or any hail of a smaller diameter which causes property and/or crop damage, or casualties. According to the NCDC definition, there have been 22 hailstorms affecting the county since 1960, recorded at 52 separate locations. While deaths and injuries have been associated with these types of storms, such occurrences are most often the result of accompanying flooding and high winds, rather than hail.

Table 3-28 Summary Bighorn County Hail History 1960-2014

Number of Events	Cumulative Fatalities	Cumulative Injuries	Cumulative Property Damage	Cumulative Crop Damage
22	0	1	\$101,000	\$350,500

Source: National Climactic Data Center

Table 3-29 Bighorn County Hail History 1960-2014

Location	Date	Time	Hail Diameter	Fatalities	Injuries	Property Damage	Crop Damage
Big Horn County	7/6/1961	16:00	1.50 in.	0	0	\$0	\$0
Big Horn County	7/6/1975	16:00	0.75 in.	0	0	\$0	\$0
Big Horn County	6/25/1991	15:43	1.75 in.	0	0	\$0	\$0
Big Horn County	6/25/1991	16:10	1.75 in.	0	0	\$0	\$0
Big Horn County	9/10/1991	19:40	0.85 in.	0	0	\$0	\$0
Basin	6/13/1997	18:40	0.75 in.	0	0	\$0	\$0
Basin	7/19/1997	16:00	1.25 in.	0	0	\$0	\$0
Manderson	7/19/1997	16:20	0.75 in.	0	0	\$0	\$0
Lovell	8/8/1998	19:50	1.00 in.	0	0	\$0	\$0
Deaver	6/9/2000	13:00	0.88 in.	0	0	\$0	\$0
Cowley	6/9/2000	13:05	0.88 in.	0	0	\$0	\$0
Cowley	6/9/2000	13:11	1.00 in.	0	0	\$0	\$0
Greybull	6/26/2001	18:02	0.75 in.	0	0	\$0	\$0
Otto	6/1/2002	17:20	1.75 in.	0	0	\$0	\$0
Greybull	6/1/2002	17:30	0.88 in.	0	0	\$0	\$0
Greybull	6/1/2002	17:56	0.75 in.	0	0	\$0	\$0
Burlington	8/21/2002	14:43	0.75 in.	0	0	\$0	\$0
Burlington	8/21/2002	14:50	1.75 in.	0	0	\$0	\$0
Emblem	8/21/2002	15:05	1.75 in.	0	0	\$0	\$0
Manderson	5/9/2005	16:15	0.75 in.	0	0	\$0	\$0
Byron	6/1/2005	12:20	1.00 in.	0	0	\$0	\$0
Burlington	6/1/2005	13:07	1.75 in.	0	0	\$0	\$0

Burlington	6/14/2006	11:42	1.00 in.	0	0	\$0	\$0
Burlington	6/14/2006	11:47	1.50 in.	0	0	\$0	\$0
Emblem	6/14/2006	11:50	2.00 in.	0	0	\$0	\$0
Emblem	6/14/2006	11:50	1.75 in.	0	0	\$0	\$0
Byron	6/14/2006	12:08	0.88 in.	0	0	\$0	\$0
Lovell	6/14/2006	12:10	1.75 in.	0	0	\$0	\$0
Lovell	6/14/2006	12:20	1.00 in.	0	0	\$0	\$0
Lovell	6/14/2006	12:25	2.00 in.	0	0	\$12,000	\$500
Lovell	6/14/2006	12:25	1.75 in.	0	0	\$12,000	\$275,000
Greybull	6/6/2007	14:15	1.00 in.	0	0	\$0	\$0
Byron	6/6/2007	14:55	0.88 in.	0	0	\$0	\$0
Hyattville	5/28/2008	17:15	0.75 in.	0	0	\$0	\$0
Basin	7/13/2009	14:45	0.75 in.	0	0	\$0	\$0
Burlington	8/7/2009	15:44	1.25 in.	0	0	\$0	\$0
Otto	8/7/2009	15:51	1.25 in.	0	0	\$0	\$0
Greybull	8/7/2009	16:10	2.00 in.	0	1	\$75,000	\$0
Greybull	8/7/2009	16:15	2.50 in.	0	0	\$0	\$0
Greybull	8/7/2009	16:17	2.00 in.	0	0	\$2,000	\$0
Byron	5/23/2013	21:31	1.00 in.	0	0	\$0	\$0
Cowley	5/23/2013	21:39	0.75 in.	0	0	\$0	\$0
Burlington	6/12/2013	16:05	1.00 in.	0	0	\$0	\$0
Emblem	6/12/2013	16:10	0.75 in.	0	0	\$0	\$0
Greybull	6/12/2013	16:35	1.00 in.	0	0	\$0	\$0
Burlington	6/13/2013	12:30	0.75 in.	0	0	\$0	\$0
Otto	6/13/2013	12:45	0.88 in.	0	0	\$0	\$0
Greybull	6/13/2013	12:55	1.00 in.	0	0	\$0	\$0
Hyattville	8/1/2013	15:41	0.75 in.	0	0	\$0	\$0
Lovell	5/31/2014	14:02	1.00 in.	0	0	\$0	\$0
Lovell	5/31/2014	14:12	0.88 in.	0	0	\$0	\$0
TOTALS				0	1	\$101,000	\$310,500

Source: National Climactic Data Center

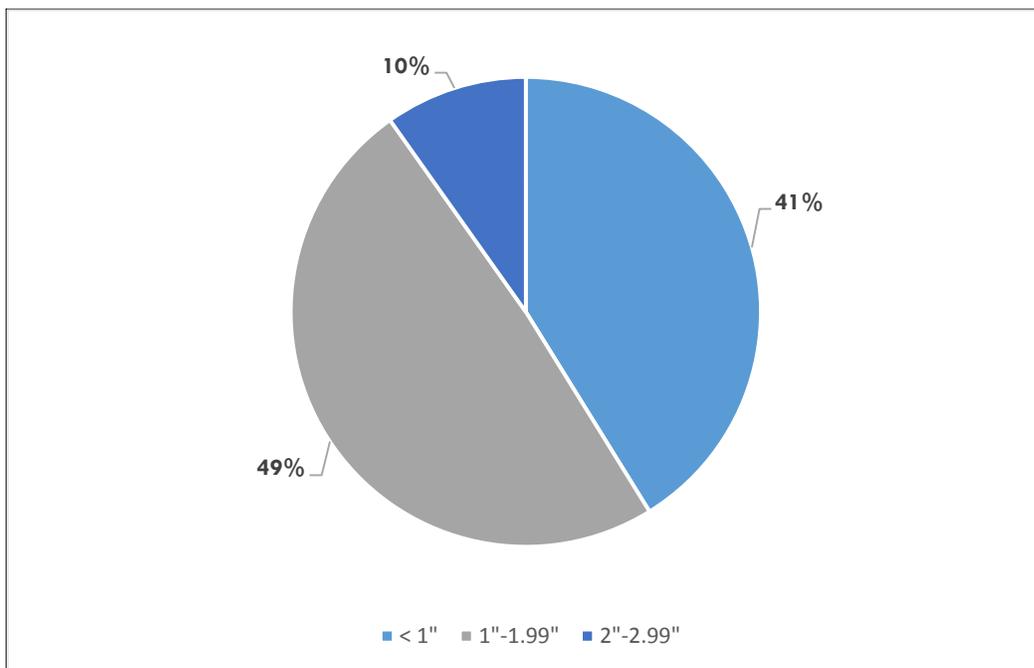
Based on historical data, an average hail event in Big Horn County occurs in June, somewhere between 12 p.m. and 5 p.m. It drops hail with a diameter between one and two inches. While most historical hail storms in Big Horn County don't result in major damage, recordable damage to property is in the \$12,000 range per incident, mostly to rooftops and vehicles; crop damage is approximately \$20,000 per incident. Historically, damage to crops is three times the amount of damage to property.

History shows a few outliers, summarized below:

On June 14, 2006, a hail storm struck approximately six miles east of Lovell. Dropping hail of approximately two inches in diameter, the storm substantially damaged two homes. Additionally, approximately 900 acres of sugar beets, over 100 acres of corn, and about 40 acres of alfalfa were destroyed by the large hail. While the storm caused no reported injuries or fatalities, it caused \$12,000 in direct property damages and \$275,000 in direct crop damage.

On August 7, 2009, a storm struck Greybull. Golf ball sized hailstones were numerous at a residence in Greybull, with stones reaching up to two inches in diameter. While the storm caused no reported crop damage, it did cause \$75,000 in property damage. One injury is attributed to the storm.

Figure 3-36 Hail Events by Hail Diameter. Big Horn County 1959 – 2014.



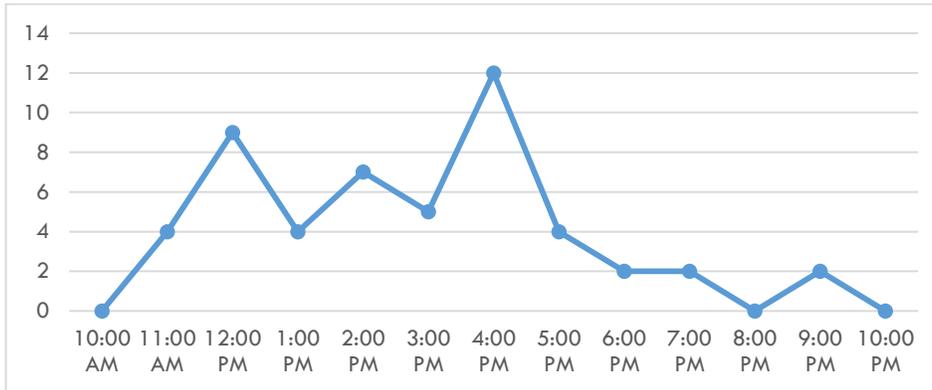
Source: National Climactic Data Center

Most public and personal property damage from hail is insured under private property insurance or crop insurance policies, serviced by multiple insurance providers. For this reason it is very difficult to get a true cumulative estimate of damage costs caused by hail events. Data collection regarding dollar damage to public and personal property holds significant gaps for this reason. There have been no FEMA disaster or state declarations for Big Horn County related to damaging hail, and no USDA disaster declarations as a result of hail damage in Big Horn County were found. Agricultural losses and claims met by crop insurance carriers due to hail damage are difficult to determine.

Vulnerability

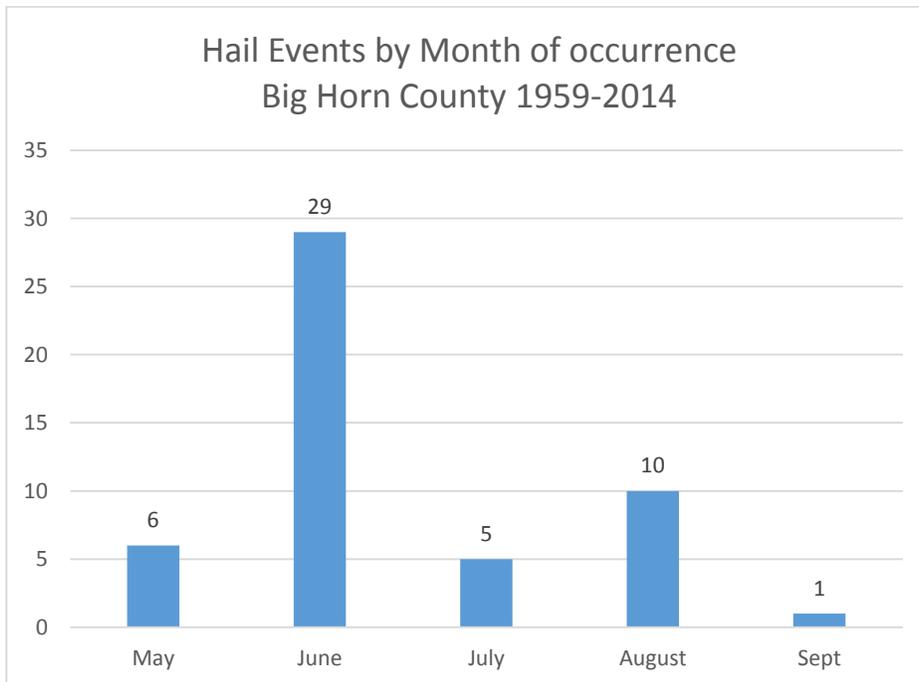
Hail storms present the largest threat to citizens and property in the month of June, between noon and five p.m. Figure 3-39 indicates the locations within the county having the highest likelihood of being affected are Greybull, Lovell, Basin, and the Byron and Emblem/Burlington areas. Based on historical data, Big Horn County can expect a damaging hail event an average of every two years.

Figure 3-37 Time of Day Hail Events in Big Horn County 1959-2014



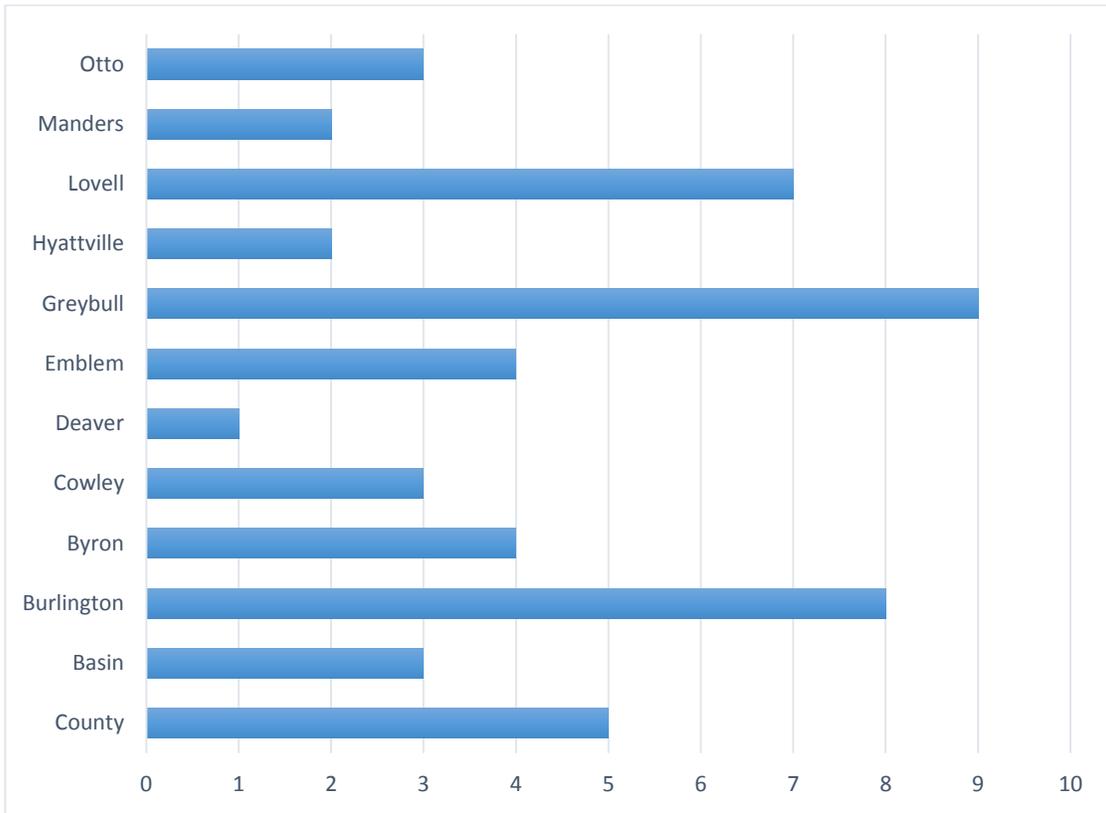
Source: National Climactic Data Center

Figure 3-38 Month of Occurrence - Hail Events in Big Horn County 1959 to 2009



Source: National Climactic Data Center

Figure 3-39 General Locations - Hail Events in Big Horn County 1959-2014



Future Development

Between 2010 and 2014, Big Horn County's population grew 2.2%. Hail can strike anywhere in the county, so any growth or new development in Big Horn County will increase exposure to hail damage. Insurance will be an important tool to offset the potentially substantial dollar losses associated with hail.

Summary

Big Horn County will continue to experience damaging hail events, based on an average recurrence interval of every two years. If the storms are damaging, damage estimate averages based on available data show an average of \$12,000 in damage to property and \$20,000 damage to crops. Hail damage to public and private property, and agricultural losses are expected to be heaviest in the Greybull, Lovell, Basin, and Burlington/Emblem areas.

Loss Potential:	High
Population Impacted:	Low
Probability:	High
Jurisdictions at Risk:	All

High Winds and Downbursts

Narrative

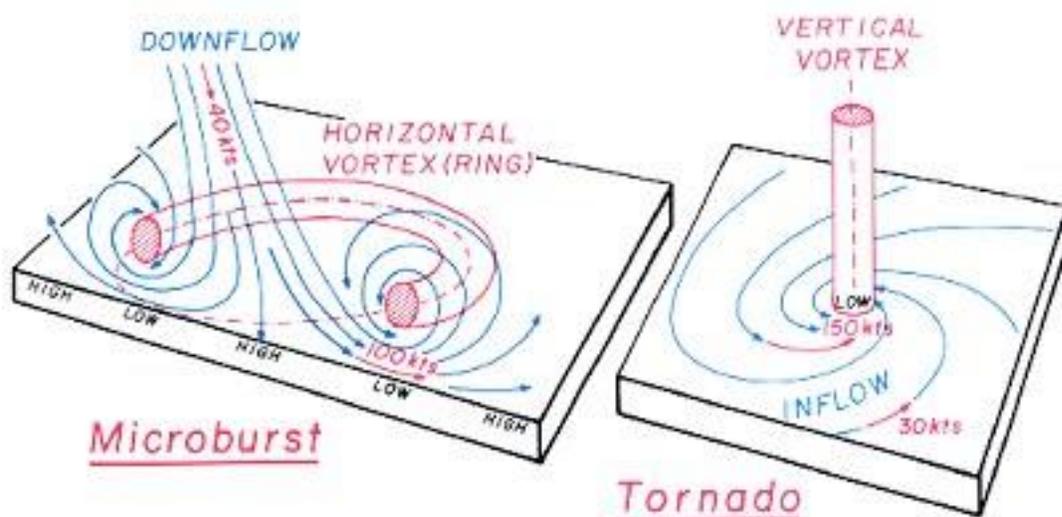
Wind, because of its constant presence in Wyoming, can be overlooked as a hazard. Upon analysis, wind can be a damage-inducing hazard and warrants review in Big Horn County. Wyoming's wind is also becoming an economic factor as renewable wind energy is developed around the state.

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

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

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

Figure 3-40 Schema of Microburst and Tornado



Source: www.erh.noaa.gov

Tornado - All wind flows INTO a tornado. Debris is often laying at angles due to the curving of the inflow winds.

Downburst - All wind flows OUT from a downburst. Debris is often laying in straight lines (hence the term "straight line winds") parallel to the outward wind flow.

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

Figure 3-41 Aerial Image of Downburst Damage



Source: T. Fujita

In this photograph, trees are blown down in a straight line - a very strong indication of a downburst as opposed to a tornado.

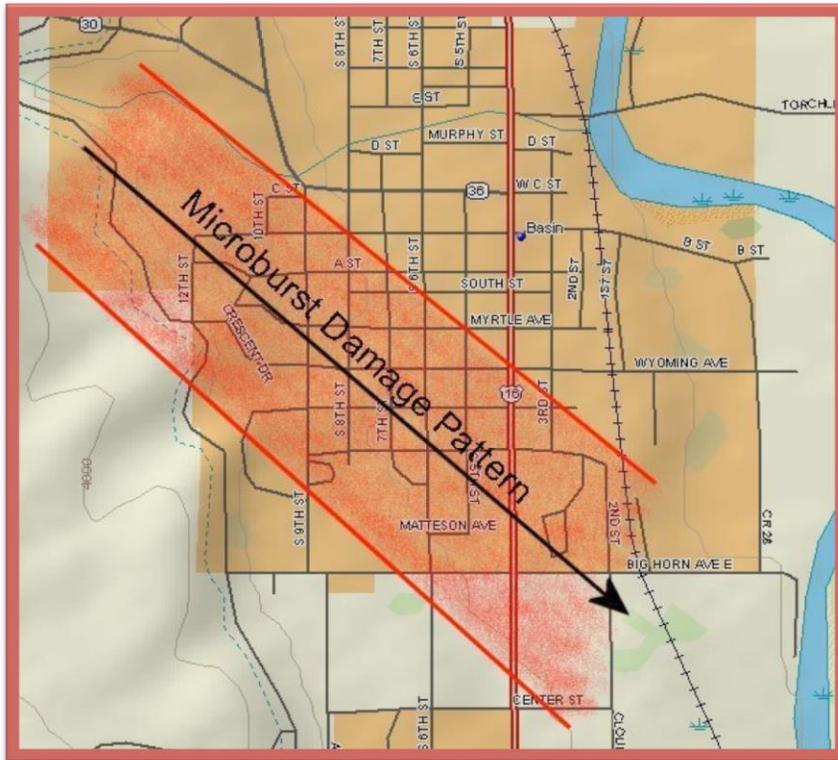
Past Occurrences

In Big Horn County most documented wind events causing damage typically range between 55 and 70 mph, and have been recorded at speeds up to 100 mph. Within the category of high winds, the county is susceptible to downbursts, as described by the NOAA Riverton Office following a July 31, 2004 event impacting the Town of Basin.

Taken from an account by the Big Horn Sherriff's Office: A weather station located in Basin near the northwest fringe of the damage only reported a wind gust of 20 mph as the storm began around 5:19 p.m. Phone calls to the Big Horn County Sheriff's Office began about the same time with a report of a tree blown over into the southbound lanes of US Highway 16/20 near Wyoming Avenue. Northwest of

town, three power poles were toppled by the strong wind. Soon after, a residence was reported to have lost the top layer of roofing material. By 5:26 p.m. calls were coming in from around town of numerous trees and limbs down. The greatest concentration of damage appeared to have occurred between 6th and 9th streets and South Street and Montana Avenue. A garage was struck by several large tree limbs, causing a gouge in the roof and tearing the gutters from the roof. Another report indicated that a van travelling south on US Highway 16/20 through Basin was struck in the driver's-side windshield by a flying tree limb. No injuries or deaths were reported during the event.

Figure 3-42 Microburst Path, Basin Wyoming July 2004



Source: <http://www.crh.noaa.gov/riw/archive/basinmicro.php>

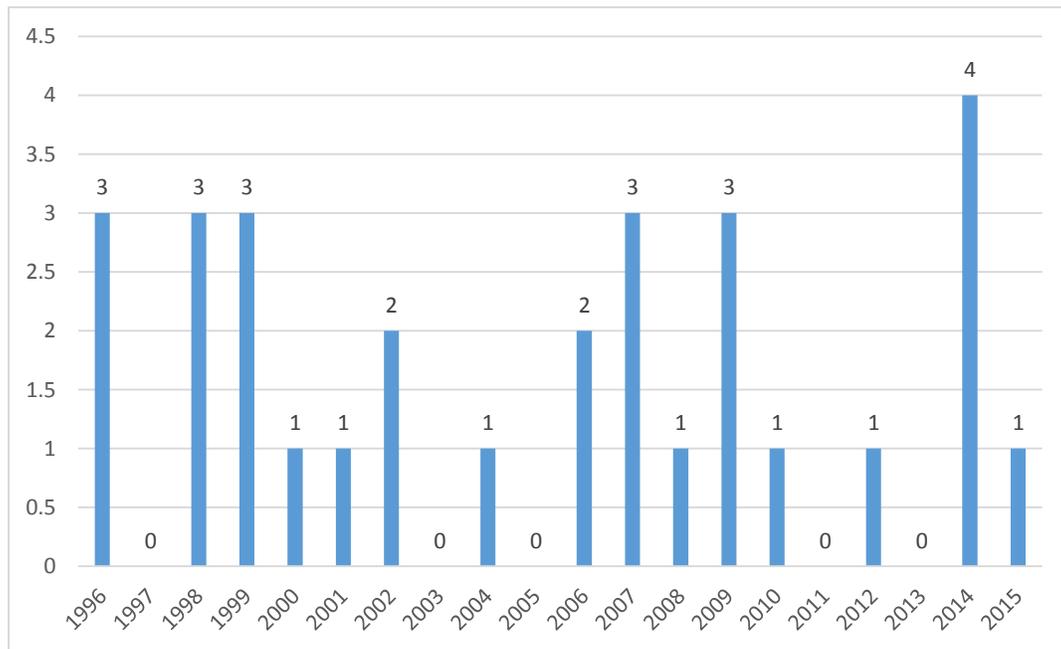
The National Climatic Data Center (NCDC) refers broadly to the Big Horn Basin in its data reports, as wind events tend to sweep from the east slopes of the Absaroka Range or from the direction of the Beartooth Range to the north, across the region and into the western slopes of the Big Horn Mountains. Data prior to 1996 was somewhat less detailed and provided limited information. However, occurrences specifically referring to Big Horn County as found in previous versions of this plan and NCDC database are summarized below. A complete list of wind weather events can be found in Appendix B.

Table 3-30 Summary of Wind Weather Events and Impacts. Big Horn County 1993 to 2015.

Total Number of High Wind Events	Total Property Damage	Total Fatalities	Total Injuries	Average Max Wind Speed (Knots)
35	\$262,000	1	1	58.5

Source: NCDC, SHELDUS and NOAA

Figure 3-43 High Wind Events by Year. Big Horn County 1996 to 2015

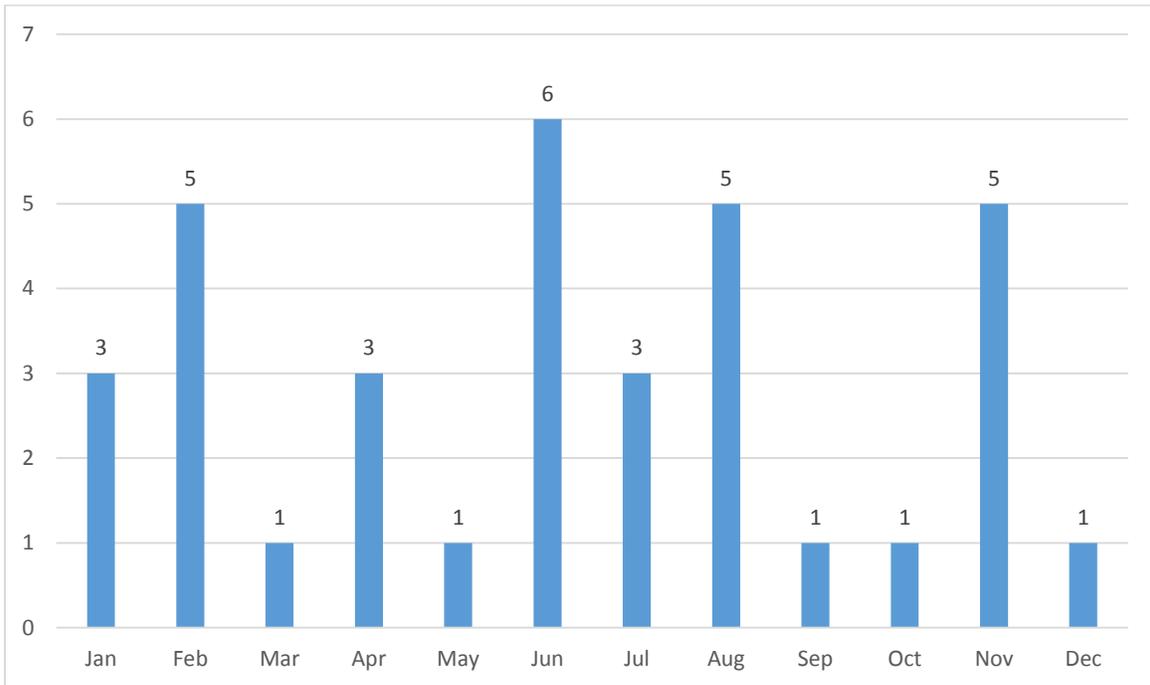


Source: NCDC

Frequency

Big Horn County experiences weather patterns that form or travel in the Basin region from any direction and foster high winds, downbursts, and tornadoes. Thirty-five (35) high wind events specifically impacting Big Horn County have been confirmed and documented since 1985.

Figure 3-44 High Wind Events by Month. Big Horn County 1985-2015



Source: NCDC and Big Horn County MHMP 2010

Big Horn County experiences an average of one significant high wind event per year, with a damaging event occurring approximately once every 3.8 years (1985 to 2015). Incidence of events appears to be randomly distributed, with no clear trends by time of year. See **Figure 3-44**.

Vulnerability

Vulnerability as it relates to location is random, as damaging winds have occurred everywhere in the county. Damage from high winds is often described in regional or broad areas, but downburst damage will impact a small area most generally less than three miles in diameter. Because state or presidential emergency or disaster declarations have not been necessary in the aftermath of wind events in Big Horn County, and because damage to personal property is dealt with by numerous private insurance companies, it is difficult to estimate actual monetary impacts that have occurred due to damaging winds. See section on Potential Losses for loss estimates based on reported damage. The county holds no record of crop loss due to wind

Potential Losses

According to the Spatial Hazards and Losses Database for the United States (SHELDUS) and the 2014 Wyoming Hazard Mitigation Plan, Big Horn County suffered 26 damage causing wind events between 1960 and 2012, and a cumulative \$128,293 in damage as a result of these events (\$4,934/event average).

Loss Potential:	Low
Population Impacted:	Medium
Probability:	High
Jurisdictions at Risk:	All

Tornado

Narrative

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

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

Rating a Tornado

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

Table 3-31 Fujita Scale Description

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

Recent Changes to Tornado Rating Scale

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

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

Table 4.31 - The Enhanced Fujita Tornado Scale

	FUJITA SCALE		OPERATIONAL EF-SCALE	
F Number Fastest	Fastest 1/4 – mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

Past Occurrences

Tornado statistics, especially prior to the 1970s, must be viewed as incomplete since many twisters have occurred without being witnessed. Wyoming's open rangelands experience little if any damage from these storms, so many go unreported. Many documented tornadoes occurring in Big Horn County are given low ratings on the Fujita Scale (F0s and F1s) simply because tornadoes are often formed over open land and result in little or no damage.

There have been 32 tornadoes in Big Horn County documented by the National Climatic Data Center since 1958. A full accounting of those tornadoes can be found at the end of this chapter. A cumulative history is found in the following table:

Table 3-32 Summary Tornado History, Big Horn County

CUMULATIVE TORNADO HISTORY BIG HORN COUNTY 1958-2014				
NUMBER OF EVENTS	INJURIES	FATALITIES	TOTAL RECORDED PROPERTY DAMAGE	TOTAL RECORDED CROP DAMAGE
32	2	1	\$352,500	\$0

Source: National Climatic Data Center

Table 3-33 List Tornado History, Big Horn County

Location	Date	Time	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
County	6/3/1958	16:00	F2	0	0	\$25,000	\$0
County	6/26/1959	16:00	F2	1	1	\$2,500	\$0
County	7/28/1959	17:30	-	0	0	\$2,500	\$0
County	6/12/1962	16:00	F2	0	0	\$2,500	\$0
County	7/9/1962	16:00	F2	0	0	\$2,500	\$0
County	6/5/1964	15:10	-	0	0	\$25,000	\$0
County	7/24/1967	16:00	F2	0	0	\$2,500	\$0
County	6/20/1974	15:00	F1	0	0	\$2,500	\$0
County	6/20/1974	15:30	F1	0	0	\$2,500	\$0
County	7/20/1964	20:30	F1	0	0	\$2,500	\$0
County	7/4/1976	17:00	F1	0	0	\$0	\$0
County	6/18/1978	21:00	F1	0	0	\$25,000	\$0
County	7/4/1978	14:30	F2	0	1	\$250,000	\$0
County	7/24/1981	15:00	F1	0	0	\$0	\$0
County	5/3/1984	18:30	F0	0	0	\$2,500	\$0
County	8/2/1985	13:30	F3	0	0	\$0	\$0
County	6/18/1987	17:08	F0	0	0	\$0	\$0
County	7/12/1992	12:55	F0	0	0	\$0	\$0
Greybull	6/6/1997	16:58	F0	0	0	\$0	\$0
Basin	6/6/1997	17:00	F0	0	0	\$0	\$0
Greybull	6/6/1997	17:10	F1	0	0	\$0	\$0
Basin	6/13/1997	18:25	F0	0	0	\$0	\$0
Basin	6/13/1997	18:35	F0	0	0	\$0	\$0
Basin	7/24/1997	15:09	F0	0	0	\$0	\$0
Basin	6/26/2001	17:42	F0	0	0	\$0	\$0
Greybull	6/26/2001	17:56	F1	0	0	\$0	\$0
Byron	6/1/2005	12:29	F0	0	0	\$0	\$0
Lovell	6/1/2005	12:38	F0	0	0	\$0	\$0
Burlington	6/1/2005	12:40	F0	0	0	\$0	\$0
Rairden	6/1/2009	14:58	EF1	0	0	\$5,000	\$0
Emblem	8/12/2010	14:11	EF0	0	0	\$0	\$0
Cowley Airport	5/24/2014	13:36	EF0	0	0	\$0	\$0
TOTALS				1	2	\$352,500	\$0

Source: National Climatic Data Center

Frequency

Recorded tornadoes occurred during the months of May, June, July, and August, between 11 a.m. and 10 p.m. Historical ratings vary between F0 and F3 on the F-scale, or between EF-0 and EF-1 on the EF-scale. Most recorded tornadoes in the County are rated as F-0 or EF-0.

Two recorded injuries and one recorded fatality are attributed to these tornadoes. Cumulatively, the storms have caused \$352,000 in recorded property damage, and \$0 in recorded crop damage. Property

damage has been described as downed tree limbs and power outages, damage to homes, sheds and outbuildings to include roofs and chimneys, and downed timber on forest lands.

Figure 3-46 F-Scale Tornadoes By Rating.

Big Horn County 1958 - 2005.

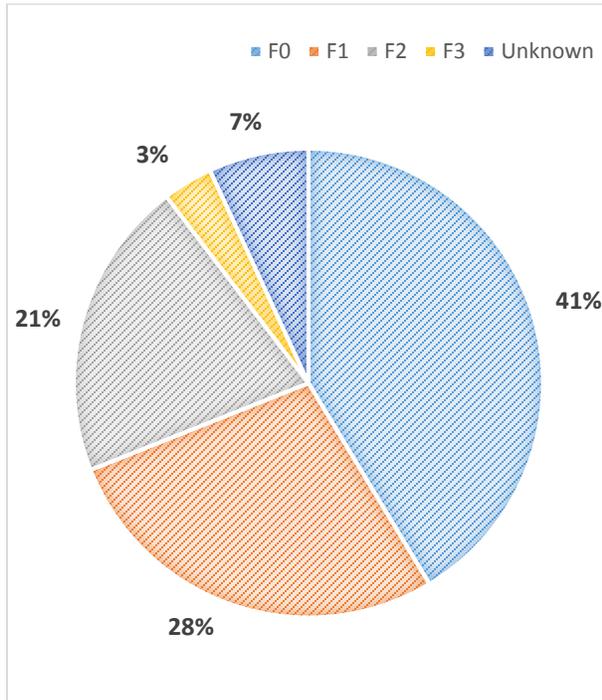


Figure 3-45 EF-Scale Tornadoes By Rating.

Big Horn County 2007 - 2014

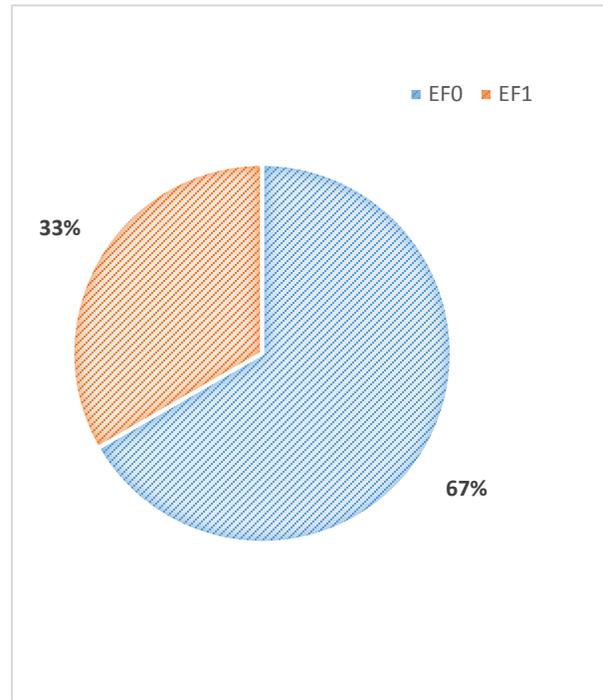


Figure 3-47 Historical Tornadoes by Month. Big Horn County 1959 - 2014

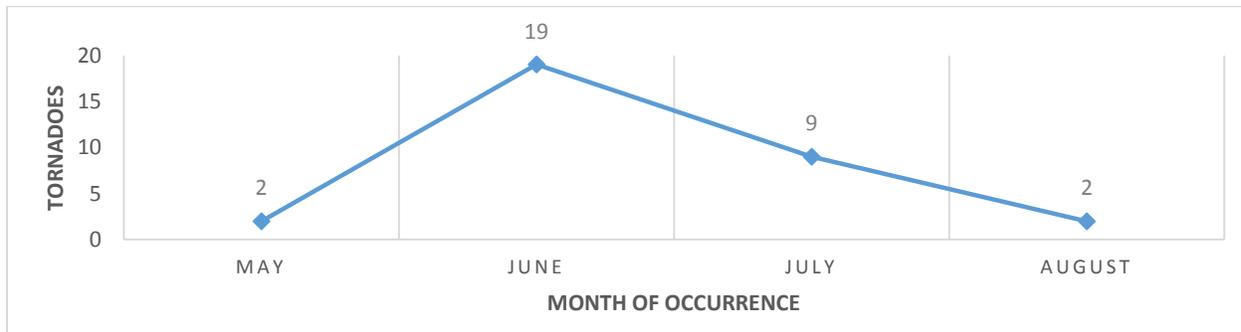
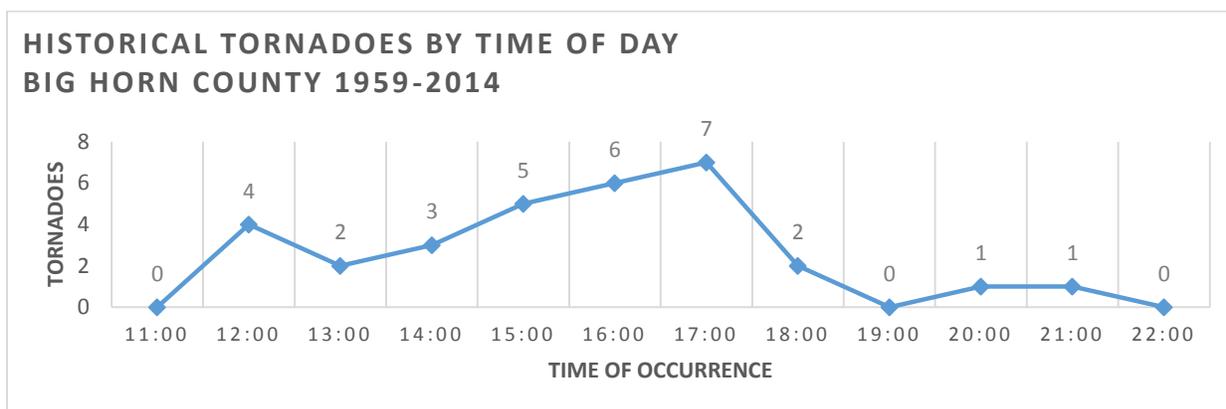


Figure 3-48 Historical Tornadoes by Time of Day. Big Horn County 1959 - 2014.



Most recorded tornadoes cause no recorded injuries, no recorded fatalities, and little to no damage to property (\$2,500 - \$25,000 range). However, there are a few notable exceptions in the County's tornado history.

On June 26, 1959, an F2 tornado 333 yards wide traveled 9.2 miles across the county, causing one direct fatality, one direct injury, and \$2,500 in property damage in 1959 dollars.

On July 4, 1978, an F2 tornado 200 yards wide traveled five miles northeast across the county, uprooting numerous trees in over 800 acres of forest near Greybull. One woman was injured in a camper as it was rolled over by winds. Damages to a lodge at a dude ranch were also noted. Cumulative damages in 1978 dollars were \$250,000 to property, and \$0 to crops.

Vulnerability

Because of its rural composition, people or property within the county have not had a history of being severely impacted during past tornado incidents. While the F-Scale ratings of historical tornadoes in Big Horn County are low, those ratings are based on recorded damage. Recorded damage may have been much more substantial if these tornadic events had impacted one of the nine cities or towns within Big Horn County, rather than timber, outlying range, and farm acreage.

Several tornadoes per year have been consistently documented as occurring somewhere in Big Horn County almost every year for the past 51 years. These events occur at random locations throughout the jurisdiction, and for that reason all structures, critical facilities, essential services, and populations are considered vulnerable.

Future Development

Any future development that is exposed and above ground will be vulnerable to a direct or indirect hit by a tornado. In order to better withstand impacts from tornadoes or other high wind events, future residential or commercial buildings built to code should be able to withstand wind speeds of at least 150 miles per hour.

Summary

Tornadoes are a credible threat, and will continue to occur in Big Horn County. Depending on a tornado's size, ferocity and path, it can cause devastating damage to people, property and infrastructure.

A tornado in the County occurs on average every 1.75 years in June, between noon and 5 p.m. The tornado is rated EF-0 or EF-1, and does between \$2,500 and \$25,000 worth of damage to property, though it mostly strikes rural areas. This is due more to chance than any environmental factor, however, as inhabited areas are statistically equally at risk of a tornado strike; the potential for injuries, fatalities and damage in these areas is much greater.

These tornadic events are often accompanied by flash flooding and severe hail, and present a serious triple threat (flood and hail threats are addressed separately in this document, under respective profiles).

Loss Potential: High

Population Impacted: Moderate

Probability: High

Jurisdictions at Risk: All

Wildfire

Narrative

Defined as a highly destructive fire or any instance of uncontrolled burning in grasslands, brush or woodlands, wildfire has encroached into urban interface situations as more people move closer to forest settings. Furthermore, the past 100 years of wildland fire suppression have led to heavy vegetation growth, greatly increasing the potential fuel-load for a wildfire to burn.

Fires have historically played a natural role on western landscapes. For example, some species of trees occupy sites following fire until replaced by more shade-tolerant species. In some cases regeneration of vegetation can be enhanced by fire. Fires may have positive or negative effects, or both, depending upon the resources at risk in the fire area.

Wildfires can occur at any time of the year, but are most likely to occur during the spring, summer or fall. Thunderstorms that contain lightning frequently start wildfires, but they can also be caused by humans. Wyoming's semi-arid climate and rural character make the state vulnerable to catastrophic wildland fires, which comprise more than 50% of all fires in Wyoming.

Although different reports, assessments, plans, and programs have been developed by organizations at all levels of government, interagency coordination has proven to be extremely effective. Today Wyoming wildland fires are managed and supported to varying extents through a cooperative effort by the following agencies:

- County and Local Fire Departments and Districts
- Wyoming Fire Academy
- Wyoming State Fire Marshall's Office
- Wyoming State Forestry Division
- Wyoming Office of Homeland Security (WOHS)
- Geospatial Multi-Agency Coordination (GeoMAC) Wildland Fire Support Maps

- National Parks Service (NPS) Fire Management Program
- US Fish and Wildlife Service Fire Management Program
- National Interagency Fire Center (NIFC)
- USDA Forest Service (USFS) Fire and Aviation Management
- US Bureau of Land Management

Past Occurrences

Big Horn County has a long history of wildfire, as a significant portion of the county is located in the Big Horn Mountains. One of the earliest recorded large fires was in the summer of 1876 when the Sioux Indians retreated into the Big Horn Mountains, setting fire to the land, burning an estimated 500,000 acres to keep the United States Army, under the command of General Crook, from pursuing them.

Historically, most significant fires in Big Horn County have occurred in the eastern region, in and around the foothills and higher elevations of the Bighorn Mountains (Bighorn National Forest, US Forest Service, see **Figure 3-49**).

More recently there have been several fires affecting over 1,000 acres, and many smaller fires throughout the county (see **Table 3-31**). Lightning starts many wildfires, but a number of structures in Big Horn County have burned as a result of out-of-control irrigation ditch burning to clear vegetation and debris for agricultural field operations (*Source: Wyoming Multi-Hazard Mitigation Plan 2014*).

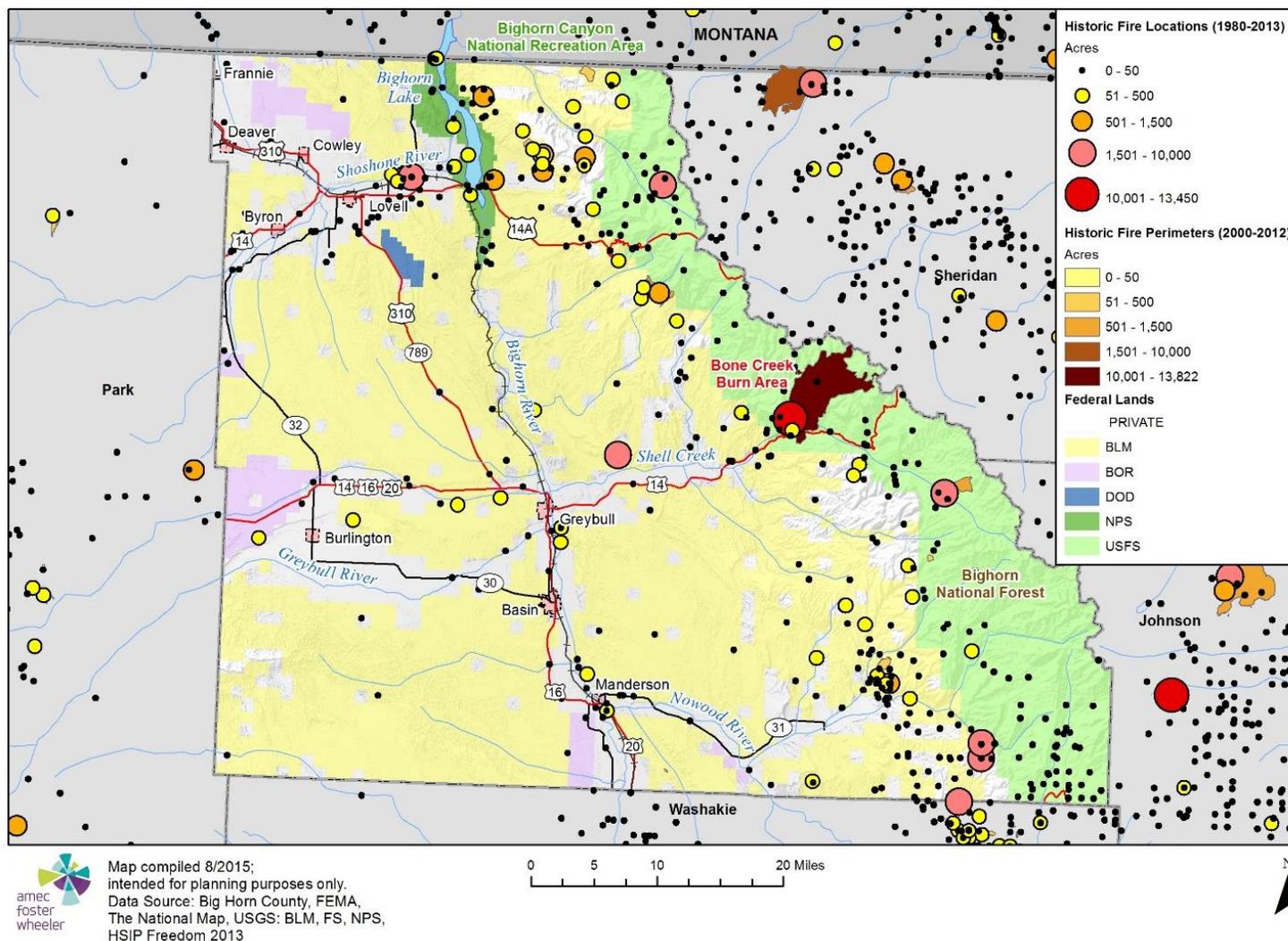
Table 3-34 Major (+1,000 Acres) Fires – Big Horn County 1975 to 2015

Name	Year	Acres Burned
Meadowlark Lake Fire	1975	1,900
Dorn Draw Fire	1988	1,514
Intermission Fire	1988	1,800
Little Mountain Fire	1997	1,083
Copper Fire	2003	2,500
Bone Creek Fire	2007	13,450
Reservoir Fire	2011	2,200

Sources: Big Horn County WRDS, HSIP Freedom

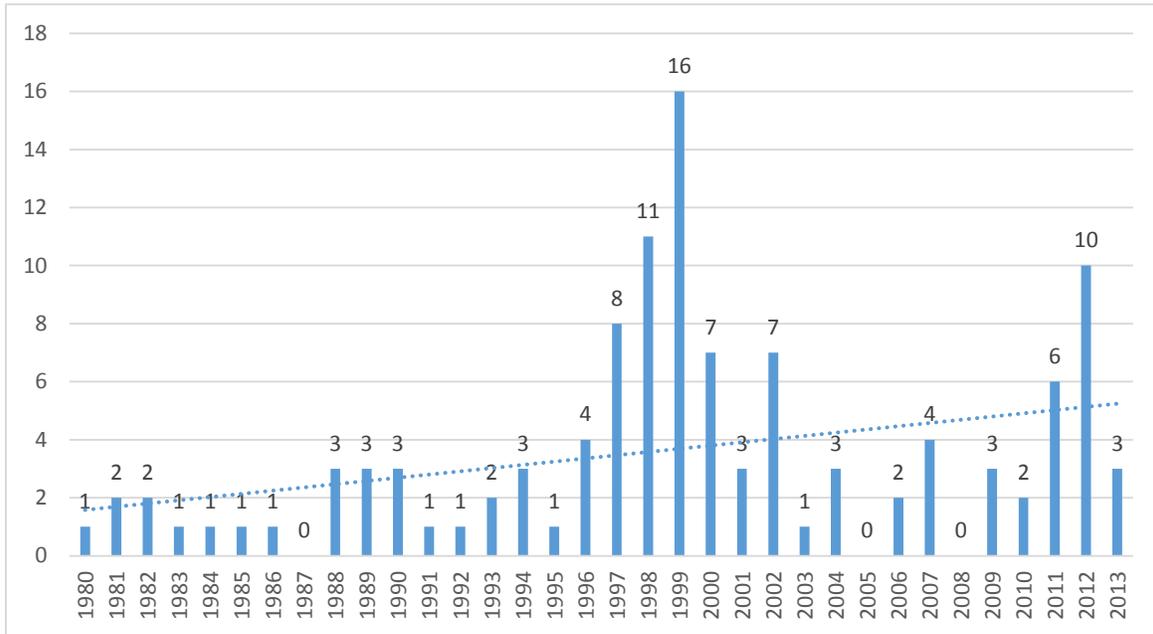
Figure 3-49 Big Horn County Wildfire Occurrences, 1980 - 2013

Big Horn County Wildfire Occurrences, 1980 - 2013



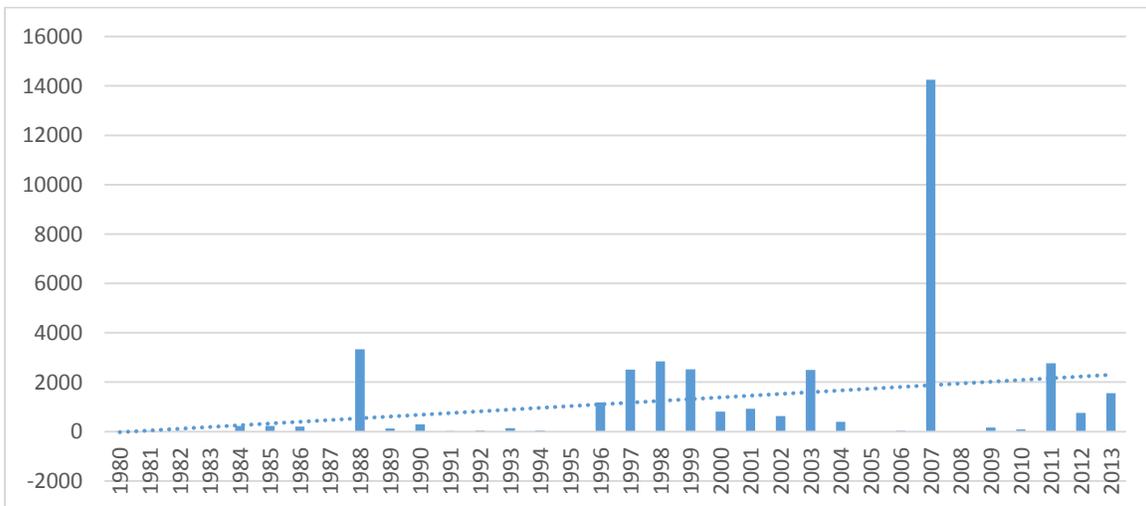
The clear upward trend in wildfires is a cause of concern as the wildland urban interface (WUI) increases while resources to manage and control wildfires remain limited. A total of 116 significant (more than 10-acre) fires have been recorded in Big Horn County since 1980 (see **Figure 3-50**). Total acres burned by year also show an upward trend, with over 38,000 acres burned in Big Horn County since 1980.

Figure 3-50 Number of Wildfires per Year – Big Horn County 1980 to 2013



Sources: Big Horn County WRDS, HSIP Freedom

Figure 3-51 Total Acres Burned by Year - Big Horn County 1980-2013



Sources: Big Horn County WRDS, HSIP Freedom

Impacts

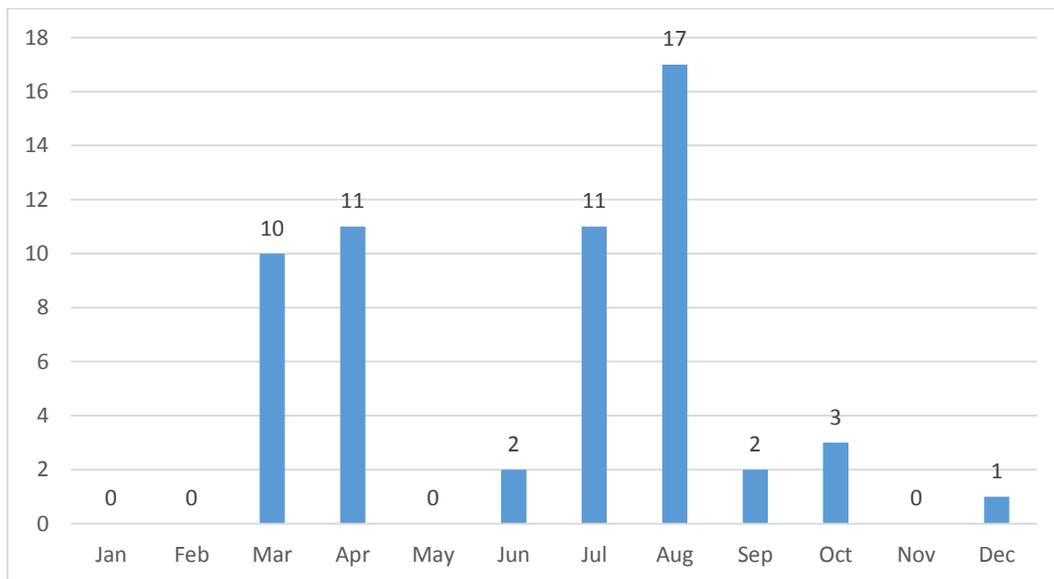
Potential impacts from wildland fires include the following:

- Loss of life (human, livestock, fish and wildlife)
- Loss of property
- Evacuations
- Transportation and business interruption
- Natural resource impacts to air and water quality

Frequency

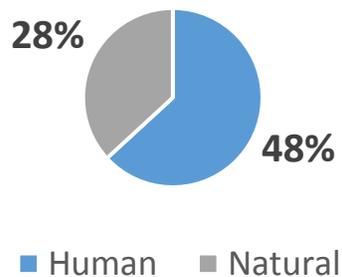
Fires in Big Horn County are likely to occur in either early spring or late summer, as the frequency distribution by month shows in **Figure 3-52**.

Figure 3-52 Significant Fires by Month – Big Horn County 1980 to 2013



Sources: Big Horn County WRDS, HSIP Freedom

Figure 3-53 Significant Fires by Ignition Source – Big Horn County 1980 to 2013



Sources: Big Horn County WRDS, HSIP Freedom

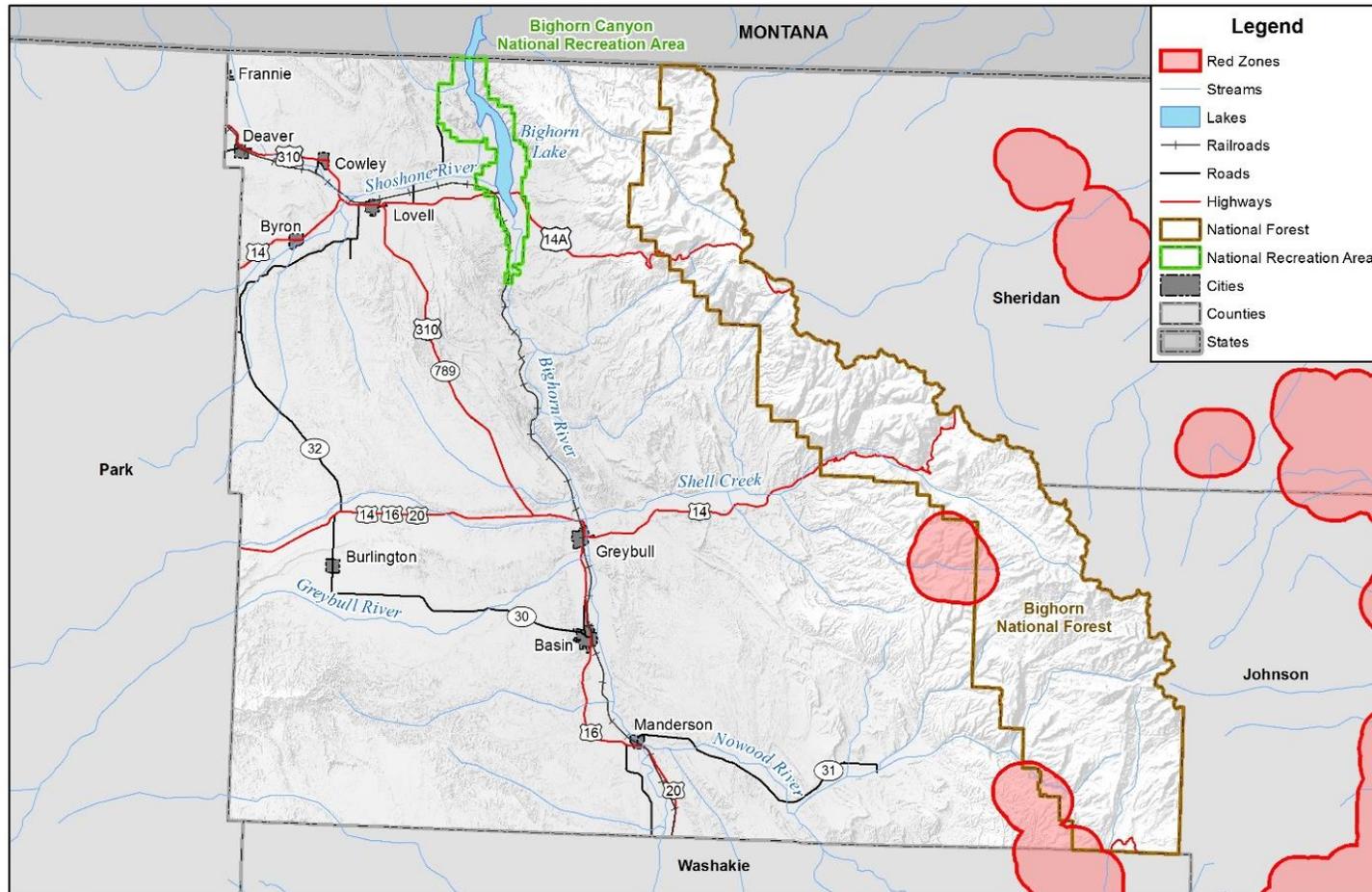
Additionally, wildfires in Big Horn County are more likely to be caused by humans, as 48% of the total fires in the county are attributable to non-natural causes (see **Figure 3-53**).

Vulnerability

Currently, the principal action plan for the State is the Wyoming Wildland Urban Interface Hazard Assessment produced by a joint venture of the Wyoming State Forestry Division, USFS, BLM, NPS, and other interested parties, with the BLM hosting the data. This is a Geographic Information System (GIS)-based mapping mission building on The Front Range Redzone Project in Colorado—the first fire-hazard mapping program of its kind. The Assessment maps fire hazard incorporating population density against slope, aspect, and fuels. With the mapping analysis evaluating areas of varying wildfire vulnerability, the final output is a Risk, Hazard, and Value (RHV) map displaying areas of concern (Redzones) for catastrophic wildland fires (see **Figure 3-54**). The Wyoming Wildland Urban Interface Hazard Assessment builds on the work of earlier hazard methodologies and provides new and updated data to further enhance accuracy and scale.

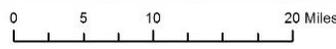
Figure 3-54 Big Horn County WUI Red Zones

Big Horn County WUI Red Zones



Legend

- Red Zones
- Streams
- Lakes
- Railroads
- Roads
- Highways
- National Forest
- National Recreation Area
- Cities
- Counties
- States



 Map compiled 8/2015;
intended for planning purposes only.
Data Source: Big Horn County, FEMA,
The National Map, Wyoming State Forestry Division

3-107

The wildland and wildland-urban interface areas in Wyoming are of most concern and are shown on the previous page. As of 2015, there are limited areas of concern located in the rural areas at the base of the Bighorn National Forest in the southeastern part of the county.

In 2005, the county commissioned Technical Forestry Services (TFS) to develop the Big Horn County Mountain Community Wildfire Protection Plan (Big Horn Co. Mountain CWPP) to assess wildfire vulnerability in terms of structures, fuels, water supply, routes of travel and current fire protection. This plan was limited in scope as it only focused on mountain communities (second homes, cabins, lodges, private inholdings, etc.) located in the Big Horn National Forest. The analysis performed involved a matrix comparison of a number of factors including: fire hazard rating, fire occurrence rating (frequency interval), community layout hazard rating, structure ignitability hazard rating and fire risk rating value. Based on this analysis, the following mountain communities—none of which are incorporated--fell within the 'high' fire risk rating:

- Deer Haven (41 structures)
- Granite Creek (16 structures)
- Sitting Bull (6 structures)
- Porcupine (20 structures)
- Shell Falls (2 structures)
- Ranger Creek (30 structures)
- West Tensleep (10 structures)
- Medicine Mountain (1 structure)

Source: Big Horn County Mountain CWPP 2005

In addition to the potential wildfire hazard in the Big Horn Mountains, the county is threaded with river drainages, creek bottoms, and irrigation canals that are overgrown with invasive species (Russian olive and tamarisk) adding both downfall and live growth fire load. The Big Horn River, Greybull River, and Shoshone River, as well as secondary waterways, are densely overgrown with these trees. Many of these waterways flow through population centers within the county. Along these rivers lie the towns of Lovell, Greybull, Basin, and Manderson. The unincorporated town of Shell is also at risk. Scattered between the towns and on the lesser watersheds are a number of ranches and farms that could also be affected by the threat of wildfire. A wildfire event in almost any one of these drainages could threaten critical structures and prompt evacuations.

To address these risks, the 2005 CWPP was amended in 2010 (Big Horn County CWPP Addendum 2010) to add the watersheds outside the National Forest and to include the rest of the county (see **Figure 3-55**). The Addendum also addressed actions to be taken to lessen the impact of wildfire in the study areas.

The Addendum ranked the communities in Big Horn County based on the following methodology:

- **Low** if within the next 10 years there is a probability of a fire that will not exceed 99.9 acres
- **Moderate** if within the next 10 years there is a probability of a fire that will be larger than 99.9 acres but will not exceed 299.9 acres

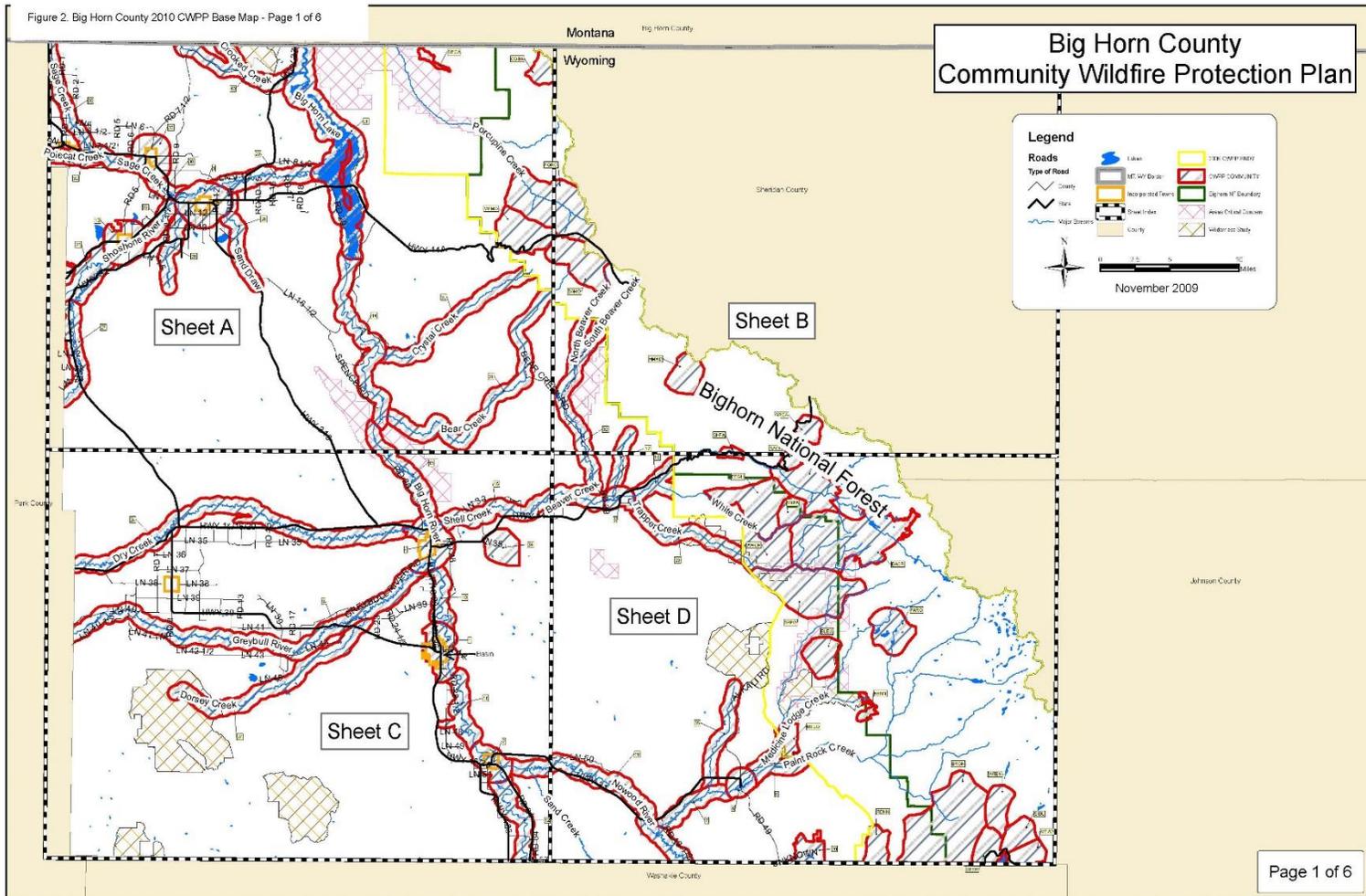
- **High** if within the next 10 years there is a probability of a fire that will be larger than 300 acres

The following communities received a **high** wildfire risk factor based on this methodology:

- Medicine Lodge Cr & Paintrock Cr (2005 CWPP boundary to Hyattville)
- Paintrock Creek (Hyattville to Nowood River confluence)
- Lovell (Town)
- Basin (Town)
- Manderson (Town)
- Greybull (Town)
- Shell (Town)
- Hyattville (Town)

Based on this analysis, there are approximately 33,379 acres in Big Horn County that have been rated as **high** wildfire risk.

Figure 3-55 Big Horn County Communities Wildfire Hazard Risk



3-110

Source: Big Horn County CWPP Addendum 2010

Potential Losses

According to the 2010 Big Horn County Future Land Use (FLU) Plan, Big Horn County contains two of the top 20 locations in Wyoming for seasonal homes. One is Meadow Lark Lake area in the Big Horn Mountains. The second location is the unincorporated town of Hyattville, showing 32% of housing units as seasonal in 2000 Census figures. Inside the county boundaries, 220 cabins in 25 different community groups ranging from just south of the Montana state line to the whole length of the county to the Washakie County line, reside throughout the Big Horn Mountains (*Source: Big Horn County Mountain CCWP*).

The Big Horn County Assessor's Office was not able to provide values on these privately owned structures on federal land. While all those structures are vulnerable to wildfire and other hazards, it is not possible to assign potential estimates or figures on financial vulnerability of personal property until more data becomes available.

Building exposure value, or structures that have potential to be involved in a wildland fire, is used as an indicator of the amount of potential losses a county could experience in a fire event.

No estimates were provided in the Big Horn County CWPP 2005 or 2010 Addendum regarding vulnerability to economic or service loss as it might relate to total taxable value of the county's commercial forest land, timber losses, loss or non-use of public grazing lands, or identification and valuation of critical facilities or infrastructure.

See discussion in Hazard Identification section for estimates on potential building and content losses by community.

The 'Local Risk Assessment' conducted in the 2014 Wyoming Multi Hazard Mitigation Plan found Big Horn County to be at **medium-high** risk of losses based on population impacted, probability of occurrence within the county, property impacted, and risk perceived by each county relative to wildland fire hazards.

Future Development

Population growth and increased areas of wildland/urban interface are prompting policy makers, fire management organizations, and mapping technology to respond to the mounting need to mitigate wildfires to protect the residents and visitors of Wyoming. Any future development built in wildfire-prone areas should institute basic wildfire mitigation features, for example adequate access, water supply, and appropriate building materials, in order to protect lives and property.

The wildland/urban interface (WUI) is a very popular building location, as shown by national trends. More and more homes are being built in the interface. Regulating growth in these areas will be a delicate balance between protecting private property rights and promoting public safety. Should Big Horn County begin to experience this type of growth, local government may wish to consider regulation of subdivision entrance/exit roads and bridges for the safety of property owners and fire personnel, building considerations pertaining to land on slopes greater than 25% (in consideration of access for fire protection of structures), and water supply requirements set forth to include ponds, access by apparatus, pumps, and backup generators. Such standards serve to protect residents and property, as well as emergency services personnel.

Summary

Because of the large percentage of land under the management of the federal government within the county (almost 80%), a commitment toward risk reduction and mitigation efforts between all levels of government will be an important factor in protecting populations, infrastructure, agricultural grazing lands, and timber.

With the Big Horn County Community Wildfire Protection Plan (CWPP) in place, countywide vulnerability to wildfire should be reduced. It is incumbent upon local officials and residents alike to recognize that the Russian olive infestations are largely on private lands, as most privately owned lands and populations reside along the numerous waterways in the county. Through federal funding programs there is currently a very strong effort underway in the Big Horn Basin to eradicate the invasive growth of tamarisk and Russian Olive trees along natural and man-made (irrigation ditch) waterways. Although this will help the situation, reduction is a long process and will require many years to complete, adequate funding, and a strong commitment by the communities to maintain. From a county standpoint, and perhaps as an ultimately more sustainable approach, priorities similar to the NRCS in Russian Olive control may be more effective. That approach is to gain control and propagate re-vegetation at higher reaches of each waterway, working downstream to the Big Horn River as the primary goal. This is to try to mitigate the downstream spread of invasive species by seed migration (seeds are viable for three years).

Wyoming continues to be proactive and strategic in addressing wildfire mitigation projects. The Preservation and Enhancement Fund, state legislative funding utilized for fuels mitigation and road maintenance projects in a competitive process, has expended, on average, \$99,000 annually over the past six (6) years for mitigation throughout the state, including Big Horn County. In addition, projects to mitigate wildfire hazards, specifically fuel removal, tree thinning, creation of wildfire defensible zones, and planting programs to spread fire resistant landscaping are occurring in 15 Wyoming counties, including Big Horn (Source: Wyoming Multi-Hazard Mitigation Plan 2014).

Loss Potential:	Medium
Population Impacted:	Medium
Probability:	High
Jurisdictions at Risk:	All

Severe Winter Weather

Narrative

Severe winter storms affect far more people in Wyoming than their summer counterparts, even though they are inherently less violent. This is because severe snowstorms are often so extensive that they usually require a day or two to cross and completely exit the state. Blizzard conditions bring the triple threat of heavy snowfall, strong winds, and low temperatures. Temperatures down to twenty below zero can occur, and wind chills to 90 below zero have been documented. Poor visibility and huge snowdrifts are major hazards caused by blowing snow. These storms disrupt work, make travel difficult

or impossible, isolate communities, kill large numbers of livestock, and sometimes leave human fatalities in their wake. (Source: Wyoming Multi-Hazard Mitigation Plan, 2014)

Most of the data used to compile this hazard analysis comes from the National Climatic Data Center (NCDC). Six different storm types were reviewed for this data, as defined below:

Blizzard – A winter storm which produces the following conditions for 3 hours or longer: (1) Sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than ¼ mile, on a widespread or localized basis.

Winter Storm – A winter weather event which has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements, on a widespread or localized basis. Normally, a winter storm would pose a threat to life or property.

Winter Weather – A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation but does not meet locally/regionally defined warning criteria.

Ice Storm – An ice storm is a type of winter storm characterized by freezing rain, also known as a glaze event or, in some parts of the United States, as a silver thaw. The U.S. National Weather Service defines an ice storm as a storm which results in the accumulation of at least 0.25-inch (6.4 mm) of ice on exposed surfaces.

Heavy Snow - A Heavy snow event is defined by snowfall rates of 4 inches (10 cm) or more in 12 hours, or 6 inches (15 cm) or more in 24 hours.

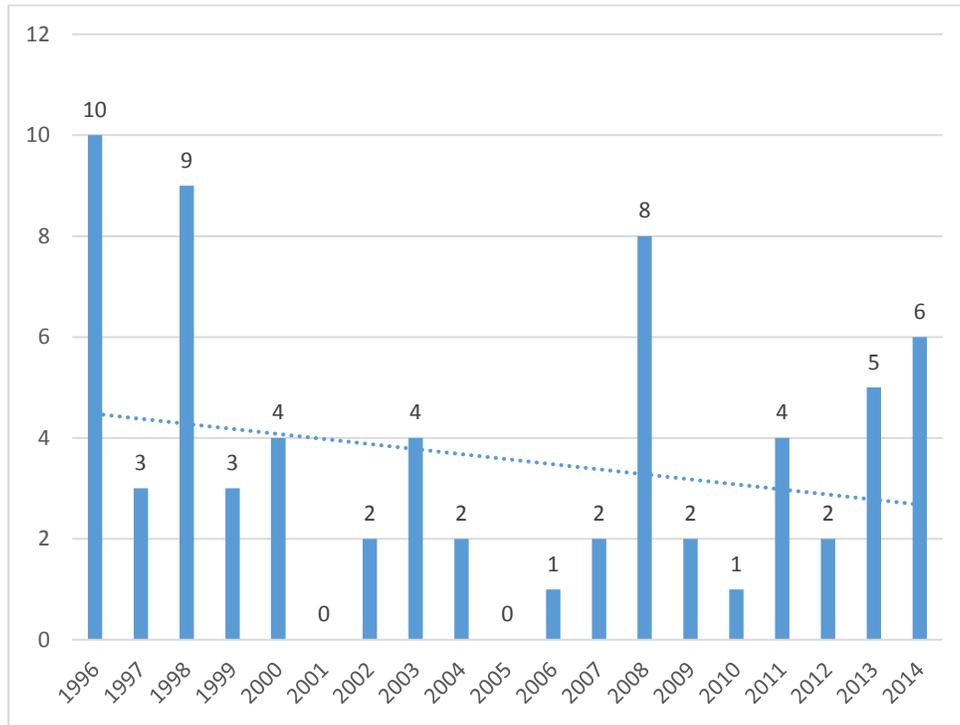
Extreme Cold/Windchill – Defined for northern American states as temperatures (with wind chill factor) at or below zero degrees Fahrenheit for 24 hours or longer.

Past Occurrences

When they do occur, winter storms usually cover a significant part of the state and as such are difficult to describe on a single county basis.

Historically, most reported impacts in Big Horn County during severe winter weather involved sub-zero temperatures and blowing snow, causing dangerous drifting and icy roads. County and municipal emergency responders and local hospitals in Big Horn County have found winter storms can critically impede emergency response, stretch local resources, and endanger responders. This is due to the county's shared jurisdictional highway responsibility with the Bighorn National Forest and the frequency of transportation related incidents as result of a winter storm. See **Figure 3-56** for a timeline of winter storm events in Big Horn County.

Figure 3-56 Severe Winter Weather Events by Year, Big Horn County 1996 to 2014



Summary: National Climatic Data Center (NCDC)

On September 20th, 2004 a passenger bus overturned on Hwy. 14, between Burgess Junction and Greybull, as a result of treacherous winter driving conditions in the Big Horn Mountains. The bus was carrying 43 passengers from Belgium, Australia, and Germany. Thirty-eight of the passengers went to South Big Horn Medical Center and were then sent on to hospitals in Worland, Powell, and Billings. The last passengers reached the hospital six hours from the time of the accident. Resources were stretched, communications were hampered, and roads were dangerous.

On May 7th, 2007 the Wyoming Highway Patrol, Basin Police, Big Horn County Search and Rescue, Greybull Police Department, and the Big Horn County Sheriff’s Department coordinated a rescue response to a location on U.S. Hwy 14 on Granite Pass, approximately two miles north of non-operating Antelope Butte Ski Area in the Bighorn National Forest. The storm resulted in vehicles being pushed off the road and stranded motorists. Law enforcement officials described conditions as “zero visibility with 30 to 40 mile per hour crosswinds.” The Basin PD used all-terrain vehicles to fight five-foot drifts and rescue people. Some motorists were stranded in vehicles for as long as six hours, including small children and elderly. Thirty-two people were brought off the mountain. Fourteen cars and six semi-trucks were left stranded until the next day.

Table 3-32 on the following page displays summary information regarding major winter weather impacting the region or the county since 1978. See **Appendix X** for a complete list of winter storm events.

Table 3-35 Summary of Winter Weather Events and Impacts, Big Horn County 1978 to 2015.

Total Number of Events	Total Injuries	Total Fatalities	Total Damage (Property and Agriculture)
74	26	3	\$4,010,223

Sources: The National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC) and SHELDUS

Impacts

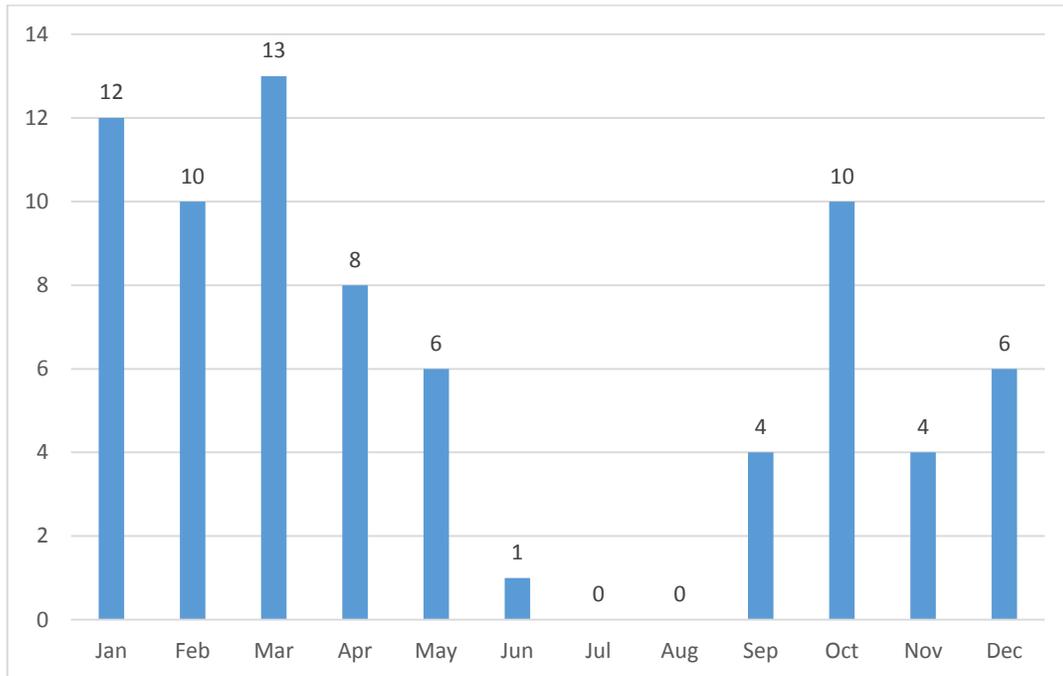
Impacts from severe winter weather include the following:

- Injury/loss of life
- Loss of utilities (gas, electric, water, wastewater, etc.)
- Business interruption
- Food shortages
- Medication shortages
- Transportation interruption
- Loss of emergency response access
- Stranded people (mine workers, locals, travelers)
- Increased risks to emergency responders
- Injuries associated with loss of utilities
- Loss of livestock
- Property loss and damage (vehicles)
- Damage to vegetation

Frequency

Data for severe winter weather in Big Horn County began to be recorded in 1996 at the National Climatic Data Center (NCDC). Since 1996, severe weather events in the county show a slight decline over this 18-year period with a current (2014) average of about three events per year.

Figure 3-57 Severe Winter Weather Events by Month, Big Horn County 1978 to 2015

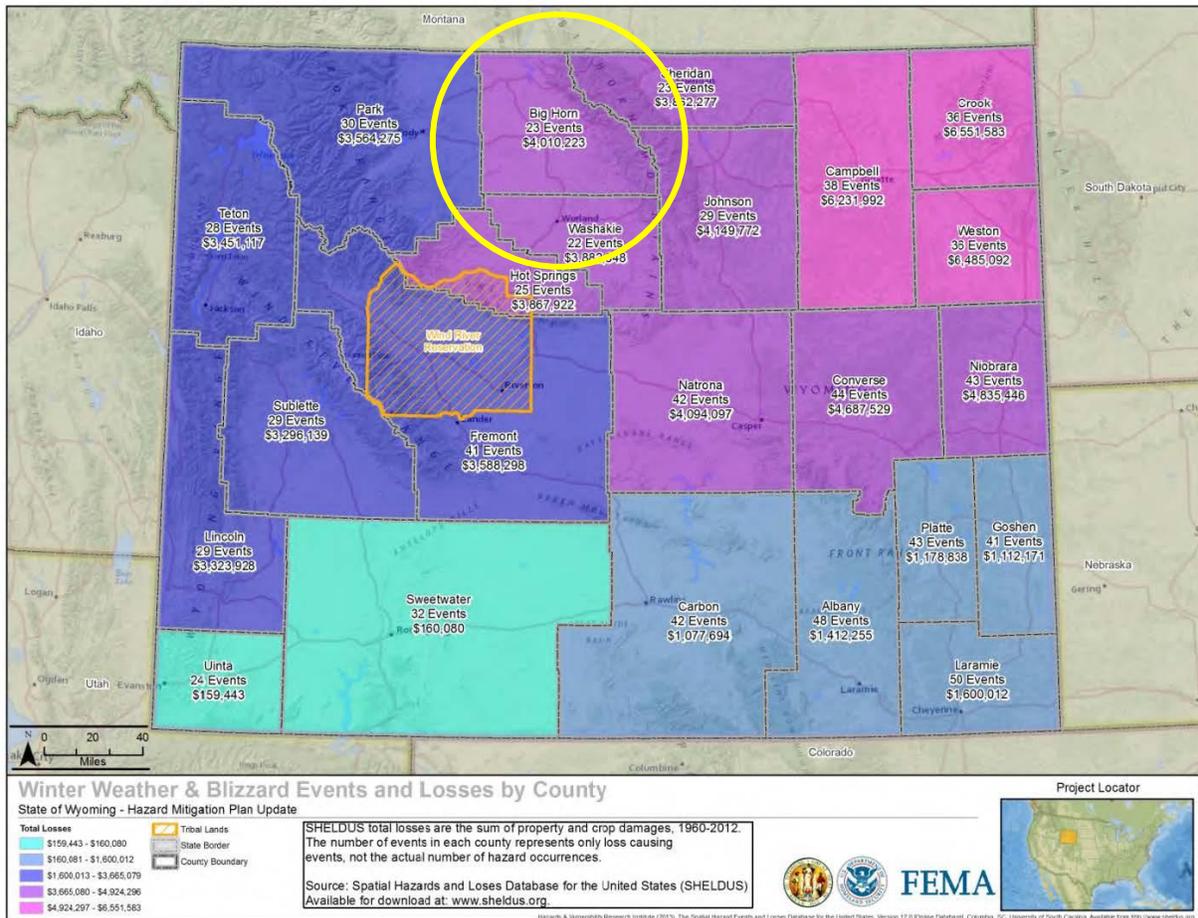


Sources: National Oceanic and Atmospheric Administration and the National Climatic Data Center

Vulnerability

According to the Spatial Hazards and Losses Database for the United States (SHELDUS) and the 2014 Wyoming Hazard Mitigation Plan, Big Horn County has suffered 23 damage causing winter weather events between 1960 and 2012, and a cumulative \$4,010,223 in damage as a result of these events (\$174,000/storm average).

Figure 3-58 Winter Weather Events and Losses, Wyoming 1960-2012. Big Horn County in Circle.



Source: Wyoming Multi Hazard Mitigation Plan, 2014

While severe weather can occur throughout winter months in Big Horn County, the major snow storms hit with greatest frequency in the early fall or during the spring in March, April and May. These springtime snowstorms are particularly destructive for ranchers when they coincide with calving and lambing seasons. Livestock losses are non-insurable.

The long-term financial impact to a jurisdiction’s economic base due to this type of hazard is hard to quantify, and can carry over for many years. Based on historic SHELDUS data, Big Horn County can expect a damaging winter weather event approximately once every 2.2 years with an average damage total of \$174,000. It is important to note that the actual impacts might be much greater than this number suggests, because of the effects on transportation and tourism, and because of loss of life and injuries (SHELDUS only reports insured losses).

At times when the lower elevations of the county remain comparatively unaffected during a winter event, response to transportation accidents and search and rescue operations within county boundaries extend well up into the Big Horn Mountains and are part of jurisdictional responsibilities. In addition to

stockmen, populations at most risk may be seasonal hunters and the growing number of snowmobile enthusiasts that lodge and recreate during the winter months throughout the Bighorn Mountains.

Better tracking and communication technology, including satellite, wireless internet, and cell communication has improved the way communities and emergency services obtain and share information. Towns and communities located throughout Big Horn County adequately cope with the types of severe winter weather that the county is susceptible to. Public utilities serving the area cite power outages of very short duration and significantly limited incidence of problems. *(Source: Big Horn Rural Electric Cooperative, Business Office)*

Future Development

Winter storms and blizzards are particularly impactful on people unfamiliar with the hazard. This makes those areas of increased development more vulnerable and subject to risk from the hazard, assuming a percentage of those moving to developing areas are unfamiliar with winter storms, specifically the need to make preparations ahead of the storm and the need to shelter-in-place through a blizzard or winter storm.

In areas of high development with an influx of families, education is critical to help prepare the community for the hazard. Other important mitigation efforts include advance warning through media and all-hazard radios. According to the U.S. Census Bureau, Big Horn County grew 2.2% in the years between 2010 and 2014 (a net gain of 262 residents) a nominal number considering the more rapid growth in other parts of Wyoming.

Summary

Severe winter weather may occur at any time in Big Horn County. Based on historic recurrence, Big Horn County can expect about three winter storm events per year with a very severe (damaging) winter storm once every two to three years. Losses have been historically low, with damage recorded primarily as agricultural.

Loss Potential:	Low
Population Impacted:	Low
Probability:	High
Jurisdictions at Risk:	All

Chapter 4 HAZARD MITIGATION GOALS AND PROJECTS

How the goals and projects were developed

This plan contains ten goals to help protect people and property in Big Horn County from natural and human-caused disasters. The Towns of Basin, Burlington, Byron, Cowley, Deaver, Frannie, Greybull, Lovell, and Manderson, and Big Horn County each have their own individual goal. Projects to address a range of hazards are listed under each of the goal statements. This allows each jurisdiction and the public to easily see and track the projects that will protect their citizens and property, and for which the jurisdiction will take the lead.

A total of 45 mitigation projects were identified as follows;

- Projects from the 2010 plan were reviewed for status and carried forward as appropriate,
- Big Horn County Emergency Management suggested project ideas,
- The contractor reviewed other local plans and brought forward needs and projects in those plans that related to hazard mitigation,
- Town/County staff suggested project ideas,
- The mayors for each community identified projects for their jurisdictions,
- The public was queried for project ideas.

The mayors for each community prioritized their own projects. The contractor did a preliminary prioritization of the county's projects. This was subsequently validated by the county commissioners. The project list was finalized and incorporated into the draft plan, then presented at a public meeting concurrent with the county commissioners' regular meeting in Basin when the draft was made available for public comment.

Project Costs

Costs for mitigation actions will fall within three ranges low (L), medium (M), or high (H.)

- Low Cost Projects: from \$0 to \$5,000
- Medium Cost Projects: from \$5,001 to \$50,000
- High Cost Projects: Over \$50,000

Project Priorities

Priority rankings of High, Medium, or Low were assigned. Generally, the jurisdictions will initiate and depending on the complexity, try to accomplish the High priority projects within two years, the time frame for Medium priority projects will be three to four years, and Low priority projects will be accomplished by the five-year anniversary of this plan--if feasible. Projects will be undertaken by the local jurisdictions dependent on the availability of resources—funding, staff, and/or technical expertise.

Projects were ranked informally by the mayors for their own towns, and by the contractor using the following criteria for the county.

- Level of risk to life and property posed by hazard which project addresses,
- Reasonableness of project and extent to which it provides a long-term solution,

- Potential consequences of not implementing,
- Support from the elected officials, and
- Compatibility with other plans and policies.

The county commissioners, the mayors and elected bodies have the ability to adopt additional plans, policies, ordinances and regulations as needed within state statutes.

Abbreviations for priorities and project types are provided at the end of the project tables.



Project Types

A range of types of mitigation actions or projects were identified by the participants in the planning process. Examples of a range of types of projects from other counties were provided to the LEPC and mayors to illustrate a variety of project types and to stimulate ideas for each local jurisdiction. This was done to assist the elected officials, LEPC, and other participants in understanding the types of projects that could logically be included in a hazard mitigation plan.

Table 4-4-1: Project Types by Goal/Jurisdiction

Goal	Project Types
Goal One—Big Horn County	Education and Awareness, Emergency Services, Natural Resource Protection, Prevention, Property Protection, Structural
Goal Two—Basin	Emergency Services, Prevention, Property Protection
Goal Four—Burlington	Coordination, Prevention, Property Protection
Goal Three—Byron	Coordination, Education and Awareness, Natural Resource Protection, Prevention, Structural
Goal Five—Cowley	Emergency Response, Prevention, Property Protection, Structural
Goal Six—Deaver	Coordination, Education and Awareness, Emergency Response, Natural Resource Protection, Prevention, Property Protection
Goal Seven—Frannie	Education and Awareness, Emergency Response, Prevention, Structural
Goal Eight—Greybull	Natural Resource Protection, Prevention, Property Protection, Structural
Goal Nine—Lovell	Prevention, Structural
Goal Ten--Manderson	Education and Awareness, Prevention, Property Protection

GOAL ONE: Mitigate natural and human caused hazards to reduce the potential for property loss or damage, injury and loss of life for Big Horn County.

Table 4-2 Goal One Projects: Big Horn County

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
1.1	Conduct public education to increase cell # sign-ups in notification system	Improve notification. Prevent loss of life.	M	L	EA	All hazards	County Emergency Management
1.2	Upgrade communications system in Sheriff's Office	Better notification, better response. Prevent loss of lives.	H	H	C, EA	All hazards	County Commissioners, Sheriff
1.3	Purchase enterprise GIS system	Better mapping for planning and response	M	M	C, EA, P	All hazards	County Commissioners, Sheriff, Planner
1.4	Conduct an exercise focused on evacuation of people unable to self-evacuate	More proficient evacuation of UTSEs if needed				All hazards	County Emergency Management
1.5	Continue program to reduce non-native vegetation in the Big Horn River floodplain	Reduce potential for floods, property loss and damage, potential for fire	H	M	C, P, PP	Flood, Wildlife Fire	County Emergency Management, Sheriff, Responders
1.6	Work with state to refill County prevention position	Reduce potential for wildland fire property loss	H	M	C, P, PP	Wildland Fire	County Commissioners, Fire Warden
1.7	Identify/construct facilities to house response equipment across the county	Protect equipment, maintain response capacity	H	M	C, P, PP	All hazards	County Emergency Management, Sheriff
1.8	Coordinate with churches to establish shelters	Prevent loss of life	M	L	C, P	All hazards	County Emergency Management, Red Cross
1.9	Develop briefing paper for elected officials on natural hazards in the county	Educate newly elected officials on hazards	L	L	C, P	All hazards	County Emergency Management

GOAL TWO: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Basin.

Table 4-3 Goal Two Projects: Town of Basin

	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
2.1	Clear gulches of dead vegetation	Reduce fire danger, potential for property loss	L	L	P, PP	Fire	Town of Basin
2.2	Remove dead and dying tree limbs	Reduce potential for injury and damage from wind.	L	L	PP	Wind	Town of Basin
2.3	Equip and train for services needed	Provide response to emergencies as needed	L	M	ER	All hazards	Town of Basin

GOAL THREE: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Burlington.

Table 4-4 Goal Three Projects: Town of Burlington

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
3.1	Work with County to fund shared GIS position	Better hazard mapping to prevent future vulnerability	H	M	C, P	All hazards	Town of Burlington
3.2	Clean-up of debris around town	Reduce potential for wind damage, injury and fire	H	L	P, PP	Wind, Fire	Town of Burlington
3.3	Mow/treat weeds within community	Reduce potential for wildland fire	H	M	P	Fire	Town of Burlington
3.4	Educate population on tornado shelter locations	Improve personal safety	H	L	P	Tornado, Wind	Town of Burlington

GOAL FOUR: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Byron.

Table 4-5 Goal Four Projects: Town of Byron

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
4.1	Investigate feasibility of joining NFIP	Determine advisability of entering the NFIP.	M	L	C	Flood	Town of Byron
4.2	Investigate and install emergency alert system	Increase warning time, reduce impacts	H	M	ER	All hazards	Town of Byron
4.3	Send fall letter to prepare for cold weather travel	Reduce potential for accidents, injury loss of life	M	L	EA	Winter Weather	Town of Byron
4.4	Identify shelter location	Be prepared to offer shelter	H	L	ER	All hazards	Town of Byron
4.5	Identify/address potential lagoon discharge to river	Reduce potential for natural resource damage	H	M	NRP, P	Flood	Town of Byron

GOAL FIVE: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Cowley.

Table 4-6 Goal Five Projects: Town of Cowley

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
5.1	Complete North drain install project	Reduce potential for flooding, property damage	H	M	P, PP	Flood	Town of Cowley
5.2	Reclaim three drains from old drainage district	Reduce potential for flooding, property damage	M	M	P, PP	Flood	Town of Cowley
5.3	Strengthen emergency response—recruit, update	Reduce potential for loss of life and property	M	M	ER	All hazards	Town of Cowley
5.4	Enhance shelter facility with power and better kitchen	Improve ability to shelter population	L	M	ER, S	All hazards	Town of Cowley

GOAL SIX: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Deaver.

Table 4-7 Goal Six Projects: Town of Deaver

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
6.1	Identify, supply shelter	Provide safe space	H	L	ER	All hazards	Town of Deaver
6.2	Work with power company to ensure prompt response	Quick restoration of electricity	H	L	C	Lightning	Town of Deaver
6.3	Educate the public on travel during severe weather.	Prevent injury and loss of life	H	L	EA	All weather hazards	Town of Deaver
6.4	Update floodplain mapping	Prevent property damage	L	M	P, NRP, PP	Flood	Town of Deaver
6.5	Revisit participation in NFIP	Determine advisability of continuing participation.	L	L	C	Flood	Town of Deaver

GOAL SEVEN: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Frannie.

Table 4-8 Goal Seven Projects: Town of Frannie

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
7.1	Do a mailing explaining the different siren tones	Increase warning time, reduce impacts	M	L	ER	All hazards	Town of Frannie
7.2	Use water bill to educate people about seasonal weather hazards	Reduce potential for accidents, injury and loss of life	H	L	EA	All weather hazards	Town of Frannie
7.3	Keep weeds and grasses sprayed and mowed	Reduce potential for wildland fire, loss of property	M	L	P	Fire	Town of Frannie
7.4	Address abandoned property	Reduce potential for injury and loss of life	H	L	P, S	Wind, Fire	Town of Frannie

GOAL EIGHT: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Greybull.

Table 4-9 Goal Eight Projects: Greybull

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
8.1	Upgrade drainage infra.on 6 th Street to prevent ponding	Reduce potential for flood damage	H	M	P, PP	Flood	Town of Greybull
8.2	Work with county to remove non-native vegetation in/along Big Horn River	Reduce potential for flood damage to property	M	M	NRP, P, PP	Flood, Fire	Town of Greybull
8.3	Promote domestic water conservation (per land plan)	Reduce drought impacts	M	L	NRP, P	Drought	Town of Greybull
8.4	Recertify Greybull levee	Protect town from flood	H	M	S, P, PP	Flood	Town of Greybull

4-9

GOAL NINE: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Lovell.

Table 4-10 Goal Nine Projects: Town of Lovell

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
9.1	Address Road 12 drain issue	Reduce basement flooding	M	M	S, P	Flood	Town of Lovell
9.2	Research and implement warning/notification system	Increase warning time, reduce impacts	L	M	P	All hazards	Town of Lovell
9.3	Continue effort to shore up sewer lagoon	Prevent contamination of river	M	M	S	Flood	Town of Lovell

GOAL TEN: Mitigate natural and human-caused hazards to reduce the potential for property loss or damage, injury and loss of life for Town of Manderson.

Table 4-11 Goal Ten Projects: Town of Manderson

#	Description	Benefits	Priority	Cost	Type	Hazard	Responsible agency for implementation, coord.
10.1	Educate residents about benefits of flood insurance	Enhanced protection and recovery from flooding	H	L	EA	Flood	Town of Manderson
10.2	Evaluate and address town drainage issues	Prevent flood damage	H	M	P, PP	Flood	Town of Manderson
10.3	Use water bills to remind people to prepare for severe weather	Reduce chance of injury and death from severe weather	M	L	EA	All Weather Hazards	Town of Manderson
10.4	Check into obtaining warning/notification software	Increase warning time, reduce impacts	M	M	EA, P	All	Town of Manderson

Abbreviations used in table

Project Types

- Coordination
- EA: Education and Awareness
- ER: Emergency Response
- NRP: Natural Resource Protection
- P: Prevention
- PP: Property Protection
- S: Structural

Priorities

H: High

M: Medium

L: Low

Hazards

- A: Avalanche
- B: Blizzards and Winter Storms
- D: Dam Failure
- E: Earthquake
- F: Flood
- H: Hail
- Ha: Hazmat
- L: Landslide
- Li: Lightning
- T: Terrorism
- To: Tornado
- W: Wildland Fire

Action Plan

The above projects will be worked on pending adequate resources (personnel and funding.) Some of the projects are ongoing or already underway—for example treatment of Russian Olive in floodplain areas. Other projects will be selected based on priority, availability of resources, timeliness, and the opportunity to complete.

The initial priorities assigned with this update are expected to shift somewhat over the course of the five-year planning period based on the needs of the individual jurisdictions and resources available to them and perhaps in response to a significant disaster or new hazard.

For projects not requiring outside expertise or funding and located exclusively within one local jurisdiction, the Town or County may select and proceed with projects they wish to complete.

As described in Chapter 5, the County Emergency Management Coordinator will place the PDM Plan on the LEPC agenda once annually. Each of the signatories to the plan has the opportunity—and does have—representation on the LEPC. The Coordinator and LEPC will discuss the list of projects in the plan to see if any changes in overall priorities are desired. The discussion will include any direction or emphases from the local governing bodies, WOHS, or FEMA; incidents which have occurred during the previous year that could affect mitigation project priorities; and local resources and funding available to accomplish projects. The County Commissioners may direct, or the LEPC may hold a vote, if and when they wish to pursue grant funds for work on mitigation projects.

Use of Cost-Benefit Analysis

In cases where grants are being sought, the applicant will complete a cost/benefit analysis before submitting any funding requests.

The county can also make available information regarding the STAPLEE method for evaluating and prioritizing mitigation actions. The method looks at social, technical, administrative, political, legal, economic, and environmental aspects of projects to weigh pros and cons of implementing specific projects. Information on this analysis method can be found in FEMA's Developing the Mitigation Plan (FEMA 386-3).

The jurisdictions applying for funds will need to consider compatibility with goals and objectives in the state's plan, compatibility with goals in this plan, impacts of the project on other jurisdictions, costs and benefits, funding priorities, and compatibility with other plans and programs—when selecting projects to implement.

Existing Authorities, Policies, Programs and Resources for Implementation

Projects in this plan will be accomplished in one of three ways; under county leadership either by the Emergency Management Coordinator, or volunteers (firefighters, emergency medical personnel, and elected officials); by Town personnel, or through contractors funded by grants.

The Emergency Management Department currently has one fulltime coordinator which is vacant as of the publication of this draft plan. Big Horn County Commissioners have advertised and intend to fill the position immediately.

Communities in Wyoming do have statutory authority to engage in planning. Big Horn County does have a planner on staff who coordinates with the communities within limited available resources. However, the communities in Big Horn County are small in population and have not retained professional planning staff. Some communities do have land use plans and zoning—prepared by contracted planners. Because populations have remained relatively stable over time, planning for new development has not been a priority. Local elected officials are ultimately responsible for public health and safety in their communities and due to lack of staff, they have largely assumed this responsibility by virtue of their elected positions.

Chapter 5 PLAN MONITORING, MAINTENANCE, REVISION AND COORDINATION

Responsible Parties

The Big Horn County Commissioners in cooperation with the Mayors of the Towns of Basin, Burlington, Byron, Cowley, Deaver, Frannie, Greybull, Lovell, and Manderson are responsible for ensuring that the PDM Plan is kept current. With adoption of the plan, the responsible officials designate the Big Horn County Emergency Management Coordinator—with the assistance of the Local Emergency Planning Committee—as the lead in accomplishing the on-going responsibilities.

Plan Monitoring and Evaluation

There are two types of plan monitoring and evaluation; effectiveness and implementation. Effectiveness monitoring looks at whether the plan has addressed needed items. Implementation monitoring looks at whether projects in the plan are being undertaken and completed. The county's Emergency Management Coordinator with the help of the LEPC will ask the following questions to evaluate the effectiveness and implementation of the plan.

- Have any potential hazards developed that were not addressed in the plan?
- Have any natural disasters occurred that were not addressed in the plan?
- Has any unanticipated development occurred that is vulnerable to hazards?
- Are there any additional mitigation ideas that need to be incorporated?
- Have projects been initiated and/or completed?
- What are the barriers to completing projects identified in the plan?

Each spring following the year of adoption of this plan, the LEPC will meet to ask and answer the questions listed above. The discussion will be documented so that when the plan is revised, the findings of the monitoring can be incorporated into the revision. The Big Horn County Emergency Management Coordinator will request that the LEPC Chairman place these items on the LEPC agenda for this purpose.

Plan Update Review Triggers

Any of the following three situations could trigger a review and update of the plan.

- Occurrence of a major natural disaster in or near Big Horn County,
- Passage of five years, or
- Change in state or federal regulations which must be complied with.

Revision Procedures

Should a major natural disaster occur in Big Horn County, the LEPC shall meet following the disaster to determine whether a review of the PDM Plan is warranted. In the absence of a major natural disaster, the five-year review will take place during the six-month period preceding the FEMA approval anniversary date.

Following proper public notice, the Big Horn County Emergency Management Coordinator will request the LEPC Chairman to convene the LEPC and with their assistance and/or the assistance of the WOHS or a contractor as determined necessary, carry out the following tasks;

1. Review the Hazard Mitigation Plan Review Tool comments from WOHS and FEMA during their most recent review of the plan (2015.)
2. Examine and revise the risk assessment data as needed to ensure it is current.
3. Update the mitigation strategies to incorporate completion of actions and add any needed strategies or projects.
4. Identify problems that may be hindering or affecting implementation of the plan, and recommend actions for resolving those problems.
5. Recommend any necessary revisions to the PDM Plan.
6. Comply with all applicable regulations and statutes.

So that the public will have an opportunity to become involved in and comment on the revision, at least one public meeting will be scheduled in Basin, Greybull, or Lovell. This meeting may occur as a regularly-scheduled county commissioner meeting. The meeting will be publicized.

Forty-five days prior to the five-year anniversary date, a final draft of the revised plan will be submitted to the WOHS.

An annual review will be conducted by the Big Horn County Emergency Management Coordinator for the purpose of summarizing the status and effectiveness of the plan mitigation goals or strategies.

Incorporation into Other Plans

Local land use plans for those communities that have them were reviewed for the preparation of this PDM Plan update. The incorporated communities in Big Horn County are small and do not have professional planning resources. The plans that do exist were prepared by the use of contracted services.

The County has a planner and planning department. The county planner works with the communities as resources allow. The county planner and county sheriff (as the supervisor of the Emergency Management Coordinator) were heavily involved in the update of this plan. Additionally, one of the current county commissioners was previously the County Emergency Management Coordinator and is familiar with the contents of the PDM plan.

None of the communities indicated the intent to prepare a new plan or revise an existing plan during in the 5-year PDM planning horizon. However, if this changes, the county planner will be aware of such efforts and along with the County Emergency Management Coordinator can ensure that the contents of this plan are considered as appropriate in other planning efforts.

Opportunity for Continued Public Involvement

In addition to the procedures for including the public in the five-year updates described above, to ensure the public will have the opportunity to remain involved in the implementation and annual updates of the plan, the following will take place.

- 1) The Big Horn County Emergency Management Coordinator will provide a brief annual summary report to the county commissioners on what has been accomplished during the previous year and to receive guidance from the elected officials on their priorities for the coming year.
- 2) Each year following a spring LEPC meeting at which the status of the plan is reviewed, Emergency Management will make information available to the public on the accomplishments of the previous year and allow comment for any revisions.

APPENDICES

A: Big Horn County Flood Events.....2

B: Big Horn County Wind Events.....8

C: Big Horn County Wildfire Events.....11

D: Big Horn County Winter Storm Events.....16

E: Status of 2010 Mitigation Actions.....20

F: Planning Process Documentation.....22

G: Resolutions of Adoption.....69

H: County Profile.....80

APPENDIX A: BIG HORN COUNTY FLOOD EVENTS

List of Flood Events in Big Horn County, 1928 to 2014

Location	Date	Total Damage Estimate (Property and Crops)	Narrative
Manderson	9/1/1928		Cloud burst caused flooding resulting in the town inundated by water.
Greybull, Big Horn River Cold Creek Area	3/9/1929	\$235,000	Ice jam (Eight Mile Gorge) in a shallow stretch of river resulting in the river overflowing its banks and causing flooding. The flooding covered streets with up to 4 feet of water; 412 homes and 93 buildings damaged (\$150,000 – \$200,000), 295 families affected (\$9,067.77). Burlington Northern tracks washed out north of Greybull. Midwest oil company (\$15,000); Businessmen stock losses (\$5,000 to \$10,000); Fire damage (gas left burning) Fire Department couldn't get out. Loss of livestock. Horses sheep, hogs, poultry. Response came from local committees, Red Cross, county commissioners, and state aid.
Big Horn Canyon	04/15/37		Locally heavy rains, accompanied by high temperatures, which caused rapidly melting snow on the 15th, caused considerable flood damage. In the Big Horn Canyon, near the Montana line, washouts occurred and back water left the tracks covered with debris.
Big Horn Basin Near the Montana Line	5/30/1941		Heavy storm resulting in considerable damage to crops both by hail and flood waters, as well as damage to bridges.
Big Horn Basin, Greybull, Manderson, Washakie, Worland	2/18/1948		An early break-up of the ice in the Big Horn River was caused by Chinook winds that melted the snow in the lower elevations. This occurred about the 18th of the month and resulted in considerable flooding in the Big Horn Basin due to ice jams from Worland northward to the Montana-Wyoming border. At Worland the water reached its highest level since 1920. No lives were lost as a result of the flood although some loss of livestock and feed was reported. One bridge was washed out and others slightly damaged as well as considerable damage to property near the river. Minor damage from floodwaters was also reported at Manderson, Greybull and Basin.
Manderson, Nowood River	2/19/1948		Ice jam caused flooding resulting in the town covered by floodwaters.

List of Flood Events in Big Horn County, 1928 to 2014 (cont.)

Location	Date	Total Damage Estimate (Property and Crops)	Narrative
Otto	5/12/1957		Near Otto in the afternoon of the 12th heavy rain produced a flash flood of the Greybull River; which damaged an auto, several houses, home furnishings, water supply systems, and other appurtenances. One ranch lost 150 or more sheep.
Greybull, Burlington, Otto	6/9/1957		The foothills of the Rocky Mountains above Meeteetse were covered by the heaviest snow pack in years. The warm weather on the 4th and 5th which caused rapid melting of snow at higher levels along the northeastern slopes of the Continental Divide, was followed by heavy and sudden downpours of rain and hail. This produced a rapid rise of the Greybull River which flooded twice during the period 5th to 9th. Normally a small stream, the river rose 6 feet above its usual depth for the time of the year, spread to about one-half mile width and extended approximately 50 miles from Meeteetse to the town of Greybull on the Big Horn River. In the vicinities of Burlington and Otto several homes were vacated. Many farms and pasturelands were inundated. Two or more small bridges were destroyed and a power line damaged.
Greybull, Greybull River	6/8/1957		Flooding caused by three successive very warm days followed by heavy cloud burst forced residents to leave homes and washed out county bridges. There was response from the county sheriff. Long-time residents stated that water was highest in 30 to 40 years. Douglas Creek near Fox Park had a discharge of 1630 CFS.
Greybull, Greybull River	6/11/1957		Afternoon cloudburst. Channel blocked south of Greybull by June 8th flood which carried dirt and silt into parts of river, bed choked with weeds during drought of past several years. This caused heavy crop damage, six families forced out, and loss of poultry and livestock. Aid was provided by volunteers and county officers.
Big Horn Basin	6/9/1960	\$24,750	Heavy scattered rainstorm during the evening caused flooding and damaged crops. The flooding washed out bridges and damaged roads in several areas.

List of Flood Events in Big Horn County, 1928 to 2014 (cont.)

Location	Date	Total Damage Estimate (Property and Crops)	Narrative
Manderson, Big Horn River	2/15/62		An ice jam caused the town to be covered by flood waters.
Northern Big Horn Basin	7/13/1962	\$2,475,000	Severe thunderstorms with one funnel cloud aloft and heavy rains of 4 to 6 inches with 6 to 9 inches of hail and high gusty winds caused widespread damage and flash flooding in the Cowley, Byron, Penrose and Lovell area.
Big Horn Mountains	6/15/1963		Flooding from heavy rains caused damage to homes, equipment, crops, irrigation, canals, roads, and bridges.
Lovell, Emblem, Big Horn River	5/4/1978	\$225,000	Heavy rains caused widespread flooding between Lovell and Emblem. Several homes were damaged with some damage extensive.
Beaver Creek	8/20/1979	\$225,000	Heavy rain in the Big Horn Mountain area caused Beaver creek to flood damaging sheds, fences, farm equipment, and ruining hay and cornfields, as well as crops in storage.
Basin	6/13/1997	\$91,000	Two very brief tornado touchdowns south of Basin. Path lengths and widths estimated. Extensive flash flooding in Basin. A flash flood came down the highway and flooded the whole town.
10 mi. NE Lovell Crooked Creek	6/13/1998		Flash flooding on Crooked Creek, near Horseshoe Bend area of Big Horn Canyon National Recreation Area. Mud slides across Highway 37. Also, Lovell canal overflowed. Caused by slow moving thunderstorms producing heavy rains.
5 miles NE of Hyatsville	7/3/1998		Medicine Lodge creek at Taylor Park Campground.
Basin	4/2/2000	\$50,000	The canal above the town of Basin broke, causing about \$50,000.00 in damages to the school and several residences.
Greybull	6/1/2002		Rainfall amounts of 1.25 to 1.75 inches occurred in 20 minutes. There were six basements flooded and a business was flooded. Two cars were washed off

List of Flood Events in Big Horn County, 1928 to 2014 (cont.)

Location	Date	Total Damage Estimate (Property and Crops)	Narrative
Manderson	6/10/2011	\$15,000	Heavy rain of one to two inches fell in Big Horn County causing the Big Horn River to swell and flood areas near the river.
Hyattville	6/24/2011	\$540,000	The first extended warm spell of the season produced an active period of snowmelt from an historic snowpack in the western Bighorn Mountains. As a result, waterways in and near the foothills of the Bighorn Mountains rose rapidly causing flooding in Big Horn and Washakie counties.
Greybull	6/24/2011	\$200,000	The first extended warm spell of the season produced an active period of snowmelt from an historic snowpack in the western Bighorn Mountains. As a result, waterways in and near the foothills of the Bighorn Mountains rose rapidly causing flooding in Big Horn and Washakie counties.
Hyattville	6/28/2011	\$25,000	Medicine Lodge Creek overflowed its banks for the second time in a week causing damage at the Medicine Lodge State Archaeological Site. Much of the site was flooded as waters surged down the narrow creek.
Greybull	6/28/2011	\$300,000	Shell Creek and its tributaries caused flooding in and around the community of Shell. The flooding was a result of continued snowmelt in the western Bighorn Mountains as the warmest temperatures of the season were attained. Damage was reported on the Kedesh Guest Ranch and a county road along Trappers Creek.
Otto	6/28/2011	\$154,000	Snowmelt waters traveled down the Greybull River and combined with heavy rain from thunderstorms to create lowland flooding along the river upstream of Greybull. Lane 40 1/2 and Road 5 southwest of Burlington were both inundated by water. The river tried to reroute itself in the vicinity of Road 5. This led county road and bridge employees to construct a new dike to protect one residence and a road.

Otto	7/1/2011	\$65,000	Flood waters along the Greybull River subsided on July 1 and 2 as snowmelt decreased and a ridge of high pressure prevented additional thunderstorm development. More information on this flood episode can be found in the June 2011 Storm Data publication.
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List of Flood Events in Big Horn County, 1928 to 2014 (cont.)

Location	Date	Total Damage Estimate (Property and Crops)	Narrative
Greybull	3/7/2014	\$250,000	Flooding of the Spence Oil Field and other areas north of Greybull occurred along the Big Horn River. Three homes outside the Greybull levee system had minor flooding.
Rairden	3/7/2014	\$500,000	An ice jam caused flooding around the town of Manderson near the confluence of the Big Horn and Nowood rivers. The National Guard was called in to assist with sandbagging and other protective measures on March 9 and 10.
Hyattville	5/29/2014	\$0	Flood stage of 3.5 feet on Medicine Lodge Creek within the boundaries of Medicine Lodge State Archaeological Site was topped beginning at 0300MST on Thursday, May 29. The water level generally stayed above flood stage through the end of the month. The creek crested at 4.07 feet at 0115MST on May 30, and nearly repeated the same feat the following morning reaching 4.06 feet. Peak water levels occurred between 0115 and 0345MST each day. State park employees sandbagged the creek and successfully protected the main road through the archaeological site. Minor flooding of a few campsites.
Hyattville	6/1/2014	\$0	The gauge on Medicine Lodge Creek in Medicine Lodge State Archaeological Site fell below flood stage of 3.5 feet at 0915MST on Sunday, June 1. A decreasing mountain snowpack and cooler air in the wake of a cold front brought an end to the snowmelt and flooding. The river ran high for roughly the first half of June but additional flooding did not occur.

Source: <http://www.ncdc.noaa.gov>

APPENDIX B: BIG HORN COUNTY HIGH WIND EVENTS

List of High Wind Events in Big Horn County 1985 to 2015

Location	Date	Recorded Wind Speed (Knots)	Fatalities	Injuries	Property Damage
Basin	1985	N/A	0	0	\$500
Basin	7/10/1989	N/A	0	0	\$50,000
5 Miles west of Shell	8/13/1993	N/A	0	0	\$0
Greybull	7/12/1995	54	0	0	\$500
Lovell	9/8/1995	N/A	0	0	\$15,000
NORTH BIG HORN BASIN (ZONE)	2/7/1996	58	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	2/9/1996	100	0	0	\$15,000
NORTH BIG HORN BASIN (ZONE)	11/7/1996	69	0	0	\$0
Greybull	6/31/98	52	0	0	\$0
Basin/Greybull	8/15/1998	50	0	0	\$0
CODY FOOTHILLS / PART OF E PARK (ZONE)	11/21/1998	58	0	0	\$0
CODY FOOTHILLS / PART OF E PARK (ZONE)	1/14/1999	61	0	0	\$0
CODY FOOTHILLS / PART OF E PARK (ZONE)	2/2/1999	56	0	0	\$0
CODY FOOTHILLS / PART OF E PARK (ZONE)	11/24/1999	55	1	1	\$0
CODY FOOTHILLS / PART OF E PARK (ZONE)	12/15/2000	76	0	0	\$0
Deaver	6/25/2001	52	0	0	\$0
CODY FOOTHILLS / PART OF E PARK (ZONE)	1/8/2002	84	0	0	\$0
CODY FOOTHILLS / PART OF E PARK (ZONE)	2/7/2002	87	0	0	\$0
Basin	7/31/2004	61	0	0	\$30,000
Burlington, Otto and Lovell	6/14/2006	65	0	0	\$95,000
NORTH BIG HORN BASIN (ZONE)	10/30/2006	37	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	5/13/2007	54	0	0	\$0

List of High Wind Events in Big Horn County 1985 to Present (cont.)

Location	Date	Recorded Wind Speed (Knots)	Fatalities	Injuries	Property Damage
NORTH BIG HORN BASIN (ZONE)	6/6/2007	54	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	8/5/2007	56	0	0	\$50,000
NORTH BIG HORN BASIN (ZONE)	11/13/2008	52	0	0	\$0
Shell	6/5/2009	56	0	0	\$6,000
Greybull Airport	8/2/2009	54	0	0	\$0
Greybull Airport	8/7/2009	51	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	4/30/2010	39	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	2/22/2012	52	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	1/13/2014	54	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	3/17/2014	56	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	4/29/2014	54	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	11/10/2014	57	0	0	\$0
NORTH BIG HORN BASIN (ZONE)	4/14/2015	51	0	0	\$0

Source: NCDC and Big Horn County MHMP 2010

APPENDIX C: BIG HORN COUNTY WILDFIRE EVENTS

List of Wildfires – Big Horn County 1980 to 2013

FIRENAME	TOTAL ACRES	CAUSE	YEAR	DATE
BEAVER	20	Human	1980	
WILLOW CR	15	Natural	1981	
SLICK CR	15	Human	1981	12/10/1981
EAGLE NEST	10	Human	1982	4/27/1982
MANDERSON	10	Human	1982	
DRY CREEK	10	Human	1983	
SHELL FALLS	225	Human	1984	7/27/1984
HYATTRANCH	225	Human	1985	8/23/1985
EAST CEMENT	200	Natural	1986	8/25/1986
INTERMISSION	1800	Natural	1988	7/29/1988
DORN DRAW II	1514	Natural	1988	8/13/1988
DORNDRAW	15	Human	1988	6/25/1988
RAILROAD 1	80	Human	1989	4/23/1989
BEAVER CR	31	Human	1989	6/30/1989
ALAMO CR	14	Human	1989	4/25/1989
MANDERSON	200	Human	1990	4/21/1990
COTTONWOOD	80	Natural	1990	
JOHNNYDRAW	10	Natural	1990	9/10/1990
DAVIS DRAW	25	Natural	1991	8/23/1991
DRY CREEK	47	Human	1992	
BRAKE	124	Human	1993	4/26/1993
CAPTAIN JK	15	Natural	1993	7/30/1993
WEBER CYN1	30	Natural	1994	
WEBER CYN2	10	Natural	1994	
ALKALI	10	Human	1994	9/24/1994
MEDICINE#2	14	Natural	1995	8/16/1995
COLD SPR#2	718	Human	1996	
LITTLE MT2	316		1996	
CRYSTAL CR	100		1996	
PAINTROCK	45	Natural	1996	8/26/1996
LITTLE MT2	1093		1997	
LITTLE MT1	432		1997	
RED HILL 2	428		1997	
LONG POINT	200		1997	

List of Wildfires – Big Horn County 1980 to 2013 (cont.)

FIRENAME	TOTAL ACRES	CAUSE	YEAR	DATE
121 CR #2	195		1997	
RED HILL 1	100		1997	
RED CYN #1	35		1997	
121 #1	20		1997	
LITTLE MT4	724		1998	
BUCHANAN	496		1998	
LITTLE MT3	450		1998	
DEVILS CYN	364	Human	1998	7/21/1998
MOSS RCH 1	326		1998	
DRY CREEK	210		1998	
MEDICINE 1	160		1998	
BLACK BUTT	60		1998	
ASSAY P	20		1998	
121 #1	20		1998	
GAMS	15	Human	1998	4/21/1998
LITTLE MTN	574		1999	
CEDAR	423		1999	
ASSAY 2	320		1999	
KERSTNER	236		1999	
BEAR CREEK	210		1999	
SMALL PAST	150		1999	
MOSS RANCH	138		1999	
Beaver Cr	120		1999	
TABLE MTN	105		1999	
SMALL2	77		1999	
DRY CREEK	55		1999	
ISLAND PARK	40	Human	1999	7/23/1999
WEST TEN	40	Human	1999	7/22/1999
HUNT MOUNTAIN	20	Human	1999	10/22/1999
TOBES 2	10		1999	
BUCKING MULE	10	Human	1999	10/3/1999

List of Wildfires – Big Horn County 1980 to 2013 (cont.)

FIRENAME	TOTAL ACRES	CAUSE	YEAR	DATE
FARMER	250	Human	2000	
LITTLEMTN6	205		2000	
Petes Cyn	92	Natural	2000	7/22/2000
BIGHORN RV	75		2000	
Bighorn Rv	75	Human	2000	
3 CANALS	65	Human	2000	
DRYCREEK	40		2000	
Lmtn MexHL	814		2001	
FARMER	100	Human	2001	
Bighorn RV	10		2001	
YUBench Cn	320		2002	
POST 1	96	Human	2002	4/14/2002
Little MTN	85		2002	
LittleMtn	85		2002	
POST #2	28	Human	2002	4/24/2002
westslopes	10		2002	
CATTAIL	10	Natural	2002	8/22/2002
Copper	2500	Natural	2003	8/15/2003
TRACK84	300	Human	2004	3/24/2004
Tract 84	76	Human	2004	3/24/2004
BHX ASSIST	25	Natural	2004	10/1/2004
Canal	26	Human	2006	
Paintrock 2	14	Natural	2006	7/12/2006
BONE CREEK	13450	Natural	2007	8/13/2007
BEAR CREEK	665	Natural	2007	8/21/2007
BEAR CREEK	122	Natural	2007	8/21/2007
LONG PARK	11	Natural	2007	8/13/2007
Yellow Hill RX	110	Human	2009	
CRYSTAL CREEK	30	Human	2009	3/17/2009
SUNLIGHT	26	Human	2009	4/25/2009
Yellowhill RX	75	Human	2010	

List of Wildfires – Big Horn County 1980 to 2013 (cont.)

FIRENAME	TOTAL ACRES	CAUSE	YEAR	DATE
Black Draw	13	Human	2010	3/17/2010
RESERVIOR	2200	Natural	2011	8/26/2011
Paint Rock	412	Natural	2011	8/25/2011
Cold Springs	76	Natural	2011	7/14/2011
Alkali	51	Natural	2011	
Dry Creek	16	Natural	2011	8/18/2011
Emblem	10	Human	2011	4/28/2011
Trout Creek	542	Natural	2012	7/16/2012
Lane 43	40	Human	2012	8/28/2012
Whistle Creek	35	Human	2012	3/28/2012
Bischoff	30	Human	2012	3/16/2012
Medicine Lodge	25	Natural	2012	7/29/2012
Sand Draw	22	Human	2012	3/25/2012
Swamp railroad	20	Human	2012	
BLACK BUTTE	14	Human	2012	8/1/2012
Ditch Creek	12	Human	2012	
Wilkerson	10	Human	2012	3/25/2012
Big Fork	1509	Human	2013	4/27/2013
Lovell Lakes	30	Human	2013	3/28/2013
Causeway	10	Human	2013	3/11/2013

APPENDIX D: BIG HORN COUNTY WINTER STORM EVENTS

List of Winter Storm Events, Big Horn County 1978 to 2015

Date	Event Type	Crop and Property Damage	Injuries	Fatalities
5/4/1978	Heavy Snow	\$11,743,890 (11 County Total)	N/A	N/A
5/3/1982	Heavy Snow	\$2,750,000 (8 County Total)	6	0
4/25/1984	Blizzard	\$1,027,000 (8 County Total)	0	0
10/16/1994	Heavy Snow	\$0	0	0
1/1/1996	Heavy Snow	\$0	0	0
1/16/1996	Blizzard	\$0	0	0
2/1/1996	Extreme Cold	\$50,000	0	1
2/24/1996	Heavy Snow	\$0	0	0
3/4/1996	Heavy Snow	\$0	0	0
3/23/1996	Heavy Snow	\$0	0	0
10/25/1996	Winter Storm	\$0	0	0
10/25/1996	Winter Storm	\$0	0	0
11/17/1996	Heavy Snow	\$0	0	0
12/24/1996	Heavy Snow	\$0	0	0
4/4/1997	Heavy Snow	\$0	0	0
10/23/1997	Winter Storm	\$0	0	0
12/8/1997	Winter Storm	\$0	0	0
1/10/1998	Winter Storm	\$0	0	0
1/19/1998	Heavy Snow	\$0	0	0
3/3/1998	Heavy Snow	\$0	0	0
3/17/1998	Winter Storm	\$0	0	0
3/28/1998	Heavy Snow	\$0	0	0
3/28/1998	Heavy Snow	\$0	0	0
4/14/1998	Heavy Snow	\$0	0	0
6/3/1998	Heavy Snow	\$0	0	0
10/15/1998	Winter Storm	\$0	0	0
3/31/1999	Heavy Snow	\$0	0	0
4/1/1999	Heavy Snow	\$0	0	0
4/22/1999	Winter Storm	\$0	0	0
1/10/2000	Winter Storm	\$0	0	0

List of Winter Storm Events, Big Horn County 1978 to Present (cont.)

Date	Event Type	Crop and Property Damage	Injuries	Fatalities
1/27/2000	Heavy Snow	\$0	0	0
2/25/2000	Heavy Snow	\$0	0	0
9/21/2000	Winter Storm	\$0	0	0
3/12/2002	Heavy Snow	\$0	0	0
11/23/2002	Heavy Snow	\$0	0	0
2/21/2003	Winter Storm	\$0	0	0
2/21/2003	Winter Storm	\$0	0	0
3/17/2003	Winter Storm	\$0	0	0
9/16/2003	Heavy Snow	\$0	0	0
2/26/2004	Heavy Snow	\$0	0	0
9/20/2004	Blizzard	\$0	17	0
2/15/2006	Winter Storm	\$0	0	0
3/28/2007	Winter Storm	\$0	0	0
5/5/2007	Heavy Snow	\$0	0	0
1/17/2008	Winter Storm	\$0	0	0
5/1/2008	Winter Storm	\$0	0	0
10/10/2008	Winter Storm	\$0	3	2
10/10/2008	Winter Storm	\$0	0	0
12/13/2008	Winter Storm	\$0	0	0
12/13/2008	Winter Storm	\$0	0	0
12/26/2008	Winter Storm	\$0	0	0
12/26/2008	Blizzard	\$0	0	0
1/6/2009	Winter Storm	\$0	0	0
3/29/2009	Winter Storm	\$0	0	0
1/22/2010	Winter Storm	\$0	0	0
3/30/2011	Winter Storm	\$0	0	0
4/7/2011	Winter Storm	\$0	0	0
5/18/2011	Winter Storm	\$0	0	0
10/6/2011	Winter Storm	\$0	0	0
2/21/2012	Winter Storm	\$0	0	0
4/27/2012	Winter Storm	\$0	0	0
1/30/2013	Winter Storm	\$0	0	0

List of Winter Storm Events, Big Horn County 1978 to Present (cont.)

Date	Event Type	Crop and Property Damage	Injuries	Fatalities
1/30/2013	Winter Storm	\$0	0	0
5/30/2013	Heavy Snow	\$15,000	0	0
10/3/2013	Winter Storm	\$0	0	0
10/13/2013	Winter Storm	\$0	0	0
2/28/2014	Winter Storm	\$0	0	0
3/1/2014	Winter Storm	\$0	0	0
4/12/2014	Winter Storm	\$0	0	0
9/10/2014	Winter Storm	\$0	0	0
11/25/2014	Winter Storm	\$0	0	0
11/25/2014	Winter Storm	\$0	0	0
1/4/2015	Winter Storm	\$0	0	0
2/20/2015	Winter Storm	\$0	0	0

Sources: National Oceanic and Atmospheric Administration and the National Climatic Data Center

APPENDIX E: STATUS OF 2010 MITIGATION ACTIONS

2010 Plan Action	Comments on Status
1) All hazards and Emergency Management public awareness campaign	No formal campaign but Sheriff's Office launched new web page with links, Facebook page. These were used during the Greybull flooding.
2) Emergency Management representation for new or special building and other projects	Emergency Management does not sit on the planning board. Safety and security input was provided for new school construction.
3) Restructure, expand CERT program and mission	Funding for the CERT program is no longer available. Delete this action for the 2015 plan.
4) GIS mapping, Phase II compliance, and Intrado	Sheriff's Office The County is now Phase II compliant. There are still dead spots in the County for communications.
5) Reduction and control of dense vegetation	The County has an active Firewise Program (under County Fire Marshal.) Program includes education and hazard fuel reduction projects. BLM and Forest Service are conducting hazard fuel reduction projects. Rural cabins are being added to the rural addressing system.
6) Installation of lining or buried water conveyances on main irrigation canals, decreasing water consumption and reducing negative impacts to agriculture and fisheries.	A canal has been buried through the Town of Lovell. Deaver is burying lateral lines. There is a project in Cowley.
7) Improve infrastructure to lessen impact of flood events, and continue to work to identify floodplain identification and mapping, including any map updates if needed.	FEMA has visited the County. A great deal of floodplain mapping has occurred.
8) Expand existing system for hazard notification by Reverse 9-1-1 pre-loaded call blocks.	The County has made great progress on this action-- implementing Code Red and Phase II compliance for notification. More lines added. Capacity exists to notify all residents or just certain areas. Still training dispatchers on use. Landlines are integrated into system. Still need to get cell phone sign-ups. Intrado mapping will provide direct routes to locations for emergency responders. Sheriff's Office communications equipment is antiquated and failing frequently. First bid to replace was \$1.45 million.
9) Strategically placed safe house(s) for emergency equipment and citizens.	Burlington Hall is available as a shelter. Greybull Community Center is a Red Cross shelter and has a generator. North Big Horn Hospital has a mobile clinic. North and South hospitals are expanding. Trailers with equipment are placed across the County. Still need storage space to get equipment inside.

APPENDIX F: PLANNING PROCESS DOCUMENTATION

Big Horn County Pre-Disaster Mitigation Plan

Briefing Paper—June 2015

What is a pre-disaster mitigation plan (PDM) and why do we need one?

The existing PDM Plan--adopted in 2009--is being updated to make Big Horn County, the communities of Basin, Byron, Burlington, Cowley, Deaver, Frannie, Greybull, Lovell, and Manderson more disaster-resistant and less vulnerable to property damage and loss of life from a natural disaster. The plan update is being funded by the county and through a grant from FEMA. Updating the plan ensures the jurisdictions in the county will stay eligible to compete for funds to carry out the projects in the plan and will also be eligible for assistance after a disaster, if needed. Adoption of the updated plan is voluntary, but the communities and the county will need to adopt the updated plan to remain eligible for grant funds and post-disaster assistance.

What is in the plan?

Assessments of natural hazards that describe historical occurrences and vulnerability to each hazard are found in the existing plan and will be updated with new information. The plan will estimate the potential losses and impacts should a disaster occur. The hazards that will be looked at include dam failure, drought, earthquake, flood, hail, high winds and downbursts, severe winter weather, tornadoes, and wildland fire. Goals and projects will also be updated as part of the plan. Projects to help protect lives, property, or infrastructure can be identified by local governments, emergency responders, and/or members of the public.

How will the plan be prepared?

The update process has been initiated by retaining a contractor, Beck Consulting, to work with the Big Horn County Board of Commissioners, County Emergency Management, town elected officials, emergency responders, and the public. The contractor will hold public meetings, work with interested parties to gather project ideas, update existing information in the plan, and complete the plan update. The contract team will coordinate most closely with the Local Emergency Planning Committee (LEPC.) A draft of the plan will be prepared and made available for public review and comment in the fall of 2015. Copies of the draft will be available at the town and county offices, and on the county's website. Following the comment period, the contractor will finalize the update. The plan will be reviewed by the State of Wyoming and the Federal Emergency Management Agency (FEMA.) Following this review, Big Horn County and each of the incorporated communities may adopt the plan.

How do we offer input?

Input is encouraged at any time during the process until the updated plan is adopted by the governing bodies in the winter of 2015. Meetings during the planning process will be noticed and open to the public. Information announcing meeting times, dates, and locations, and the availability of the draft plan update will be submitted to Basin, Greybull, and Lovell newspapers. If you have any comments or questions, please contact Barb Beck at (406) 446-3628, barbbeck@bresnan.net.

June 12, 2015

FOR IMMEDIATE RELEASE

TO: Lovell Chronicle

CONTACT: Barb Beck, 406 446-3628, barbbeck@bresnan.net

Bad Things Don't Have to Happen

Many parts of Wyoming have just experienced severe flooding and tornadoes. And, in Big Horn County, wildfire season is right around the corner—again. Wildland fire is just one of the natural hazards that residents and property in Big Horn County are vulnerable to. Other hazards include dam failure, drought, flooding, and winter storms to name a few. Although, not a frequent occurrence, the county can and has also experienced earthquakes. Natural disasters can be costly in terms of property damage, injury, and loss of life. For example, Big Horn County has experienced \$1,263,559 in damages from tornadoes from 1907-2003. And, damaging hail storms from 1960 – 2012 have caused \$461,500 in crop and property damage in the county. Earthquake and wildland fire losses and costs can add up even more quickly than the examples above.

To prepare ahead to lessen disaster impacts, Big Horn County has entered into a contract with Beck Consulting of Red Lodge, Montana to update the recently expired Pre-Disaster Mitigation Plan. According to County Emergency Management Coordinator, Jason Beal, “The County is updating this plan because we consider public safety to be a very important responsibility and updating this plan will help both protect property and save lives.” The plan will cover the unincorporated areas of the county and all of the communities.

One public meeting and a Local Emergency Planning Committee (LEPC) meeting are scheduled to explain the project and answer questions. The first public meeting will be held at the County Weed and Pest Building in Greybull at 5:30 p.m. on Thursday, June 25. Following that, the LEPC will meet at 7 p.m. in the same location. Contractor Beck will explain the reasons for updating the plan, the roles of the various entities involved—including the public, the natural hazards that people and property in the county are vulnerable to, the kinds of projects that go into the plan, and how to stay involved and offer input during the plan update. Additional public meetings will be scheduled over the coming months in Basin and Lovell.

According to Beck, “Saving lives is such an important topic, we really hope folks are willing to share their thoughts on what we might do to prevent disasters and keep people safe. The more we hear from people in the know, the better the plan will be.”

Following these meetings, the contractors will begin updating the research on past natural disasters in the county and will continue working with the LEPC to develop goals and projects. The draft plan will be available for public review and comment in the fall.

Please check the county’s website over the coming weeks and months for information on the project. You may also contact Barb Beck at barbbeck@bresnan.net or 406 446-3628 with any questions or comments.

XXXXXXXXXXXXXXXXXX

BIG HORN COUNTY

PRE-DISASTER MITIGATION PLAN MEETING

Thursday, June 25, 5:00 p.m.

County Weed and Pest Building, Greybull



- Anyone with an interest is encouraged to attend!
- Agenda items include; explanation of the plan/process, hazards that people and property are vulnerable to, and how to stay involved
- For more information, contact:
Contractor, Barb Beck, 406 446-3628, barbbeck@bresnan.net

**Big Horn County Pre-Disaster Mitigation Plan Update
Public Meeting Agenda
Greybull—June 25, 2015**

Welcome and introductions

What is a PDM Plan? (briefing paper handout)

Who is doing what? – Roles

- **Big Horn County**
- **Incorporated communities**
- **Emergency Management**
- **LEPC**
- **Contractor**
- **Public**
- **Wyoming Office of Homeland Security**
- **FEMA**

Hazards in Big Horn County (that will be analyzed)

Discussion about hazards of concern to the public

Projects

- **Types of projects that can be included in the plan**
- **Project ideas from the public?**

Planning Process

- **Timeframes**
- **How to get updates and stay involved**
- **Contact information, website**

Adjourn

There were no attendees for the public meeting.



**Big Horn County
Local Emergency Planning Committee
Meeting Agenda**

(All individuals present must sign-in)

June 25, 2015
7:00pm
Weed and Pest Building

Chairman – John Hyde
Vice Chairman – Ken Blackburn
Treasurer – Jason Beal
Secretary – Teresa Caldwell

1. Call Meeting to Order & Welcome
2. Approve Minutes: Additions, Corrections - Motion to Accept
3. Jason Beal: Treasurer's Report
4. Jason Beal: Funding Requests
5. Correspondence
6. Unfinished Business:
7. New Business:
8. Sub-Committee Reports
9. Presentation (Note: Presentations must be pre-scheduled and limited to 15 minutes)
- Barb Beck with Beck Consulting to discuss Pre-Disaster Mitigation Plan Update
10. Reports from Members
11. Good of the Order
12. Announce Next Meeting Date & Determine Meeting Location
13. Adjournment - Motion to Adjourn

**Big Horn County Pre-Disaster Mitigation Plan Update
LEPC Meeting Agenda
Greybull—June 25, 2015**

Welcome and introductions

What is a PDM Plan? (briefing paper handout)

- Role of LEPC and others
- Timeframes

Hazards analyzed in Big Horn County

- Events related to these hazards in the past five years?

Actions from the 2010 Plan

- What has been accomplished--status of these actions? Keep or delete?

What hazards are the jurisdictions vulnerable to?

- Top 2-3 hazards for each jurisdiction
- Types of projects that can go into a PDM Plan
- Preliminary project ideas for each jurisdiction

Development Trends-whole group

- Identify trends for residential, commercial, and industrial development

Next steps

- Next LEPC meeting—
hazard profile research results
discussion to refine project ideas
- Need a cover photo for plan!

Adjourn

Big Horn County Pre-Disaster Mitigation Plan Update

LEPC Meeting Summary

Greybull—June 25, 2015

Introductions

Contractor, Barb Beck introduced herself and thanked the LEPC for allowing her time on their agenda. She explained that she along with the engineering firm AMEC had been retained by the County to update the Multi-Hazard Mitigation Plan for the County and all of the local jurisdictions.

What is a PDM Plan?

Beck handed out the briefing paper and talked through it explaining the benefits of updating the plan—minimizing the risk to people and property from natural disasters, maintaining eligibility for matching grant funds, and allowing for FEMA assistance following a major disaster. She explained the roles of all involved in the update including the LEPC, the County, the Towns, the public, the contractors, WOHS and FEMA. She invited input from the LEPC at any point in the process and provided her contact information.

Hazards Analyzed in Big Horn County

Hazards analyzed in the county were presented on a flip chart and listed in the Briefing Paper. The LEPC asked to add naturally-occurring hazmat (radon gas and Sulphur dioxide) to the list.

The group then identified natural disaster incidents that had occurred since the last plan update.

- March 2014: Ice jams on the Big Horn River stretching from Worland to Greybull—caused damages in Big Horn County
- County-wide flooding in 2011
- Spring 2014: Tornado touched down north of Cowley, no damages
- May 2014, May 2015: Tornados sighted west of Burlington
- Summer 2012: Wind damage to property Basin
- Spring 2015: Wildland fires County-wide
- Summer 2013, 2014: Wildland fire south of Greybull in the river bottom
- 2008: 12,000-acre fire in Shell Canyon
- Fall 2014: Fire at Medicine Lodge
- Misc dates: Fires in the Big Horn National Forest
- ?: Hail and crop damage (grain, beets, and corn) Cowley area and County-wide
- 2012, 2013: Drought and grasshopper damage to crops
- January 2014: Accidental death at Western Sugar shut down operations, extreme cold during shutdown caused freezing in factory and high cost damages

Status of Actions from the 2010 Plan

Barb presented the nine actions from the last plan and asked the LEPC members what had been accomplished for each of these. The LEPC listed the following accomplishments and suggest deletions. Barb will likely reorganize the mitigation actions into one major action or goal for each of the local jurisdictions. Almost all of the actions in the current plan are the responsibility of the county and it is difficult for anyone including the jurisdictions to track who is involved in which projects.

2010 Plan Action	Comments on Status
10) All hazards and Emergency Management public awareness campaign	No formal campaign but Sheriff's Office launched new web page with links, Facebook page. These were used during the Greybull flooding.
11) Emergency Management representation for new or special building and other projects	Emergency Management does not sit on the planning board. Safety and security input was provided for new school construction.
12) Restructure, expand CERT program and mission	Funding for the CERT program is no longer available. Delete this action for the 2015 plan.
13) GIS mapping, Phase II compliance, and Intrado	Sheriff's Office The County is now Phase II compliant. There are still dead spots in the County for communications.
14) Reduction and control of dense vegetation	The County has an active Firewise Program (under County Fire Marshal.) Program includes education and hazard fuel reduction projects. BLM and Forest Service are conducting hazard fuel reduction projects. Rural cabins are being added to the rural addressing system.
15) Installation of lining or buried water conveyances on main irrigation canals, decreasing water consumption and reducing negative impacts to agriculture and fisheries.	A canal has been buried through the Town of Lovell. Deaver is burying lateral lines. There is a project in Cowley.
16) Improve infrastructure to lessen impact of flood events, and continue to work to identify floodplain identification and mapping, including any map updates if needed.	FEMA has visited the County. A great deal of floodplain mapping has occurred.
17) Expand existing system for hazard notification by Reverse 9-1-1 pre-loaded call blocks.	The County has made great progress on this action-- implementing Code Red and Phase II compliance for notification. More lines added. Capacity exists to notify all residents or just certain areas. Still training dispatchers on use. Landlines are integrated into system. Still need to get cell phone sign-ups. Intrado mapping will provide direct routes to locations for emergency responders. Sheriff's Office communications equipment is antiquated and failing frequently. First bid to replace was \$1.45 million.
18) Strategically placed safe house(s) for emergency equipment and citizens.	Burlington Hall is available as a shelter. Greybull Community Center is a Red Cross shelter and has a generator. North Big Horn Hospital has a mobile clinic. North and South hospitals are expanding. Trailers with equipment are placed across the County. Still need storage space to get equipment inside.

Development Trends

The LEPC identified the following trends for residential, commercial, and industrial development in the County. The County is experiencing slow population growth. Barb will follow up with the County Planner.

Residential: new residential subdivision activity occurring around Burlington, North of Cowley, Lovell, and Hyattville. Call volumes for medical and law enforcement response have increased.

Commercial: The former Deaver High School has been converted into an oil field parts manufacturing business. Lovell has a new specialized blasting business. There is a new cable manufacturer in Greybull. Yellowstone Bean has a new (3-4 years old) plant in Manderson.

Industrial: The LEPC was not aware of any new industrial activity. The group expressed frustration with federal land management agency policies that restrict energy development. The County is 78% federal land so federal policies have a large impact on economic activity in the County.

Next steps

- Next LEPC meeting—present preliminary hazard profile research results
- Discuss and refine project ideas
- Big Horn County EMA will use the Sheriff's Facebook and web pages to make information about the planning process available to the public

Finally, Barb requested LEPC members to send her photos of past disasters that might go in the plan or on the cover.

Adjourn

The Secretary for the LEPC provided a sign-in sheet, see below.



Big Horn County

Local Emergency Planning Committee

Date 6/25/15 Location Weed + Pest Bldg.
Greybull

	PRINT NAME	AGENCY/ORGANIZATION	TOWN/CITY
1	Burt Beck	Beck Consulting	Red Lodge, MT
2	David Caldwell	LEPC	Greybull
3	Jason Beal	Big Horn County EM	BHC
4	Todd Dean	WDA/CHS + Basin VFD	Basin
5	Ernie Smith	Amateur Radio	Greybull
6	James Thomas	SBH Hospital	Basin
7	Ken Blackburn	BHCSO	Spencer
8	Howard Morris	BHC SAR	Cowbell
9	Tom Drwin	BHC SAR / BHCSO	Lowell
10	Vicki Hyde	BHC	Lowell
11	Mark Tomaszewski	SBHC SAR	Basin
12	Mike Newton	SBHC SAR	Basin
13	Chelle Schwager	WDA-CHS	Cowbell
14	Craig Sorenson	BHCFD #5	Denver, Wyoming
15	Brendan Summers	County Health Officer	Greybull
16	Karen Neighbors	Public Health	Greybull
17	Terese Caldwell	LEPC Secretary	Greybull
18			
19			
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21			
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23			
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25			

**Big Horn County Mayor and Clerk Meeting
July 16, 2015
Town of Deaver Picnic Pavilion
6:00 p.m.**

Host: Town of Deaver

Invitees: Town of Basin, Town of Burlington, Town of Byron, Town of Cowley, Town of Frannie, Town of Greybull, Town of Lovell, Town of Manderson, Commissioner John Hyde, Commissioner Felix Carrizales, Commissioner Jerry Ewen

Visitors: Nick Lewis, Jason Beall

Order of Agenda:

- Nick Lewis with Big Horn County Mobile Medical Unit
- Hamburger Cook-Out
-  Jason Beal with Big Horn County EMC: Pre-Disaster Mitigation Plan
- Paul Thur with Town of Greybull: Sale of police sedans
- Mayor Brightly: OSHA Grant

Big Horn County PDM Plan Update

**Mayors' and Clerks' Meeting
Deaver, Wyoming
July 16, 2015**

Introductions

What is a PDM Plan and Why Update it?

- Briefing paper, roles

Development Trends

- Mayors complete worksheets for residential, commercial, industrial, and government trends

Natural Hazards in Big Horn County

- Overview of projects from previous plan
- Identify concerns for each community
- Project types
- Project ideas

Planning Process and Next Steps

- July-September: HIRA and other research
- August: meet with LEPC to refine projects
- August: public meeting
- Sept-Oct: release draft plan
- Oct-November: 30-day public comment period
- WOHS and FEMA reviews
- Local jurisdictions adopt plan

Handouts: briefing paper, trends worksheet, project types, status of 2010 mitigation actions

DEVELOPMENT TRENDS
Big Horn County, Wyoming
Pre-Disaster Mitigation Plan Update
July 16, 2105

Town/City _____

Person filling out form _____

Title _____

Please note the following trends if applicable

Type of Development (residential, commercial, industrial, or government)	What is happening?	Where is it happening?	When is it happening?

Yes or No

Do you have a land use plan? _____ **Do you have zoning?** _____

BIG HORN COUNTY MAYORS' BRIEFING SUMMARY
Deaver, Wyoming
July 16, 2015

Briefing Paper hand out

- Explained reasons for updating plan, went over information in paper
- Plan contents
- HIRA and the reasons for compiling this information
- Goals and Projects from last plan—handout
- Types of projects that can go in the plan--handout

Roles—who is doing what?

- Towns- provide information, access to staff, plans, representatives on the LEPC, project ideas, review and input. Identify needs. Projects not unfunded mandates. Each jurisdiction must have at least one project to adopt plan. Plan adoption comes after public, WOHS, and FEMA reviews.
- County
- LEPC
- Contractors
- Public
- WOHS and FEMA

Hazards BH County is vulnerable to

Dam Failure
Drought
Earthquake
Flood
Hail
High winds and downbursts
Severe winter weather
Tornadoes
Wildland fire
Radon gas and H2S

Which hazards are of most concern to you for your community?

Jurisdiction	Hazards of Concern
County	All
Basin	High winds and downbursts, Flood
Burlington	High winds and downbursts, Tornadoes, Severe Winter Weather
Byron	High winds and downbursts, Hail, H2S, Wildland Fire, Severe Winter Weather
Cowley	High winds and downbursts, Hail, Severe Winter Weather
Deaver	High winds and downbursts, Hail, Severe Winter Weather
Frannie	High winds and downbursts, Hail, H2S, Severe Winter Weather
Greybull	Flood, Hail, High winds and downbursts, Tornadoes, Severe Winter Weather
Lovell	Flood, Hail, High winds and downbursts, Severe Winter Weather
Manderson	Flood, Hail, High winds and downbursts, H2S, Wildland Fire, Severe Winter Weather

Development Trends and Local Plans/Zoning

Each mayor and/or clerk filled out a worksheet that asked “What are you experiencing in terms of residential, industrial, commercial and/or government development, where is it occurring, and when? The following is the compiled results of the worksheets.

Community	Type	What	Where	When
Basin				
Burlington	Residential-govt.	Husky Phase III Subdivision	In town	In progress
Byron				
Cowley	Not present			
Deaver	Residential	Misc new home construction	In town	3/year
	Industrial	Manufacturing facility	Old school	Possible
Frannie	Industrial	Individual farm development	Outside town	In progress
	Government	Park development	In town	Soon
	Residential	Nuisance cleanup	In town	In progress
Greybull	Residential	Looking for development	E of town	5-10 years
	Commercial/Ind.	Developing business park	SE corner of town	Next 5 years
	Government	New Forest Service building	S of town	Completed
Lovell	Residential	Residential building	Clay Subdi.	In progress
	Residential-govt	Senior housing development	10 th Street	Future
	Industrial	Factory improvements	Western Sugar	In progress
	Government	Replacing lift station	Sewer Lagoon	Fall 2015
Manderson	None	N/A	N/A	N/A

Jurisdiction	Land Use Plan?	Zoning?
Basin		
Burlington	Yes	Yes
Byron		
Cowley	Not present	
Deaver	Yes, being updated.	Yes, being updated.
Frannie	No	Yes
Greybull	Yes	Yes
Lovell	Yes	Yes
Manderson	No	No

Planning Process and Next Steps

- Complete HIRA research
- Meet with LEPC at the end of August
- Public meeting in Greybull
- Draft plan late this summer
- WOHS and FEMA review
- Adoption by local jurisdictions

Questions?

How to contact me, welcome to call or e-mail at any time

Thank you for your time!

Handouts: Briefing paper, Project Types, Sheets to enter hazards of most concern and local development activities, Summary of projects from last plan and status of implementation of those projects

Attendees: see sign-in sheets attached

**Big Horn County Pre-Disaster Mitigation Plan
 Mayors' and Clerks' Meeting
 July 16, 2015**

Name	Representing	E-mail
Walter A. To	Greybull	
Paul Thur	Greybull	greytown@tctwest.net
Valerie Beal	Lovell	vbeal@townoflovell.com
Angel Montano	Lovell	AMontano289@yahoo.com
Jasen Beal	Big Horn County	jasenbeal@bighorncountytwp.gov
Heidi Brightly	Byron	heidibrightly@yahoo.com
Allison Weber	Deaver	deavertown@tctwest.net
Michael Beyer	Deaver	" "
Jaquelyn Ernest	Manderson	mandrjn@tct.net
Deidre Clendenen	Frannie	frannietaown@tctwest.net
WINK BENNETT	BURLINGTON	burlington@tctwest.net
Wanda Vane Bank	FRANKLIN	wanda.vanebank@GMAIL.COM
Dennis W. PETERS	BASIN	dwpdepbhc.coroner@hotmail.com
Barb Beck	Beck Consulting	barbbeck@breshaw.net

August 14, 2015

FOR IMMEDIATE RELEASE

TO: Lovell Chronicle

CONTACT: Barb Beck, 406 446-3628, barbbeck@bresnan.net

Not Too Smoky--Yet

Fortunately so far this summer, there haven't been any large fires in the County. But, fire season isn't quite over yet. How safe do you think you are from a natural disaster in Big Horn County? While history shows that you should be relatively safe, people and property in the County are vulnerable to a long list of potential hazards that include drought; river, ice-jam and flash flooding; tornadoes; wildland fire; and winter storms to name just a few.

Natural disasters can be costly in terms of property damage, injury, and loss of life. For example, Big Horn County experienced \$1,263,559 in damages from tornadoes for the period 1907-2003. And, damaging hail storms from 1960 – 2012 have caused \$461,500 in crop and property damage in the County. Earthquake and wildland fire losses and costs can add up even more quickly than the examples above. And, drought can be the most costly natural disaster of all—potentially impacting crops, livestock, municipal water supplies, recreation, wildland fire, and the overall economy in Big Horn County for extended periods of time.

To prepare ahead to lessen disaster impacts, Big Horn County has entered into a contract with Beck Consulting of Red Lodge, Montana. Beck will be updating the recently expired Pre-Disaster Mitigation Plan. According to County Emergency Management Coordinator, Jason Beal, "The County is updating this plan because we consider public safety to be a very important responsibility and updating this plan will help both protect property and save lives." The plan will cover the unincorporated areas of the County and all of the communities. Most of the cost for preparing the plan is covered by a grant.

A public meeting is scheduled for Thursday, August 27, at 5 p.m. at the County Weed and Pest Building west of Greybull. Following that, the LEPC will hold a regularly-scheduled meeting at 7 p.m. in the same location. Contractor Beck will explain the reasons for updating the plan, the roles of the various entities involved—including the public, the natural hazards that people and property in the County are vulnerable to, the kinds of projects that go into the plan, and how to stay involved and offer input.

According to Beck, "Saving lives is such an important topic, we really hope folks are willing to share their thoughts on what we might do to prevent disasters and keep people safe. The more we hear from people in the know, the better the plan will be."

The contractors have been updating the research on past natural disasters in the County and will continue working with the LEPC and the Mayors to develop projects for the plan. The draft plan will be available for public review and comment in the fall.

Please check the County's website over the coming weeks and months for information on the project. You may also contact Barb Beck at barbbeck@bresnan.net or 406 446-3628 with any questions or comments.

XXXXXXXXXXXXXXXXXXXX

BIG HORN COUNTY

PRE-DISASTER MITIGATION PLAN MEETING

Thursday, August 27, 5:00 p.m.

County Weed and Pest Building, Greybull



- Anyone with an interest is encouraged to attend!
- Agenda items include; explanation of the plan/process, hazards that people and property are vulnerable to, and how to stay involved
- For more information, contact:
Contractor, Barb Beck, 406 446-3628, barbbeck@bresnan.net

**Big Horn County Pre-Disaster Mitigation Plan Update
Public Meeting Agenda
Greybull—August 27, 2015**

Welcome and introductions

What is a PDM Plan? (briefing paper handout)

Who is doing what? – Roles

- **Big Horn County**
- **Incorporated communities**
- **Emergency Management**
- **LEPC**
- **Contractor**
- **Public**
- **Wyoming Office of Homeland Security**
- **FEMA**

Hazards in Big Horn County (that will be analyzed)

Discussion about hazards of concern to the public

Projects

- **Types of projects that can be included in the plan**
- **Project ideas from the public?**

Planning Process

- **Timeframes**
- **How to get updates and stay involved**
- **Contact information, website**

Adjourn

Big Horn County Pre-Disaster Mitigation Plan Update

Public Meeting Notes

Greybull—August 27, 2015

Welcome

What is a PDM Plan? (briefing paper handout)

- Quick review of overarching purpose to make people and property safer from natural disaster. Also make jurisdiction eligible to compete for project dollars and post-disaster assistance.

Who is doing what? – Roles

- Big Horn County
- Incorporated communities
- Emergency Management
- LEPC
- Contractor
- Public
- WY Office of Homeland Security
- FEMA

List of Hazards in Big Horn County

Participants listed additional hazard concerns including; livestock disease (brucellosis and chronic wasting disease), disease from mass livestock casualty, tularemia, dust storms, lightning, aquifer contamination (specifically in Cowley), sedimentation of Yellowtail Reservoir, and a proliferation of non-native Russian Olive. The county had a fatality from tularemia earlier this summer. The fatality at the sugar beet factory in Lovell almost resulted in a large cattle quarantine because cattle are fed beet pulp and some believed the fatality at the beet factory posed a threat of contamination to the cattle feed.

Some of these items (lightning and dust storms) are covered in other chapters. Non-native Russian Olive affects both flooding and wildland fire. Plan should support Russian Olive eradication efforts. Livestock diseases have not typically been handled in a PDM plan. Other agencies—such as Department of Livestock and Public Health address these hazards. The county experienced several fatalities at the Torchlight Oil Field facilities from toxic gas seepage. This is being addressed in the plan. Sedimentation of the reservoir is beyond the scope of this plan.

The group noted that there had recently been high winds at Hyattville that caused tree damage and there was a microburst at Bald Mountain last weekend that did extensive damage.

Projects

- Types of projects that can be included in the plan
- Barb went over some project ideas she had obtained from reviewing the local land use and other plans. Many of these projects had already been accomplished according to participants.
- Several project ideas were identified and will be added to the draft project list to use at the next Mayors' and Clerks' meeting in September.

- The project ideas include; public relations effort to get people to sign up their cell phone numbers with the emergency notification system, replacing the communications equipment at the sheriff's office (also need three new repeaters—two North, one South), obtain higher resolution elevation data, establish an MOU between the county and all of the incorporated communities to share in GIS licensing and support staff, plan/exercise helping UTSE's during a disaster, develop a historical disaster information briefing paper for elected officials, upgrade drainage infrastructure in Greybull to address ponding in the 6th Street area, remove non-native vegetation in the Big Horn River to reduce potential for flooding, policy to promote water conservation as per land use plan, mitigate potential for Lovell lagoon failure in event of flood from Buffalo Bill Dam failure, continue to work with LDS church on their intent to provide shelter in disaster event, refill Fire Wise program position that will soon be vacant. Keep previously identified project to house and shelter emergency response equipment such as Search and Rescue equipment.

Planning Process

- Timeframes, How to get updates and stay involved, Contact information, website

**Big Horn County Pre-Disaster Mitigation Plan
Public Meeting
August 27, 2015**

Name	Representing	E-mail
Ken Blackburn	Self	Ken.Sharad@TCTwest.net
Paul Thuer	Greybull	greytown@tctwest.net
Joy Haydt	BHC Land Planning	joy.hill@bighorncounty.wy.gov
Jason Beal	BHC Emergency Management	Jason.beal@bighorncounty.wy.gov
Barb Beck	Beck Consulting	barbbeck@bveshwa.net

BIG HORN COUNTY, WYOMING

Hazard Quiz

August 2015

1. Which two towns in Big Horn County are located almost entirely in the 100-year floodplain of the Big Horn River? _____
2. From 1980 – 2013 what percentage of wildland fires in Big Horn County were human-caused _____ and what percentage of fires in the county were caused naturally _____?
3. How many damaging flood events have there been in Big Horn County between 1928 and 2014 (resulting in property damages of \$5.6 million)? _____
4. All communities in the County are vulnerable to a 1% annual flood except which community? _____
5. The County experiences a damaging wind event approximately every how many years on average? _____
6. How many wildland fires 1,000 acres or larger has the County experienced since 1980? _____
7. Microbursts caused damage to property and vegetation in which communities in the County. In 2004? _____ In 2010? _____
8. The County experiences a damaging winter weather event every how many years on average? _____
9. The earliest recorded fire in the County in 1876 was started by the Sioux to prevent the U.S. Army from following them. Approximately how large was this fire? _____
10. The County experiences a damaging flood event every how many years on average? _____



**Big Horn County
Local Emergency Planning Committee
Meeting Agenda**

(All individuals present must sign-in)

August 27, 2015
7:00pm
Wood and Pest Building

Chairman - John Hyde
Vice Chairman - Ken Blackburn
Treasurer - Jason Deal
Secretary - Teresa Caldwell

1. Call Meeting to Order & Welcome
2. Approve Minutes: Additions, Corrections - Motion to Accept
3. Jason Deal: Treasurer's Report
4. Jason Deal: Funding Requests
5. Correspondence
6. Unfinished Business:
7. New Business:
 - Appreciation Dinner/Meeting at Lovell Fire Hall September 17, 2015. Please RSVP to Teresa
8. Sub-Committee Reports
9. Presentation (Note: Presentations must be pre-scheduled and limited to 15 minutes)
 - Barb Beck with Beck Consulting to discuss Pro-Disaster Mitigation Plan Update
10. Reports from Members
11. Good of the Order
12. Announce Next Meeting Date & Determine Meeting Location
13. Adjournment - Motion to Adjourn

**BIG HORN COUNTY PDM
LEPC Agenda Topics
August 27, 2015**

Briefing paper handout (for anyone who missed last meeting)

Past disasters in the County

- Take Hazard Quiz--some facts and figures

Results of Mayors and Clerks' Meeting

- Hazards identified by each community (flip chart)

Project ideas

- Different types of projects that can go in the plan
- Each participating jurisdiction must have at least one project
- Contact Jason or Barb with any project ideas

Next Steps

- Meet with mayors to refine project ideas
- Complete HIRA
- Assemble draft plan for public review
- Watch for draft plan out this fall for 30-day public review and comment

**BIG HORN COUNTY PDM
LEPC Notes (Beck)
August 27, 2015**

Introduction

Contractor, Barb Beck, introduced herself to the group. She explained what a PDM plan is and why the county is updating the current plan. The plan Briefing Paper was available.

Hazards for the County

She referred to a list of natural hazards on the wall and explained that part of the process to update the plan includes researching the history of these types of events in the county. The research addresses how many events have occurred, where and when they occurred, damages or loss of life for each event, frequency of each type of event, and probability for the future. Because sometimes our perceptions of what hazards pose the biggest threats are not entirely accurate when compared to the historical record, this information provides a factual basis for identifying mitigation projects.

Hazard Quiz

Each person received a copy of the hazard quiz. The group took the quiz together.

Update on the Discussions at the Mayors' ad Clerks' Meeting

Barb presented a list of the hazards each mayor believed his community was at risk from. She explained that the Mayors then went on to identify development trends in and around their own community.

Project Ideas

Barb explained the types of projects that can be included in the plan and provided several examples. The project types were listed on the back side of the Briefing Paper which was available as a handout. Barb has gleaned a number of project ideas from her review of all of the local plans. She will be working with the Mayors again on September 17. LEPC members were invited to contact either Jason or Barb with project needs.

Next Steps

After the next Mayors' meeting, the draft plan will be assembled. The draft will be available for a 30-day public review. Hard copies of the draft will be available in Basin, Greybull, and Lovell. The other communities will receive a disk and the plan will be posted on the county's website.



Big Horn County, WY
Local Emergency Planning Committee
August 27, 2015 Meeting Minutes

Chairman – John Hyde
Vice Chairman – Ken Blackburn
Treasurer – Jason Beal
Secretary – Teresa Caldwell

The monthly meeting of the Big Horn County LEPC was called to order by **Ken Blackburn** at 7:00 PM at the Weed & Pest Building in Greybull

MEMBERS & GUESTS PRESENT:

Barb Beck; Brendan Fitzsimmons; Michael Scherman; Howard Morris; Chelle Schwope; Mark Tomaszewski; Jerry Ewen; Nick Loftus; Vicky Case; Andy Melin; James Thomas; Felix Carrizales; Tom Irwin; Dennis Woodward; Kami Neighbors; Joy Hill; Ken Nelson; Mike Nelson; Todd Denny; Ernie Smith; Jim Minchow; Frankie Rohrer; John Lane; Chris Kampbell; David Caldwell; John Hyde; Ken Blackburn; Jason Beal & Teresa Caldwell. (29)

WELCOME:

Ken welcomed everyone to the meeting and led us in the Pledge of Allegiance.

DRAFT MINUTES:

Ken entertained a motion to accept the June 25, 2015 draft LEPC minutes. **Dennis Woodward** moved to approve; seconded by **Jim Minchow**. Motion carried.

TREASURER'S REPORT - JASON BEAL:

State Homeland Security Grant (1): 2014 Grant - \$23,619.84 Expires on 05/31/2016

FUNDING REQUESTS: NONE

CORRESPONDENCE & EMAIL:

Teresa said she received an email from **Michael Newton** saying that he would be unable to attend tonight's meeting.

UNFINISHED BUSINESS: NONE

NEW BUSINESS:

John and **Ken** requested that the date for the LEPC Appreciation Dinner Meeting be changed from September 24th to September 17th. The date change was discussed and agreed upon. The dinner will be served at 6:00 PM at the Lovell Fire Hall. Formal invitations will be sent and members will be asked to RSVP to **Teresa** by 9/4.

SUB-COMMITTEE REPORTS: NONE

PRESENTATION: Barb Beck, Beck Consulting distributed a 10-question, thought provoking “Hazard Quiz”. Barb reviewed the quiz answers, led us in discussion on project ideas, answered several questions and updated us on the overall Big Horn County Pre-Disaster Mitigation Plan.

REPORTS FROM MEMBERS:

Vicky Case – Extended her appreciation again to all the Sheriff’s Office deputies for all their past assistance.

Ernie Smith – Reported on the recent Big Horn Basin amateur radio club field day exercise and other radio operator events in and around Big Horn County.

Michael Scherman – Thanked members for the Get Well card he received and reported on numerous items from Burlington Fire Department. **Michael** said he recently learned from the State Fire Marshall’s office that a DCI member will now be responding to all fire investigator calls to the State Fire Marshall’s Office.

Brendan Fitzsimmons – Reported on the most recent case of Tularemia in Wyoming which tragically took the life earlier this month of **Michael Schwope, Chelle Schwopes’** father. **Dr. Fitzsimmons** said the serious, even deadly disease is unusually active this year. He said Tularemia, also known as “rabbit fever” or “deer fly fever” frequently affects rabbits, hares and rodents.

Joy Hill – Said she has had a lot of map requests lately and is trying to get them all done. **Joy** also mentioned it has been a very busy time with RIMS software and mapping updates.

Howard Morris – Briefly recapped a recent mountain accident involving a young female who suffered injuries following a fall. **Ken** provided us with an update on her medical condition.

Dennis Woodward – Told about the recent rescue of an 81 year old gentleman who had wandered away from his camp. **Dennis** also reported on a microburst from a couple of weeks ago. He said Search & Rescue has had a very, very busy summer. **Ken** commented how pleased he is that everyone has been working together so well. **Dennis** added to **Ken’s** comment by saying that they have pretty much decided that the north team and the south team has really come together as one Search & Rescue. **Dennis** gave the example of how one had a snow machine and no ridders and the other had ridders but no snow machine.

Mark Tomaszewski – Said they have been extremely busy on calls to car wrecks and a few fires. **Ken** briefly recapped the 911 emergency call, dispatch received from the gentleman who while on his cell phone, tragically died after his 4-wheeler had flipped over on him on the Dugway.

Mike Nelson – From Shell FD said they have had a lot of 4-wheeler wrecks this year but hardly any fires. **Mike** extended his appreciation to Search & Rescue saying they have been on about 95% of his calls in just minutes. **Ken** said, “Search & Rescue does it all free gratis and even at night. They do it all because of their dedication and willingness to help the citizens of Big Horn County.”

John Lane – Said it’s been quiet around Hyattville except for the high winds, tree damage and a lot of smoke!

Felix Carrizales – Extended his appreciation for all the fine services LEPC members render to the citizens of Big Horn County.

Todd Denny – Said it's been relatively quiet for Basin Fire Department.

Chris Kampbell – Commented on the high volume of calls all around the County. **Chris** also said they've been experiencing a rash of burglaries lately; the latest count being four, during a 3 ½ week period of time.

Nick Loftus – Talked about a recent, softball game fund raiser that raised over \$4,500.00 for a little girl who is fighting leukemia. **Nick** added that Deaver-Frannie FD has just had their busiest month ever on record.

Jim Thomas – Said construction at the South Big Horn Hospital is still on track and it's looking like completion will be sometime in November.

Jim Minchow – Said Lovell FD usually averages around 120 calls per year but they've already had over 135 calls so far this year. **Jim** said, "It's just been extremely busy."

Frankie Rohrer – After hearing **Ken's** die-hard compliment about him not being willing to retire and give it all up, like he had planned to do, **Frankie** just grinned and said that he just can't say no.

Ken Blackburn – Updated us on the Sheriff's Office communication services, news and dispatch statistics. **Ken** reminded everyone to be mindful of radio etiquette in that a channel may already be active.

NEXT MEETING:

The next LEPC meeting will be held on Thursday, September 17, 2015 at 6:00 PM at the Lovell Fire Hall. (Annual Appreciation Dinner Meeting)

ADJOURNMENT:

A motion to adjourn was made at 7:53 PM by **Chris Kampbell** and seconded by **Jim Minchow**. Motion carried.

Respectfully Submitted,

Teresa M. Caldwell

LEPC Secretary



Big Horn County

Local Emergency Planning Committee

Date 8-27-15 Location Wood & Pest Bldg.
Greybull

	PRINT NAME	AGENCY/ORGANIZATION	TOWN/CITY
1	FRANKIE RATHER	BYRON CO	Byron
2	David Caldwell	L&PC	Greybull
3	Jim Minchew	BHC Fire Dist #1	Lovell
4	John Hyde	BH County	"
5	Ernest L. Smith	BH Basin American	Greybull
6	Todd Deany	WDA CHS Basin VFD	Basin
7	MIKE NELSON	SHELL FIRE	Shell
8	KEN NELSON	South Searcher Rescue	BASIN
9	James Thomas	So Big Horn Hoops	Basin
10	Jerry Hill	Land Planning	County
11	Kami Neighbors	Public Health	Greybull
12	Garb Beck	Beck Consulting	MT.
13	Ken Blackburn	BHCSO	Greybull
14	Felix Carrizales	Commissioner	Burlington
15	Nick Loftus	BHCFPD # 5	Denver
16	Howard Ward	NAH SFR	Lovell
17	Dennis Woodward	NBH SFR	Cowley
18	Tom Lewis	SOI SFR	Lovell
19	Brandon Fitz Summons	COUNTY HEALTH	Greybull
20	Michael Schramm	B.H.C.F.D. #4	Burlington
21	MARK Tomaszewski	SBH SFR	Basin
22	Chelle Schwoppe	WDA/CHS	Cowley
23	Jerry Ewen	RHC	Shell
24	Jason Beal	EMC	Lovell
25	Vicky Case		

26	ANDY MELTZN	UT ARNG	GREYBELL
27	John Lane	MPUD	Highlands
28	Chris Rampbell	Basin P.D.	Basin
29	Jenna Caldwell	LEPC Secretary	
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TOWN OF BURLINGTON
PO Box 38
BURLINGTON, WYOMING 82411
307-762-3502 ph.
307-762-3600 fax
burlington@tctwest.net

WELCOME TO BURLINGTON!!!!

September 17, 2015

Mayors/Clerks Meeting Agenda

Heidi Brightly-----Town of Byron Reallocation of Concensus Funds

Heidi Brightly-----Byron Recreation Dept Reorganization Proposal

Heidi Brightly-----OSHA Update for Municipalities

Town of Burlington-----Feral Cat Issue

Jason Beal-----Pre-Disaster Mitigation Plan Update

Barb Beck-----Pre-Disaster Mitigation Plan

Thanks for coming!! :-)

**Big Horn County PDM Plan Update
Mayors' and Clerks' Meeting Agenda
Burlington, Wyoming
September 17, 2015**

Introductions

What is a PDM Plan and Why Update it?

- Quick review, review towns' roles

Natural Hazards in Big Horn County

- Take the hazard quiz together
- Overview of projects from previous plan
- Project types
- Project worksheets/project ideas

Next Steps

- Sept-Oct: release draft plan
- Oct-November: 30-day public comment period
- WOHS and FEMA reviews
- Local jurisdictions adopt plan

Handouts: briefing paper, hazard quiz, project types, project worksheets

Mayors' Meeting Notes
September 17, 2015
Burlington, WY.

Contractor Beck quickly reviewed what a PDM plan is and why the county is updating it. The overall goal of the plan is to prevent loss of life and property from natural disasters. Having a current plan also allows local jurisdictions to compete for project funds and receive post-disaster assistance if that should be needed. Barb handed out copies of the Briefing Paper to those who had not received one at the July meeting.

The group took the natural hazards quiz together and was quite interested in the information represented in the quiz. Barb explained that these items were a snapshot of the kinds of information that will be contained in the plan's chapters. Research has been conducted for each hazard to compile a history of past events, where and when they occurred, how frequently they occur, and what kinds of losses or damages resulted from the various hazards. This provides a factual basis for developing project ideas to prevent future incidents.

Barb passed out a handout of the projects from the previous plan and explained that each jurisdiction that wants to sign on to the plan must have at least one project in the plan. The jurisdictions will not be required to complete the projects, but should attempt to do so as resources are available. The projects are needs of the communities and county regardless of whether the resources to complete them are currently available. On the reverse side of the projects from the last plan were types of projects that could be considered for the plan.

Barb then handed out a worksheet to each mayor where they could list their projects and prioritize them, and gave some examples of the kinds of things they could identify for their communities. She had also reviewed their local land use plans and brought forward some ideas consistent with those plans where applicable. For the next few minutes the mayors and clerks worked on filling in project ideas and then turned in their worksheets. Barb will list these project needs in a table along with the mayors' priorities related to the projects. These will appear in the draft plan to be released this fall.

Next steps include pulling the entire draft plan together for a public comment period. The mayors whose communities maintain websites indicated an interest in posting the plan on each of their websites. Barb will provide a hard copy to the commissioners and the electronic copy will be posted on the county's website. The towns can download and post the plan on their sites. Disks will be sent to the Lovell and Greybull libraries.

Barb thanked the mayors and clerks for their participation and ideas!

Example of worksheet provided to each mayor at September 17 meeting.

**Big Horn County PDM Plan Projects
2015**

Jurisdiction: _____

Project Idea	Hazard(s) Addressed	Priority (High, Medium, or Low)

**Big Horn County Pre-Disaster Mitigation Plan
 Mayors' and Clerks' Meeting
 Burlington, WY.
 September 17, 2015**

Name	Representing	E-mail
Jaaguelyn Ernest	Town of Manderson	mandcrsn@tctwest.net
Deidre Clendener	Town of Frannee	frannietown@ktwest.net
Allison Weber	Deaver	deaver.town@tctwest.net
Wade Aagard	Burlington	jaagard@tctwest.net
Wink Bennett	BURLINGTON	burlington@tctwest.net
DEAN PETERS	BNSW	dw@depbncorner@hotmail.com
Valerie Beal	Town of Lovell	vbeal@townoflovell.com

Big Horn County Pre-Disaster Mitigation Plan
Mayors' and Clerks' Meeting
Burlington, WY.
September 17, 2015

Name	Representing	E-mail
Heidi BRIGHTLY	Byram, Wyo.	heidi.brightly@yahoo.com
VANCO PRREGOY	FRANKLIN	VANCO.VANCO.INC@GMAIL.COM
Felix Carrizales	Commissioner	felix.carrizales@gmail.com
Joel Peterson	Country	jlp@tetwest.net
Paul Thurt	Greybull	greytown@tetwest.net
Angel Montano	LOVELL	AMontano@yahoo.com
JEDEDIAH NEBEL	LOVELL	JNEBEL@townoflovel.com
Barb Beck	Beck Consulting	barbbeck@braman.net

10/30/2015 11:12 AM

BIG HORN COUNTY COMMISSIONERS' MEETING

**DRAFT AGENDA: November 3rd, 2015 - 9:00 a.m. Board of Commissioners Chambers
Big Horn County Courthouse, 420 West C Street, Basin, WY**

Chairman: Jerold S. Ewen; John Hyde, Member; and Felix Carrizales, Member; Lori Smallwood, County Clerk

#1	9:00 a.m.: Call to Order – Pledge of Allegiance by Felix Carrizales- <ul style="list-style-type: none">• Recognize Guests• Approve Agenda - Motion
#2	9:05 a.m.: Willie Bridges- Pryor Mtn. Engineering <ul style="list-style-type: none">• Roads & Bridge:• Engineering:
#3	10:00 a.m. <ul style="list-style-type: none">•
#4	10:30 a.m. Marquerite VanDyke & Carol Willard – Deputy County Clerks <ul style="list-style-type: none">• Accounts Payable & Payroll• Conference Call with Yvonne Adekalé-Wyoming Worker’s Compensation Program
#5	11:15 a.m. Carl Meyer, Airport Manager <ul style="list-style-type: none">• Airport Report
	12:00 Lunch Break
#6	1:00 p.m. Barb Beck – Consultant <ul style="list-style-type: none">• Pre Disaster Mitigation Plan Update
#7	1:30 p.m. Joy Hill – Land Planning <ul style="list-style-type: none">• Department Update
#8	2:00 p.m. Dean Peranteaux – Traveling Computers <ul style="list-style-type: none">• Phone system update & expansion planning
#9	2:30 p.m. Old and New Business <ul style="list-style-type: none">• Byron Solid Waste Disposal Dist. Board Appointment• Big Horn County Solid Waste Disposal Dist. Board Appointment• Big Sky Region First Choice Health Agreement (Public Health)• Approval of Minutes for October 6th & October 20th
	FOR THE GOOD OF THE COUNTY AND FOR GENERAL DISCUSSION- Consider signing and/or reviewing, discussing or rejecting the following: <ul style="list-style-type: none">• Financial Statements:• Monthly Report(s) and prepared correspondence review: LEPC Minutes (September, 2015)• Bond:• Cancellation of Taxes:
	Adjourn – Next BHC Commission Mtg: 11/17/15

MINUTES OF THE BIG HORN COUNTY COMMISSION MEETING

NAME: Big Horn County Commission TYPE: Regular Session

PLACE: Big Horn County Courthouse Commissioner's Chambers

DATE: November 3rd, 2015 TIME: 9:00 AM

Chairman: Jerold S. Ewen, Members present: John Hyde, Felix Carrizales

Others County Representatives: Lori Smallwood, County Clerk;

List of attendees on file.

The meeting was called to order at 9:00 AM by Chairman Ewen; followed by the Pledge of Allegiance led by Felix Carrizales. Ewen recognized guests and presented the agenda, a **motion** was made by Carrizales to accept the agenda as amended, the motion was seconded and carried.

Willie Bridges – Pryor Mtn. Engineering & Road and Bridge: Hovey reported on progress on Road 8, also reporting an issue resulting from a landowner who dug his pipe out of the county culvert without a utility permit. Discussion determined the county will not replace the existing culvert following precedent set during similar situations. Carrizales presented a situation on road 9 caused by a new fence and gate built too close to the roadway. Hovey & Bridges will discuss the issue with the land owner. Utility permits for Lane 31 (Horsecreek) and Lane 13 were presented and recommend for approval. Hyde moved to approve the two permits as presented, the **motion** was seconded and carried. There was discussion about illegal storage of cars on the right of way on Road 13. Bridges suggested a letter from the County Attorney might be the best form of follow-up. Hyde suggested that safety should be the guiding factor when enforcing right-of-way violations. By consensus the Commission agreed that the Sheriff should be asked visit with the offending party to discuss the issue. Wambeke shared that the gate at Beaver Flats is being locked again. Bridges confirmed the gate is locked and will request the Sheriff contact the land owner to emphasize that gates on county roads are not to be locked.

Bridges summarized a letter from WYDOT regarding work required by the county to upgrade the railroad crossing on Lane 22 ½. Bridges reported that the striping project has been completed and was well done. Bridges is concerned with the most recent draft of the agreement from Washakie County regarding shared maintenance of Lane 57. Discussion determined that Big Horn County doesn't feel an agreement of this sort is needed. Bridges will respond with a note to Washakie County accordingly. FEMA will be conducting final inspections on various 2011 projects. Ewen reported that additional digging and repairs were occurring on Horseshoe Lane and gave an update on his conversation with the Forest Service regarding FS Road 17. Further conversations with the Forest Service verified that they have no plans to correct maintenance problems reported by a landowner. Bridges reported that road counters have been placed in various locations with results to be reported soon.

Hyde moved to go to executive session for personnel issues, the **motion** was seconded and carried. The session was adjourned, no action was taken.

Marquerite VanDyke & Carol Willard -Deputy County Clerks: Van Dyke and Willard presented bills & payroll. Hyde moved to approve the bills and payroll as presented, the **motion** was seconded and carried. A conference call was placed with Yvonne Adekale of Wyoming Workers Compensation to discuss alternative ways to handle worker's

compensation payments. A request was presented to allow an employee to access donated sick leave. Hyde moved to approve 460 hours of sick leave to be used from the sick leave bank, the **motion** was seconded and carried. It was noted that a number of employees made generous donations to help a co-worker in need.

Carl Meyer – Big Horn County Airport Manager: Meyer presented the Airport report. Meyer submitted two NAVAID RFR's and reported that there will be some upcoming costs of about \$5,000 associated with fuel sales for the required credit card readers. Meyer will be meeting with L. Bruscano of the Wyoming Business Council about potential Airport projects and funding. Dusty Spomer & Carrie Brown of GDA attended to report on the Greybull project close out process, to submit RFR's for the Cowley project grants and reported on the proposed notice of award for Century with its contingencies for future FAA funding. Hyde moved to approve the notice of Award to Century, the **motion** was seconded and carried. Meyer presented an addendum to the GDA agreement for the changes on the Cowley project. Hyde moved to approve Addendum A to the GDA agreement for the Cowley project, the **motion** was seconded and carried.

Barb Beck- Consultant for the Big Horn County Pre-Disaster Mitigation Plan update: Beck gave an overview of the plan update process to date, including an overview of the plan contents which includes updated projects for each town and the county.

Joy Hill – Land Planning: Hill gave an update on department activities. There was discussion regarding the budget and scope of work for the NRMP-RFP.

Dean Peranteaux – Traveling Computers: Peranteaux gave an overview of the telephone system expansion and explained the need for redundancy in internet access. By consensus the Commission agreed to have TCI obtain an alternate internet provider for redundancy and set priorities of telephone system expansion to Library, Public Health and the Fair Grounds.

Kim Adams & Brandon Vilos - County Attorney: Vilos provided an up-date on the waterline question in an abandoned county road recently discussed with W. Bridges and will draft a response to the Water District's attorney. C. Meyer & G. Anderson, Assessor, each briefed the Commission on their attendance at the State Board of Equalization hearing held in October. Meyer and Anderson expressed concerns with the testimony that was given, the concentration on airport operations, difficulties with a phone hearing and the states recording system malfunctions. Meyer gave an overview of a Fixed Base Operator (FBO) case in Cheyenne and the requirement that a FBO is vital to the operation of the airport. Meyer & Anderson testified that B & G is an enhancement but not vital to operation of the Greybull Airport. Meyer expressed his appreciation for the large amount of work and time that has been committed to this issue by County Attorney Adams. Adams gave an overview of next steps and timeline for a decision.

Hyde moved to go into executive session for contractual issues, the **motion** was seconded and carried. The session was adjourned and no action was taken.

Old and New Business: Smallwood presented Byron Solid Waste and Big Horn County Solid Waste District board applications. Hyde moved to reappoint Brock Meir to the Byron SWD, the **motion** was seconded and carried. Carrizales moved to reappoint Carl Olson to the BHCSWD, the **motion** was seconded and carried. It was noted that there is one remaining position to be filled on the BHCSWD. Smallwood presented minutes from the October 6th & 20th, 2015 meetings for approval. Hyde moved to approve both sets of minutes as presented, the **motion** was seconded and carried. Smallwood presented a contract for BHC Public Health with First Choice Health, Hyde moved to approve the contract as presented, the **motion** was seconded and carried. Smallwood gave an overview of correspondence received from Security State Bank regarding changes in the county's credit cards. Discussion indicated that there is a need for credit card services and Ewen requested B. Lindsey do some research on options to avoid the new account charges.

Smallwood presented Good of the County Items and Mail: **Financial Statements:** Serena Lipp, District Court Clerk (October 2015) **Monthly Report(s) and prepared correspondence review:** LEPC minutes (September, 2015)

Hyde moved to adjourn, the **motion** was seconded and carried.

STATE OF WYOMING)

COUNTY OF BIG HORN)

I, Lori Smallwood, County Clerk and Ex-Officio of the Board of the County Commissioners, do hereby certify the above and foregoing to be a full, true and complete copy of proceedings of the Commission on November 3rd, 2015 **These minutes can be viewed electronically at** www.bighorncountywy.gov

Big Horn County Commissioners' Briefing
November 3, 2015

1) Release of draft and planning process to date

Started the process in May. Held a total of seven meetings including this one which should be more than sufficient for an update.

The kick-off public meeting in June in Greybull. No attendees—didn't get the word out very well. LEPC meeting following that with good attendance. Met with Mayors and Clerks in Deaver in July. Another public meeting in Greybull in August followed by an LEPC meeting. Met with Mayors and Clerks again in September to work on project ideas. Pulled draft together.

Draft out for public review October 30- November 30. Posted on county website, Greybull website, Lovell website—hopefully. Purchased legal ads in Basin Republic-Rustler and Lovell Chronicle. All three papers will have an article this week—either my news release or my news release with a local spin. Final meeting is this one. Since people just don't come to public meetings because they are too busy, it's best to just use regularly scheduled and noticed meetings.

For most plans there would be one group that would work with me on the plan all the way through. We did kind of a hybrid process for your plan because of how many local jurisdictions you have. It worked great to have the LEPC do some of the initiation work and then have the Mayors and Clerks identify the projects for their communities. I think it makes for a plan that reflects local priorities and has gotten everyone involved. Plus it saved costs to have so many folks together for the meetings and allows us to provide a strong local soft match for your grant.

2) Overview of Mitigation Projects

FEMA requires each participating jurisdiction to have at least one project. We have projects for each of the communities and projects for the county. Each of the mayors indicated that they want to participate and adopt the plan—so hopefully no issues there.

There a total of 45 mitigation projects in the plan. The county has nine. There is a nice mix of projects which is what FEMA likes to see. The only category of projects we are missing is regulatory types of projects, but they won't refuse to approve based on that and the mayors did not suggest any regulatory projects.

Talk through project tables.

3) What's left to finish up?

- Complete and close public comment period—November 30

Please make LEPC aware of the comment period.

- Address public comments
- Address comments from WOHS
- Provide disk for FEMA review (plan will be “approvable”)
- Address comments from FEMA-if any
- Adoption by local jurisdictions

Would like to get them adopted before new mayors come on board if possible, but it will be difficult and depend on FEMA review. If they don't adopt before January, we can put 2016 on your plan and give you another year before you have to update it.

I will send sample resolution

County will need to follow up and get copies for WOHS

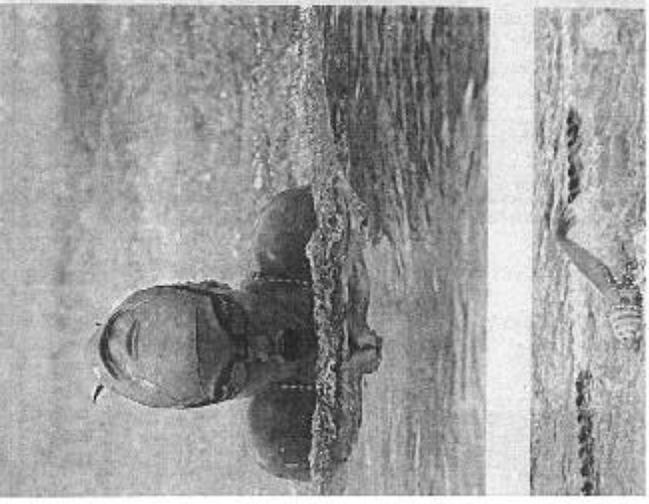
- FEMA approves plan

Because of the flooding in Niobrara County, there will be funds available for other WY counties to apply for. I think because we are so far along you will be eligible. The call for projects/applications will probably come out in February. If you have someone on board that can apply you might consider it. Greybull may wish to go after some money for their levee re-certification.

This is my last trip down to the county. Very little work to finish up, mostly waiting to get the approvals from the state and FEMA.

Any questions or comments?

Thanks for the opportunity to update your plan. Everyone I worked with was great and very responsive! It was especially nice to have you guys present for a number of the LEPC and Mayors and Clerks meetings. Sends a good message that peoples' safety is important.



To the water

DAN'S CORNER PHOTO
The Powell Lady Panthers swimming team is heading to the 3A Girls State Swimming Meet this week with three girls competing on the team from the Lowell area. Left, Katrina Twitchell powers through a stroke during a recent meet. Lower left, Aly Schneider competes in the backstroke event during a competition. Below, Rylie Kannard rests after an event.



Public Notices

Public Notice

Big Horn County Multi-Hazard Mitigation Plan is available at the county courthouse, Lowell Town Hall and on-line at www.bighorncountywy.gov. The 30-day public review period for the draft plan runs 9/30/15 - November 30, 2015. Send comments to barbeck@brcs.net.

Published: October 29 and November 5, 2015

Public Notice

CALL FOR BIDS
Big Horn County School District No. 2
Lowell High School, New Kilo Building

The Big Horn County School District No. 2 is receiving sealed proposals for New Kilo Building at the Lowell High School. The work consists of the following: The work will consist of a new 415 square foot kila building at the Lowell High School. This building will be constructed with foundation walls and footings, cold formed steel structure, EIFS siding to match the existing surrounding building, and a standing seam metal roof system. There will be minimal HVAC and electrical systems, as well as other work as defined by the Contract Documents.

Final copies of the Contract Documents will be on file after October 29, 2015, and open to public inspection in the office of Plan One/

BASIN
REPUBLICAN RUSTLER

Thursday, November 5, 2015



**Big Horn County
Multi-Hazard Mitigation Plan**
is available at the county courthouse,
Lovell Town Hall and on-line at
www.bighorncountyyw.gov.
The 30-day public review period for the draft plan runs
October 30 - November 30, 2015. Send comments to
barbeck@bresnan.net.



Statement

Big Horn County Newspapers, Inc

DATE: NOVEMBER 9, 2015

PO Box 640, Basin, WY 82410
Phone 307-568-2458 Fax 307-568-2459

BILL Beck Consulting
TO PO Box 870
Red Lodge, MT 59068

COMMENTS

DATE	DESCRIPTION	BALANCE	AMOUNT		
11/5-19	4" Ad - Multi-Hazard Mitigation - Basin Paper		\$60.00		
<i>Legal Ad announcing draft plan in two county papers</i>					
CURRENT	1-30 DAYS PAST DUE	31-60 DAYS PAST DUE	61-90 DAYS PAST DUE	OVER 90 DAYS PAST DUE	AMOUNT DUE
					\$60.00

REMITTANCE
Date
Amount Due
Amount Enclosed

PA 11/26

Make all checks payable to Basin Republican Rustler or Greybull Standard

Thank you for your business!

APPENDIX G: RESOLUTIONS OF ADOPTION

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Basin recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Basin fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Basin desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Basin demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Basin adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Burlington recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Burlington fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Burlington desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Burlington demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Burlington adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Byron recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Lusk fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Byron desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Byron demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Byron adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Cowley recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Cowley fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Cowley desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Cowley demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Cowley adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Deaver recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Deaver fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Deaver desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Deaver demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Deaver adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Frannie recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Frannie fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Frannie desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Frannie demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Frannie adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Greybull recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Greybull fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Greybull desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Greybull demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Greybull adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Lovell recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Lovell fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Lovell desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Lovell demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Lovell adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, the Town of Manderson recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, the Town of Manderson fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, the Town of Manderson desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for the Town of Manderson demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the Town of Manderson adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

Resolution # _____

Adopting the Big Horn County Multi-Hazard Mitigation Plan

Whereas, Big Horn County recognizes the threat that natural hazards pose to people and property within our community; and

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

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 (“Disaster Mitigation Act”) emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

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

Whereas, Big Horn County fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Wyoming Office of Homeland Security and the Federal Emergency Management Agency Region VIII officials have reviewed the Big Horn County Multi-Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body;

Whereas, Big Horn County desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Big Horn County Multi-Hazard Mitigation Plan.

Whereas, adoption by the governing body for Big Horn County demonstrates the jurisdiction’s commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that Big Horn County adopts the Big Horn County Multi-Hazard Mitigation Plan.

Passed: _____

Certifying Official

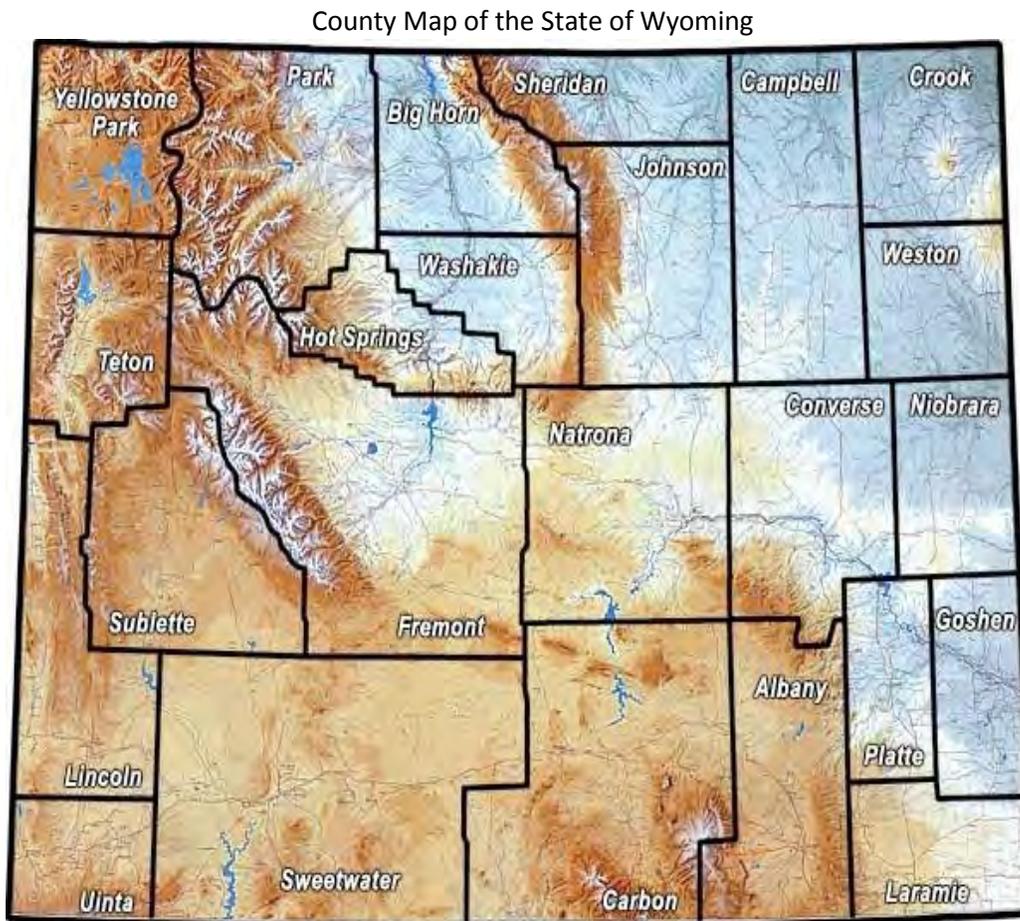
APPENDIX H: COUNTY PROFILE



GENERAL DESCRIPTION

To be able to fully analyze how physical hazards and threats relate to Big Horn County and the communities that lie within its external boundaries, it is important to understand the pertinent or unique facts regarding geographic, demographic, growth and economic features of the area.

The project area for this PDM Plan is Big Horn County, Wyoming and the incorporated cities and towns within its boundaries stipulated as Lovell, Greybull, Basin, Manderson, Burlington, Byron, Frannie, Deaver, and Cowley. The county is located in north central Wyoming, as pictured below in Figure 3.1, occupying 3,136 square miles. The State of Montana meets its northern boundary.



Natural Features

Big Horn County is situated within the Big Horn Basin of Wyoming. Elevations in the county range from 3600 at basin floor, and soar to 13,187 feet above sea level at the top Cloud Peak in the Big Horn Mountain Range.

Mountains that surround this large regional basin create some formidable natural geographic barriers. The jurisdictional boundary of the county actually travels down the spine of the Big Horn Mountains on its eastern border. Between the mountains that ring the region, the landscape consists of acres of foothills, prairie, and desert badlands. The landscape is interspersed with thousands of irrigated agricultural acres fed by an intricate system of canals and irrigation ditches, with water supplied by various existing reservoirs and rivers that flow through the county.

Minerals & Natural Resource Development

Several different types of minerals are mined throughout the County. Most mines are surface mines. One known exception is the underground Rockwell Petroleum Mine located near Greybull. Extraction operations have the ability to move around the County according to need and supply. Bentonite processing plants proliferate throughout the jurisdiction. A gypsum plant operates southeast of Lovell.

The future of energy development in the County depends on both supply and demand, and given the extent of the federal land in the County--primarily Bureau of Land Management and National Forest--on federal policies.

Waterways

Big Horn County ranks sixth in number of irrigated acres, compared among the State's twenty-three counties. Water for agricultural use is vital to the County's economy and is contained and diverted from the Big Horn, Shoshone, Nowood, and Greybull Rivers, as well as smaller creeks such as Beaver Creek, east of the unincorporated town of Shell.

Big Horn River

The Wind River flows north from Fremont County and Boysen Dam, where it is renamed the Big Horn River continuing its path north through Big Horn County and into Montana. This primary waterway flows for approximately 60 miles through the county, paralleling major transportation route U.S. Hwy. 16-20 and 310.

Tributary - Nowood River

The Nowood River flows southeast across the southern boundary of the county (approx. 21 miles) until it reaches the Town of Manderson at the junction of U.S. 16/20, State 31 and 789. There it joins the Big Horn River's journey north to Montana and Yellowtail Dam.

Tributary - Greybull River

The Greybull River travels approximately 33 miles within county boundaries from the west county line to the Big Horn River. The source of the Greybull River is to the west of Big Horn County above the town of Meeteetse, situated in neighboring Park County. As the waterway wends its way to Meeteetse, it flows past the Upper and Lower Sunshine

Reservoirs and is fed by water collected in the Sunshine Dams from snow melt and other smaller creeks and streams. Downstream, water is diverted from the Greybull River to fill Roach Gulch Reservoir, to supply water for crops and livestock for the many farms and ranches existing in this portion of the Big Horn Basin. As the Greybull River continues its journey along the floor of the Big Horn Basin, it travels in close proximity to a portion of Wyoming County Road 40 and Highway 30, from west to east, until it makes its way into the Big Horn River directly above the Town of Greybull.

Tributary – Shoshone River

On the upper end of the county, the Shoshone River flows west to east from the Buffalo Bill Cody Dam located above Cody in neighboring Park County, eventually traveling near the town of Byron and just north of the Town of Lovell, and emptying into Big Horn Lake. It flows for a distance of approximately 24 miles through Big Horn County before emptying in Big Horn Lake.

Tributary – Shell Creek

Flowing west out of the Big Horn Mountains through the unincorporated town of Shell, Shell Creek is joined by Trapper and Beaver Creeks, as well as several others before joining the Greybull River several miles north of the city of Greybull.

Climate

Because of the varied terrain and geology of Big Horn County the climate is diverse. According to the Wyoming Climate Atlas (2004), Big Horn County has averaged from 6-10 inches, all the way up to 81-90 inches of precipitation annually for the 30-year period 1971-2000. Western areas of the County see little precipitation while the crest of the Big Horn Range receives a great deal more precipitation much of it in the form of snow. Actual snow cover in lower elevations through the winter averages two inches, while the mountain elevations typically experience deep snow throughout the winter months.

Summer temperatures average 75 to 85 degrees during the day and 50 degrees at night across much of the County. Deep winter months average 15 to 25 degrees during the day and 5° F at night. Spring and fall months are generally moderate and pleasant. However, temperature extremes have been recorded as high as 112 degrees F in the summer to -43 degrees below during the winter. Humidity is low, making summer temperatures more tolerable and cold temperatures less penetrating. Mean average annual temperatures range from 20-25 degrees Fahrenheit high in the Big Horns to 40-45 degrees in the lower western areas of the County. (Wyoming Climate Atlas, 2004) High elevation lands are largely public and the population centers of the County lie in the drier, more moderate western areas.

Transportation & Infrastructure

Big Horn County is characterized by its distances, and the fact that nine incorporated towns and four unincorporated towns are spread over the entire length and width. There are 70 miles from the

southern-most town of Manderson to the northern-most town of Frannie. The County's width also spans just over 70 miles east to west from the top of Burgess Junction in the Big Horn Mountains, to the western most town of Burlington.

Highways

There are four primary transportation routes that cross Big Horn County. **US Highway 16-20** parallels the Big Horn River on the east and State Hwy. 433 on the west, then slicing south to north from Worland to Manderson and on through Basin and Greybull. **U.W. Hwy 310** begins at the intersection of Highway 16-20 five miles northwest of Greybull and travels through Lovell, Cowley, Deaver and Frannie into the State of Montana.

Country Road 40 is a secondary connecting route traveling east - west from the Park County, Meeteetsee area to just south of the Town of Burlington where it merges with State Hwy 30 traveling east into Basin.

U.S. Alternate Route 14A travels west and east from Yellowstone National Park and Cody through the town of Byron and Lovell and continuing east up into the Big Horn Mountains. This route parallels the Shoshone River through Lovell, until it terminates at Big Horn Lake east of Lovell. This route is closed in the winter months.

U.S. Primary 14 also travels west and east out of Cody, transecting **U.S. Hwy 1620** in the Town of Greybull and continuing east through Shell and up into the Big Horn Mountains. It eventually joins **Alternate 14** to become one transportation route at Burgess Junction. This route drops down the eastern slope of the Big Horn Mountains.

Railroad

The Burlington Northern/Santa Fe (BNSF) Railroad line generally follows **U.S. 310** and **U.S. 16-20**, ultimately traveling right next to the Big Horn River passing through the towns of Frannie, Deaver, Lovell, Greybull, Basin, and Manderson.

Air

Big Horn County hosts two airports. South Big Horn County Airport located two miles northwest of Greybull has two asphalt runways; 100' wide and 6302' long and 75' wide by 3699' long. North Big Horn Airport is located two miles north of Cowley and also contains two runways. The first is asphalt, 75' wide by 5199' in length. The second is dirt, measuring 65' wide and 1856' long. Both airports have lights and basic services. These airports are used for general aviation. Additionally, several sod runways are scattered across the county. South Big Horn Hospital near Basin and North Big Horn Hospital in Lovell both have helispots. Commercial air service is located to the west in Cody, to the east in Sheridan, and to the north in Billings, MT.

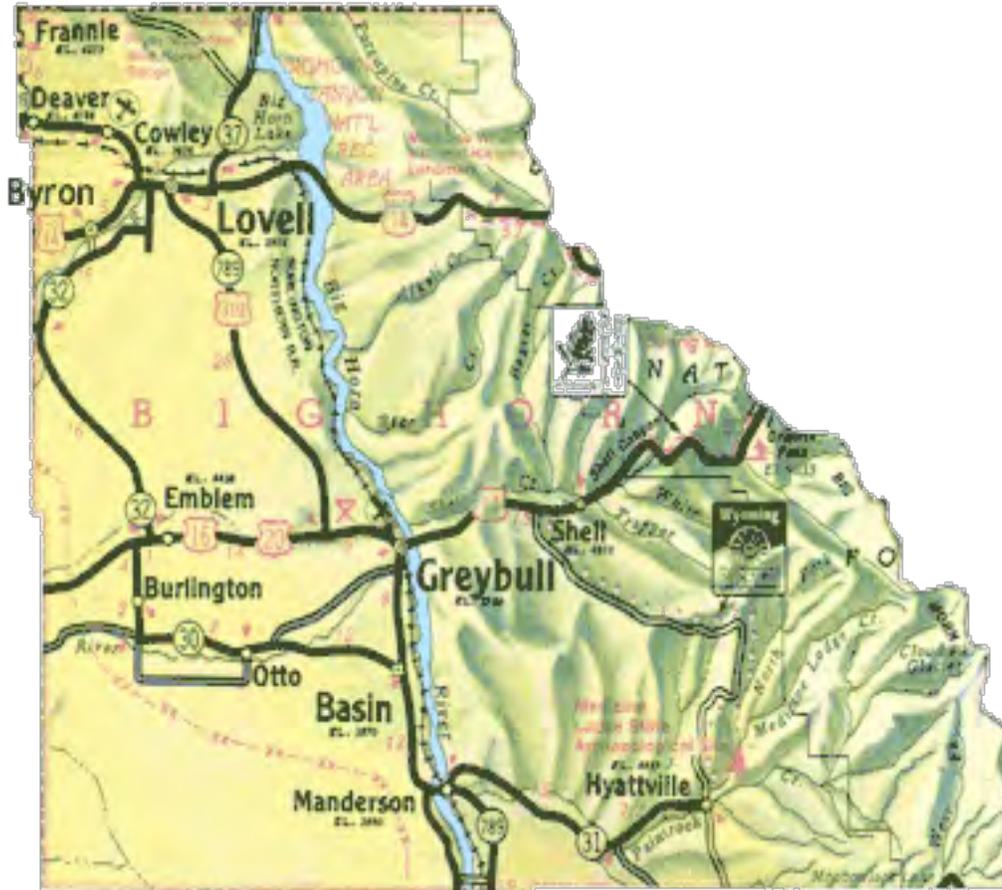
Pipelines

A fourth mode of transportation must be considered as relevant in describing Big

Horn County transportation systems; that of pipeline transportation or carrier. There are at least five major buried eight to fourteen-inch pipe conveyances carrying natural gas, crude oil, and some H2S product across the county in various locations, as reported to local officials by 'the Pipeline Group.'

Pipelines may be found at very, very shallow depths due to wind and water erosion or other unspecified circumstances, or may be found buried up to 20-feet deep. Specified routes and locations of major industrial pipelines are not made public, but are known by the emergency management, fire, and law enforcement officials within the County.

Features of Big Horn County, Wyoming



Municipal Water Supplies

Much of Big Horn County is served by one of the several public drinking water systems. Each incorporated town and the unincorporated towns of Hyattville and Shell each have water systems. There are also several rural water systems that provide service to extensive unincorporated areas of the county. The four largest water systems are those served by the (1) Shoshone Municipal Pipeline, (2) South Big Horn County Water Supply (3) Northern Supply Pipeline, and (4) Cowley water supply. Three of four of these water supplies are derived from deep artesian wells of up to 5,000 feet deep, pumping as much as 1,000 gallons per minute. The Shoshone would be the exception and flows from the Buffalo Bill Reservoir located outside of Cody.

There are no water treatment plants located in Big Horn County, with chlorination regimes and testing protocols in place. The Northern Supply Pipeline and the South Big Horn County Water Supply derived from four different artesian wells, serve several counties and are managed by the Big Horn Regional Joint Powers Board. The pipelines under the Big Horn Regional umbrella are sourced from the artesian wells in the Manderson area serve communities and residences in Washakie, Hot Springs, and Big Horn Counties. Redundancy and looping has been built into the system so that should one of the four wells be compromised, another part of the system can still supply the needs of users on the South Big Horn, Northern Supply, or Big Horn Regional systems.

Population

According to the U.S. Census Bureau, the estimated County population on July 1, 2014 was 11,930. The town of Basin is the county seat, with the two larger towns of Greybull and Lovell lying 8 and 35 miles north of Basin, respectively. These three cities are the primary population centers of the County. The estimated populations as of 2013 for the other incorporated cities and towns and their corresponding populations are presented below—taken from www.city-data.com. The Census Bureau does not estimate populations between the decennial censuses for small communities.

Population of Incorporated Municipalities

Community	2013 Estimated Population
Basin	1312
Burlington	316
Byron	615
Cowley	710
Deaver	180
Frannie	162
Greybull	1885
Lovell	2432
Manderson	188

Each of the above communities with the exception of Frannie and Deaver showed a slight population increase since the 2010 PDM plan. The population of Frannie has decreased slightly. The population of Deaver remained the same. Approximately 65% of the County’s population resides in one of the incorporated communities.

The remainder of approximately 4,140 residents (or 35% of the County’s population) is either scattered across the landscape of the County or reside in one of the four unincorporated towns of Hyattville, Shell, Otto, and Emblem. According to the Census Bureau’s Quickfacts, Big Horn County has a population density of 3.7 persons per square mile. This contrasts with the national average of 87.4 persons per square mile.

Economy

In 2013, the three industrial sectors in Big Horn County with the largest earnings were Government, Farm, and Construction. Government had \$86.1 million in earnings and provided 1,587 jobs—making it the most significant economic sector in the County by a large margin. The Farm sector had \$26.1 million in earnings, and Construction produced \$21.5 million in earnings. However, mining (including fossil fuels), rather than farming had the second highest number of jobs with 699. Construction, third in both earnings and number of jobs provided 462 jobs in 2013.



From 1970 to 2013, the population increase in the County was 17%. During this same period, the number of jobs grew from 4,542 to 6,904--a 52% increase, while personal income grew from \$215.5 million to \$457 million--a 112% increase. Total personal income in the County in 2013 was \$456,997,000. Of this total personal income, \$258,430 was labor earnings and \$198,567 was non-labor earnings. Non-labor earnings (43% of personal income in Big Horn County) include dividends, interest, and rent; age-related transfer payments, hardship-related transfer payments, and other transfer payments. (Source: Economic Profile System (EPS.) EPS compiles and analyzes publicly-available data from the U.S. Department of Commerce, Bureau of Economic Analysis, the Department of Labor, Bureau of Labor Statistics, and the U.S. Census Bureau.)

Big Horn County Income and Earnings

Per Capita Personal Income (2013)	\$38,102
Average annual earnings per job (2013)	\$42,540

Source: *Headwaters Economics Socioeconomic Profile for Big Horn County, WY. August 11, 2015*
www.headwaterseconomics.org

The total number of jobs in the County in 2013 was 6,904. This is an increase of 134 jobs for the period 2010-2013. Services related jobs made up 41.1% of the total number of jobs, Non-service related jobs made up 33.4% of all jobs, and Government jobs made up the remaining 23.0% of the number of jobs in Big Horn County.

The average annual unemployment rate for the County in 2014 was 4.7%. For the months in 2015 to date the rate has been at a high of 5.7% in March to a low of 3.7% in May. There is some seasonality to the unemployment picture in Big Horn County.

According to the 2012 Census of Agriculture conducted by the National Agricultural Statistic Service (NASS), Big Horn County contained 627 farms or ranches in 2012 compared to 621 in 2007. The average farm size in 2012 was 483 acres compared to the average farm size 705 acres in 2007. The amount of land in farms was 302,555 acres in 2012 and 438,003 in 2007. The average farm size and the number of acres in farms each decreased by 31% during this five-year period. So while the total number of farms in the county stayed relatively constant, both the average farm size and total acreage in farms decreased by approximately one third.

Crop sales of over \$53 million exceeded livestock sales of just under \$36 million. Livestock production numbers are made up primarily of cattle and calves, and sheep and lambs. The highest value crop production in 2012 in descending order was in hay, barley, dry beans, sugar beets, and corn. Big Horn County ranked seventh in the State of Wyoming in 2012 agricultural sales with a figure of \$88,836,000. (USDA, NASS Census of Agriculture)

Land Use

The county is a rural public lands county, with seventy-seven percent (77%) of the acres owned and managed by the federal government. Bureau of Land Management (BLM) acres are found across the county and account for the largest holding. The Big Horn Mountains--largely National Forest--run north-south on the eastern side of the county. Big Horn Canyon National Recreational Area under the jurisdiction of the National Park Service, and Medicine Lodge State Park are also part of the county profile of public lands.

Surface Management	Acres	% of Total
Bureau of Land Management	1,160,612	57.2
National Forest	351,226	17.3
Private	383,614	18.9
State of Wyoming	83,055	4.1
National Park Service	26,725	1.3
Bureau of Reclamation	20,324	1.0
Department of Defense	3,542	0.2
Total	2,029,102	100

Bureau of Land Management (BLM) records/ Big Horn Co. FLU

Private lands are largely used for agricultural, residential, and industrial purposes.

Development Trends

The following information on development trends was obtained from the County Planner, the Mayors, and planning department records.

Mayors from each of the nine incorporated communities were asked to report on development within their communities at the July 16 Mayors’ and Clerks’ meeting held in Deaver. The following table summarizes their responses.

According to Big Horn County Planner, Joy Hill, there is not much development activity in the unincorporated areas of the county. Based on development permits, septic permits, floodplain development permits, subdivision applications, and change of address requests current activity is slightly less than average. Hill characterized the situation as “very stable.” (phone interview on August 11, 2015)

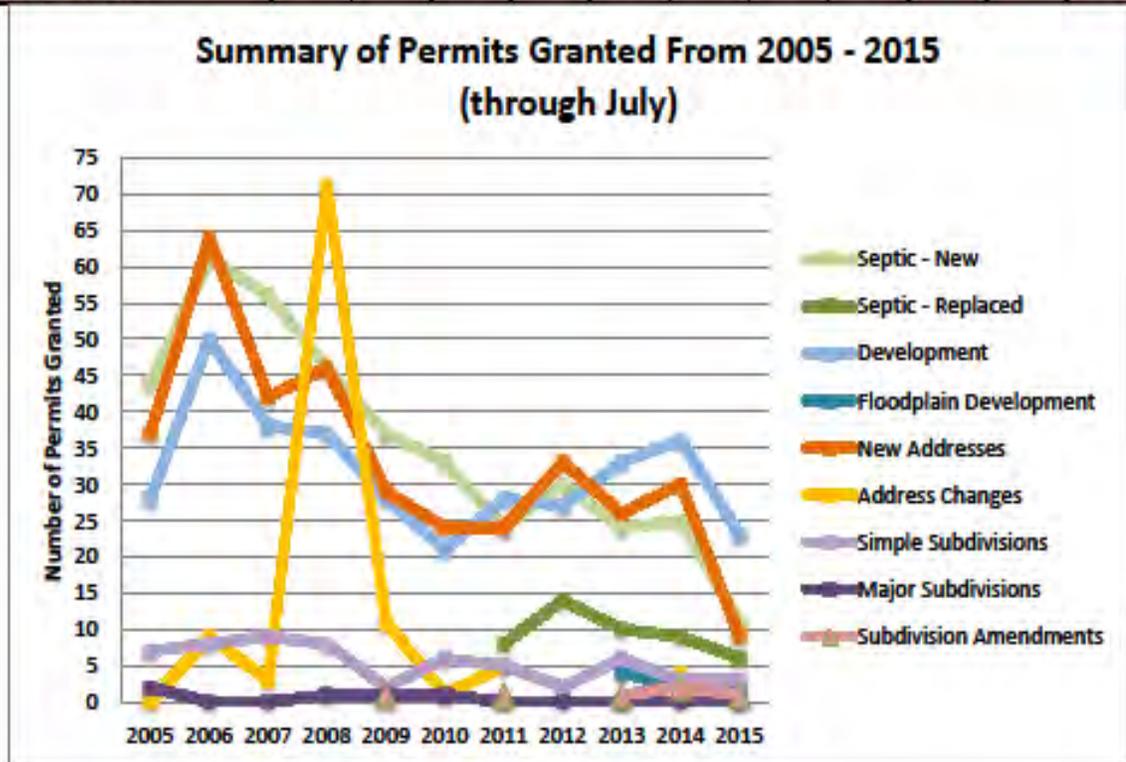
Development by Community

Community	Type	What	Where	When
Basin	Unknown			
Burlington	Residential-govt.	Husky Phase III Subdivision	In town	In progress
Byron	Unknown			
Cowley	Not present			
Deaver	Residential	Misc new home construction	In town	3/year
Deaver	Industrial	Manufacturing facility	Old school	Possible
Frannie	Industrial	Individual farm development	Outside town	In progress
Frannie	Government	Park development	In town	Soon
Frannie	Residential	Nuisance cleanup	In town	In progress
Greybull	Residential	Looking for development	E of town	5-10 years
Greybull	Commercial/Ind.	Developing business park	SE corner of town	Next 5 years
Greybull	Government	New Forest Service building	S of town	Completed
Lovell	Residential	Residential building	Clay Subdi.	In progress
Lovell	Residential-govt	Senior housing development	10 th Street	Future
Lovell	Industrial	Factory improvements	Western Sugar	In progress
Lovell	Government	Replacing lift station	Sewer Lagoon	Fall 2015
Manderson	None	N/A	N/A	N/A

Source: Individual respective Mayors and Town Clerks, July 16, 2015

Building Permits 2005-2015

Permit Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Septic - New	44	61	56	46	37	33	24	30	24	25	11
Septic - Replaced							8	14	10	9	6
Development	28	50	38	37	28	21	28	27	33	36	23
Floodplain Development									4	2	2
New Addresses	37	64	42	46	29	24	24	33	26	30	9
Address Changes	0	9	3	71	11	1	5	2		4	
Simple Subdivisions	7	8	9	8	2	6	5	2	6	3	3
Major Subdivisions	2	0	0	1	1	1	0	0	0	0	0
Subdivision Amendments					1		1		1	2	1



Source: Big Horn County Planning Office

Land Use Plans

This 2010 Big Horn County Future Land Use (FLU) Plan is a comprehensive document about Big Horn County land use, including past and future development.

As stated in the FLU, it is anticipated that the county will have slow growth overall; that the growth will be uneven among the municipalities; and the unincorporated areas will see a major portion of the growth. In 2000, the unincorporated areas of the county accounted for 34% of all households in the county and that proportion was the same in 1990 as well. This percent remained quite stable in 2015. If the proportion of households in the unincorporated areas continues at 34% of all households in the county, by 2020 it would result in an additional 121 households under the moderate household projection scenario, 277 under the strong growth scenario, and 463 under the very strong scenario.

It is most likely that both Burlington and Cowley are planning on growth rates greater than the rest of the county. Growth often attracts growth, so the county can likely anticipate increased population (and related development) in unincorporated areas near growing municipalities. Please see the Review of Existing Plans section in Chapter 2 for remarks on how each of these plans may relate to the PDM Plan.



Big Horn River at Greybull

Conclusion

A broad description of topography, land use, growth trends, climate, local economy, populations, and infrastructure provides a foundation with which to consider the hazards to which Big Horn County may be vulnerable.

This Plan, particularly the Section 3 - Risk Assessment will outline each hazard in detail and how it may affect Big Horn County and the nine

incorporated cities and towns within. Additional hazards may exist that were not apparent during the development process, and certainly, disasters can occur in unexpected ways.

Although any and all hazards cannot be fully mitigated, the intent of the Big Horn County PDM Plan is to help local government, public safety officials, and citizens better understand the various hazards as they truly exist.