Hazard Mitigation Plan 2023-2028

Assistance provided by:

WSP

March 2023

Table of Contents

1 Introduction

Archuleta County, Colorado, including the participating jurisdictions of the Town of Pagosa Springs, Pagosa Fire Protection District (FPD), and the Pagosa Area Water and Sanitation District (PAWSD) have prepared this local hazard mitigation plan to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. This plan documents Archuleta County's hazard mitigation planning process by identifying relevant hazards and risks and identifying the strategy the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed to make Archuleta County and participating jurisdictions eligible for certain federal disaster assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grants including the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA) and Pre-Disaster Mitigation (PDM) program, as well as to make the County and its jurisdictions more disaster resistant.

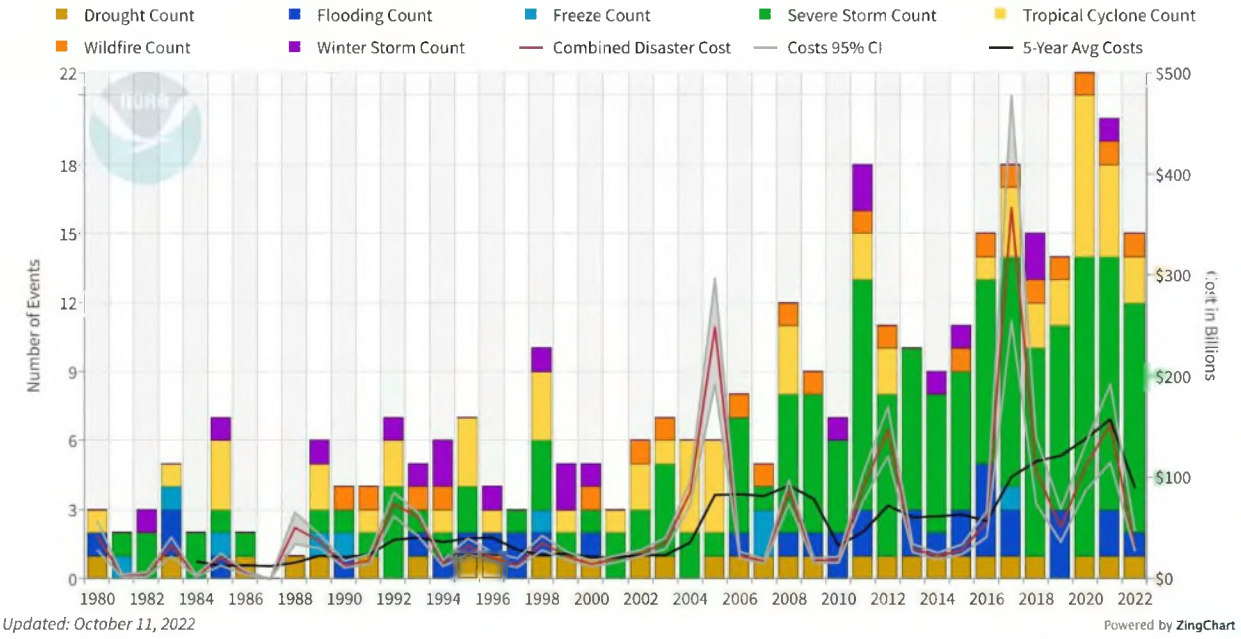
The planning area geographic extent also includes southern Hinsdale County and southern Mineral County, which are within the County's Response Area. The plan covers hazards that might affect these areas, but each county has its own hazard mitigation plan. It is important to note that a portion of Archuleta County is Southern Ute Indian tribal lands; the Southern Ute Indian tribe is a sovereign nation and has its own Hazard Mitigation Plan. On these lands, this plan is only a resource to support the tribe's planning and operations.

Additionally, approximately 50% of the land in Archuleta County is managed by the U.S. Forest Service (USFS). Other federal land managers include the Bureau of Indian Affairs (BIA) and the Bureau of Land Management (BLM). While the federal government ultimately has jurisdiction in these parts of the County, the Archuleta County Hazard Mitigation Plan could also be used to support federal hazard mitigation efforts. In particular, the hazard profiles and risk assessment in the Hazard Mitigation Plan could be useful for supporting the federal government's efforts related to wildland fire mitigation and watershed protection. The USFS was an active partner during both the original development and update of this plan.

1.1 Background and Scope

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Additional expenses to insurance companies and non-governmental organizations are not reimbursed by tax dollars, making the costs of disasters several times higher than calculated amounts. Figure 1-1 shows the number and type of natural disasters in the US that have done more than one billion dollars in damage (adjusted for inflation per the Consumer Price Index), showing how the frequency and cost of major disasters have risen over the past several decades.

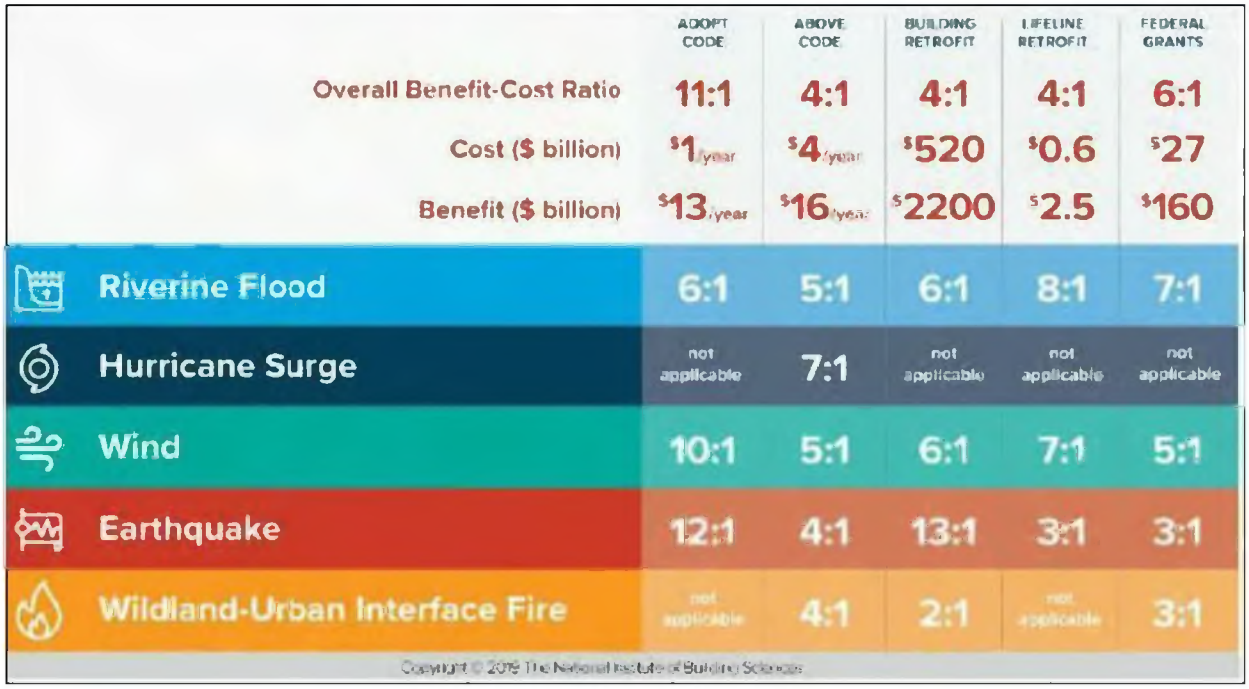
Figure 1-1 Billion-Dollar Disasters in the US, 1980-2022



Source: National Oceanic and Atmospheric Administration (NOAA)

However, some types of hazards are predictable, and much of the damage caused by these events can be mitigated through the use of various zoning, construction and permitting vehicles and other preventative actions. Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $6 in avoided future losses in addition to saving lives and preventing injuries, as illustrated in Figure 1-2.

Figure 1-2 Financial Benefits of Hazard Mitigation



Source: National Institute of Building Sciences, Natural Hazard Mitigation Saves: 2019 Report

This Plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390, also known as the DMA) and its implementing regulations, which establish the requirements local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

This Plan builds on 10 years of mitigation planning in Archuleta County, starting with the County's first stand-alone HMP in 2011-12, which was subsequently updated in 2017. This Plan is a comprehensive update to the 2017 plan. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the community and its property owners by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The Archuleta County planning area is committed to reducing future disaster impacts and maintaining eligibility for federal funding.

1.2 Multi-Jurisdictional Planning

This plan is a multi-jurisdictional plan. The planning area encompasses all of Archuleta County, the incorporated Town of Pagosa Springs, Pagosa FPD, PAWSD, and the southern portions of Hinsdale County and Mineral County within the Archuleta County Emergency Management Response Area. This area also includes Southern Ute Tribal Lands. As such, the tribe has been an important stakeholder partner in the planning process. All local units of government in the County were invited to participate in the planning process. The decision whether or not to participate in this process was a local decision, based on local community needs. Local governments have the options to not prepare a plan, to prepare a stand-alone plan for their jurisdiction, or to participate in a multi-jurisdiction or county-wide plan. The following entities meet the definition of a local government per the DMA regulations and have opted to participate in this

effort and are seeking FEMA approval of the 2022 updated version of this plan. Entities that participated in the plan are noted below, which are the same entities that participated in the 2017 Plan. Additional detail about participation can be referenced in Chapter 3, and Appendix C and D.

Participating entities:

- Archuleta County
- Town of Pagosa Springs
- PAWSD
- Pagosa FPD

1.3 Plan Organization

The Archuleta County Hazard Mitigation Plan is organized as follows:

- Chapter 1: Introduction
- Chapter 2: Community Profile
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance

Appendix A Glossary

Appendix B References

Appendix C Hazard Mitigation Planning Committee

Appendix D Planning Process Documentation

Appendix E Plan Approval and Adoption

2 Community Profile

2.1 Geography and Climate

The Archuleta County Response Area, depicted in Figure 2-1, encompasses the entirety of Archuleta County, the Southern Ute Indian tribal lands, and the southern portions of Hinsdale and Mineral Counties. The northern border of the Response Area, which crosses through Hinsdale and Mineral Counties, is roughly coterminous with the Continental Divide. The Response Area's northern border deviates briefly from the Continental Divide in the southeastern part of Mineral County.

The Archuleta County Response Area is located in southwest Colorado near the headwaters of the San Juan River. The terrain in the Response Area ranges from the San Juan Mountains in the northern half of the Response Area to mesas and valleys in the southern part of Archuleta County. The Response Area is bordered by La Plata County to the west, the southern portions of Hinsdale and Mineral County to the north, Rio Grande County to the northeast, Conejos County to the east, and the state of New Mexico to the south. Archuleta County encompasses 1,364 square miles and includes the incorporated municipality of Pagosa Springs. Roughly 50% of the land in Archuleta County is public land managed by the U.S. Forest Service (USFS) and Bureau of Land Management (BLM). 15% belongs to the Southern Ute Indian Tribe, and the remaining 35% is privately owned. The portion of Hinsdale County covered by the Response area is 295.7 square miles. The Mineral County portion covers 222 square miles. The USFS manages the large majority of the land in these parts of the Response Area. Land stewardship in the Archuleta County is depicted in Figure 2-2.

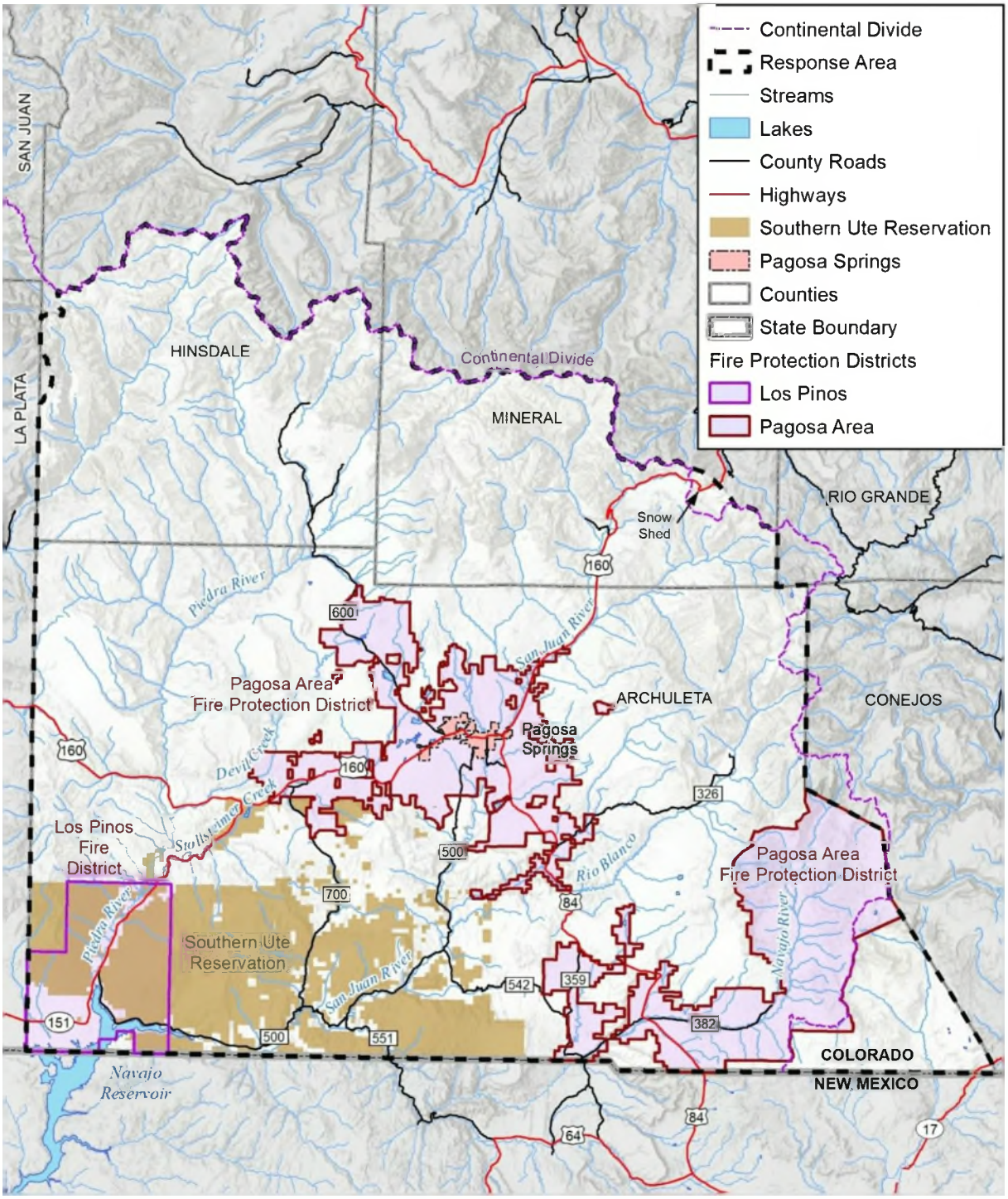
The Archuleta County Response Area has four distinct seasons and averages 300 days of sunshine per year. The National Centers for Environmental Information (NCEI) *Climate at a Glance* reports temperature data from 1895-2022. In Archuleta County, the coolest month is January with an average temperature of 21.7 degrees Fahrenheit. The lowest temperature recorded in the County was -4.7 degrees Fahrenheit and occurred in January of 1919. The warmest month in the County is August with an average temperature of 62.4 degrees Fahrenheit. The highest temperature recorded in the County was 82.5 degrees Fahrenheit in August of 2020. The NCEI *Climate at a Glance* shows a trend of increasing temperatures in the County from 1895 to 2022.

Average annual precipitation is 17.35 inches per year, and average annual snowfall is 67.4 inches per year. Vegetation in the area consists of ponderosa pine and mixed coniferous forests. Most of the land in the County lies at an elevation of about 7,000 feet, but elevation overall varies from roughly 5,900 feet to over 13,300 feet at the highest point in the County.

Temperatures in the Mineral County portion of the Response Area tend to be much cooler due to the higher elevation. At Wolf Creek Pass in Mineral County, the average high temperature is in July at 65.8 degrees with an average low of 4.4 degrees in January. The elevation at Wolf Creek Pass is estimated at 10,857 feet. The average total annual precipitation at the Pass is 45.39 inches, and the average total annual snowfall is 435.6 inches according to the Western Regional Climate Center (WRCC).

The climate in southern Hinsdale County is generally cooler than that of Archuleta County and warmer than the climate in Mineral County. The average high temperature at the Palisade Lakes WRCC station is 78.3 degrees, occurring in July. January is typically the coolest month, with an average minimum temperature of 1.4 degrees. Southern Hinsdale County gets more precipitation per year than Archuleta County; the average total annual precipitation is estimated to be 21.99 inches with an average total annual snowfall estimate of 128.7 inches.

Figure 2-1 Archuleta County Emergency Response Area



Map compiled 7/2022; intended for planning purposes only.
Data Source: Archuleta County, CDOT

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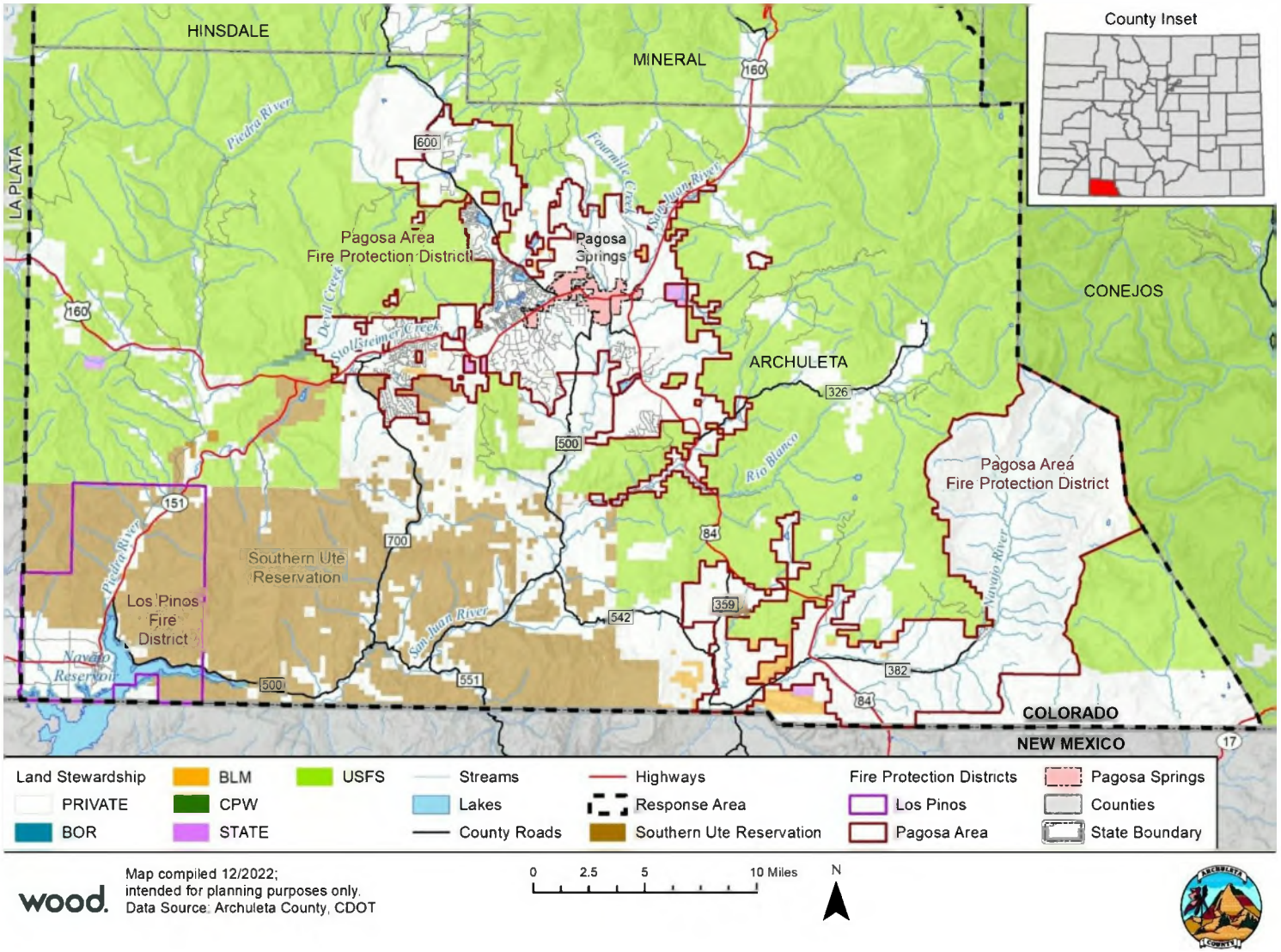
Figure 2-2 Archuleta County Land Stewardship



2.2 History

The land that comprises Archuleta County was originally home to the Ancestral Puebloans, Ute, Navajo, and Apache. The area was later claimed by Spain. It then became part of the Territory of Northern Mexico after the Mexican Revolution. It became part of the U.S. and Utah Territory after the 1848 war with Mexico. Later, the Archuleta County area was absorbed into the Colorado Territory. Archuleta County as it is known today was created on April 14, 1885. The land area that makes up the County was originally part of Conejos County. Archuleta County was named for "J.M. Archuleta, the patriarch of one of the old Spanish families of New Mexico, and in honor of Antonio D. Archuleta, the [state] Senator from Conejos County at that time" (http://www.sangres.com/colorado/archuleta/index.htm). The Town of Pagosa Springs was incorporated on March 2, 1891. It was named after the hot springs in the area, "one of the largest and hottest natural springs in the world, and one which continues to be celebrated for its therapeutic powers" (http://www.pagosa.com/pagosa_hot_springs.php). According to the cultural historian of the Southern Ute Indian Tribe, Pah gosah is a Ute term that has been translated as "water that has a strong smell."

Pagosa Springs evolved into lumber town with the arrival of the railroad. Pagosa Springs is the only incorporated community, but other populated areas include Arboles and Chromo. The Town of Pagosa Springs is a Home Rule Municipality.

2.3 Population

Archuleta County has been steadily growing since 2010. The estimated 2010 county population was 12,136 people and has increased by 12%; estimated to be 13,588 in 2020. The Town of Pagosa Springs is the County's principal population center, comprising 14.6% of the total County population. Population estimates for the Town of Pagosa Springs, and the County are provided in Table 2-1.

Table 2-1 Archuleta County Population Estimates 2010-2020

Jurisdiction	2010	2016	2017	2018	2019	2020	% Change 2010 to 2020
Archuleta County	12,136	12,355	12,595	12,908	13,253	13,588	12.0%
Pagosa Springs	1,774	1,966	1,927	2,064	2,057	1,751	-1.3%

Source: U.S. Census Bureau, American Community Survey Population Estimates

Select 2020 U.S. Census demographic and social characteristics for Archuleta County and the Town of Pagosa Springs are shown in Table 2-2.

Table 2-2 Archuleta County Demographic and Social Characteristics, 2021

Characteristic	Archuleta County	Town of Pagosa Springs
Gender/Age		
Male	50.1%	49.8%
Female	49.9%	50.2%
Under 5 years	4.1%	6.2%
65 years and over	27.3%	19.5%
Median Age (years)	50.3	36.4

Characteristic	Archuleta County	Town of Pagosa Springs
Race/Ethnicity (one race)		
White	76.1%	52.3%
American Indian/Alaska Native	3.8%	3.3%
Asian	1.2%	0%
Black or African American	0.9%	2.5%
Hispanic or Latino (of any race)	18.5%	38.4%
Education		
High school graduate (includes equivalency), population 25 to 64 years, 2016-2020	94.1%	88.6%
Bachelor's degree or higher, percent persons 25 years+, 2016-2020	39.7%	23.4%
Families and Living Arrangements		
Language other than English spoken at home, percent persons 5 year+, 2016-2020	7.4%	19.4%

Source: U.S. Census Bureau 2020

2.4 Government

The Board of Commissioners is the governing body for Archuleta County. Each of the three members serves a four-year term. They are elected from each of three districts, but by the County electorate as a whole. County government has very limited legislative power per state statute.

The Town of Pagosa Springs is a home rule municipality. The governing body of the Town is the Town Council and an elected Mayor. The Town Council consists of six members who serve four-year terms. The Town Council has power of appointment over the Town Manager, Town Attorney and Municipal Court judge. The Council also determines policy and budget for Pagosa Springs.

The southwestern portion of Archuleta County is within the Southern Ute Indian tribal lands. The Southern Ute Indian tribe is a sovereign nation and is working on its own hazard mitigation plan (HMP). Therefore, the tribe is not a participating jurisdiction in the Archuleta County HMP. However, the Southern Ute Indian Tribe is considered a stakeholder in the Archuleta County HMP planning process.

2.5 Economy

Lumber and ranching were traditionally the most important economic activities in Archuleta County, but in the last few decades, public services and recreation/tourism have taken the lead. According to the American Community Survey 2016-2020, the industries that employed the most people in Archuleta County were "educational services, and health care and social assistance" (17.1%) and "arts, entertainment, and recreation, and accommodation and food services" (16.1%). Similarly, in the Town of Pagosa Springs, "arts, entertainment, and recreation, and accommodation and food services" (16.4%) was the largest industry employer, followed by "construction" (15.6%). Figure 2-3 displays the distribution of employment by industry in Archuleta County and the Town of Pagosa Springs.

Select economic characteristics for Archuleta County from the 2016-2020 American Community Survey and the 2020 U.S. Census are shown in Table 2-3.

Table 2-3 Archuleta County Economic Characteristics

Characteristic	Archuleta County	Town of Pagosa Springs
Persons in Poverty, percent	9.4%	25.7%
Median home value	$331,900	$250,000
Median household income	$55,658	$26,125
Per capita income	$32,995	$18,593
Population in labor force, persons 16 years+	57.6%	57.3%
Total employment, 2020	5,957	712
Unemployment	2.5%	4.9%
Total annual payroll, 2020 ($1,000)	127,901	60,564

Source: U.S. Census Bureau, American Community Survey, 2016-2020 http://factfinder.census.gov/

Figure 2-3 Archuleta County and Pagosa Springs Employment by Industry

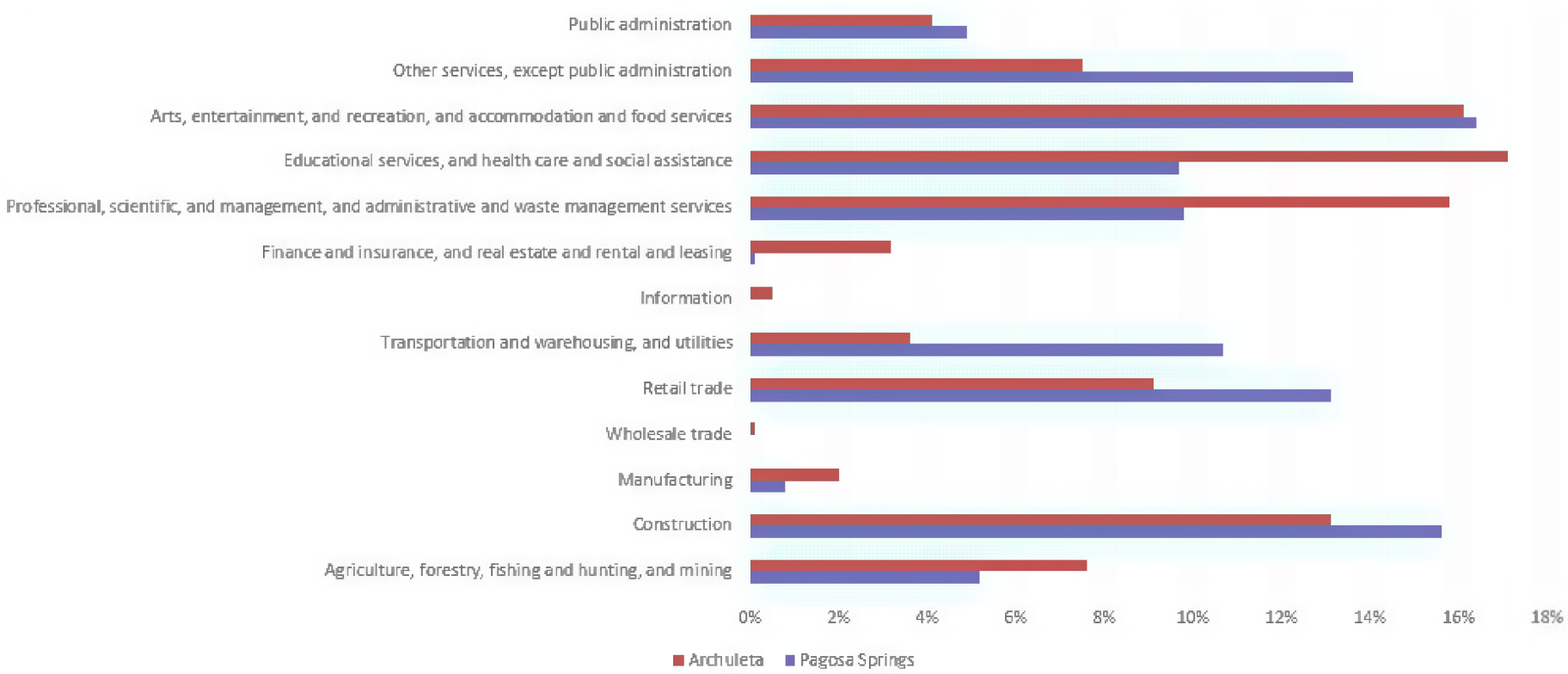


Figure by WSP, Data Source: U.S. Census Bureau, American Community Survey, 2016-2020 http://factfinder.census.gov/

2.6 Mitigation Capabilities Assessment

The Planning Team performed an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of an agency's mission, programs, and policies, and evaluates its capacity to carry them out.

2.6.1 Archuleta County Mitigation Capabilities

This section presents Archuleta County's mitigation capabilities, as well as the capabilities of the Town of Pagosa Springs, Hinsdale County, and Mineral County, that are applicable to the planning area. This assessment describes existing capabilities, programs, and policies currently in use to reduce hazard impacts or capabilities that could be used to implement hazard mitigation activities. It addresses regulatory mitigation capabilities and administrative/technical mitigation capabilities for the participating jurisdictions.

Archuleta County Regulatory Mitigation Capabilities

Table 2-4 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Archuleta County. Excerpts from applicable policies, regulations, plans, and programs descriptions follow to provide more detail on existing mitigation capabilities.

Table 2-4 Archuleta County Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Comments
Building Codes	Y	
Building Codes Year	Y	2015 IBC & 2018 IRC Appendix Q
BCEGS Rating	N	
Capital Improvements Program (CIP) or Plan	Y	PAWSD operates under a 20 year CIP, which is update approximately every 4 years.
Community Rating System (CRS)	N	
Community Wildfire Protection Plan (CWPP)	Y	Archuleta County Community Wildfire Protection Plan (2020)
Comprehensive, Master, or General Plan	Y	Archuleta County Community Plan (2017)
Economic Development Plan	Y	
Elevation Certificates	Y	Development Services maintains
Erosion/Sediment Control Program	Y	
Floodplain Management Plan	N	
Flood Insurance study	Y	"FIS for Archuleta County, Colorado and Incorporated Areas" dated September 25, 2009
Growth management Ordinance	Y	Preferred Growth Scenarios in Community Plan
Hazard-Specific Ordinance or Plan (Floodplain, Steep Slope, Wildfire)	Y	Archuleta County Land Use Regulations, Section 10, updated 2015 Winter Storm Emergency Mitigation and Response Plan Extended Power Outage Plan Ordinance for the regulation of open burning (Ordinance No. 10-2017) Emergency Alert and Notification Plan
NFIP	Y	Since January 3, 1979
Site Plan Review Requirements	Y	Archuleta County Land Use Regulations, Chapter 5
Stormwater Program, Plan, or Ordinance	N	
Zoning Ordinance	Y	Archuleta County Land Use Regulations, Chapter 3
Subdivision Ordinance	Y	Archuleta County Land Use Regulations, Chapter 4
Hazard Overlay Districts	N	

Regulatory Tool (ordinances, codes, plans)	Y/N	Comments
Other?	Y	PAWSD has a Drought Mitigation Plan last updated in 2021

As indicated in the table above, Archuleta County has several plans and programs that guide the County's mitigation of development in hazard-prone areas. Some of these plans and programs are described in more detail below.

Archuleta County Community Plan, Updated 2017

The Archuleta County Community Plan was prepared by a steering committee comprised of 13 individuals appointed by the County Commissioners. The Community Plan was developed to be used in the decision-making process regarding the physical, cultural, and socioeconomic development of the County over time. The plan's goals provide general statements reflecting the desires of County residents regarding land use and development. These goals and associated action items also lay the groundwork for zoning and the land use decision-making process. The policies provide the County's positions as they relate to the identified goals and establish guidelines for direction or action. The overall goal of the plan is to allow gradual, long-term population and economic growth within the County in a manner that does not harm the County's scenery or character and residents' way of life. To this end, the plan examines four different growth and land use scenarios based on development trends within the County since about 1980.

Elements of the plan were updated in 2008 and in 2011. Beginning in 2016, the Archuleta Planning Commission, with support from the Board of Commissioners, began a comprehensive, staff-level review of the Community Plan. The new edition includes a reformat, as the plan has been split into four sections and an appendix. Additional edits include clarifying Policies and Action Items to make the plan more current and useful, as well as updates to maps, and statistics. The update was adopted by the Planning Commission on October 11th, 2017.

Archuleta County Community Wildfire Protection Plan, 2020

The Archuleta County Community Wildfire Protection Plan (CWPP) was completed and adopted in October 2019. It is an update to the 2008 and 2001 Archuleta County Community Fire Plan. The CWPP outlines the County's fire response capabilities and mitigation strategies. It includes a subdivision-level risk assessment which was used to inform the wildfire hazard risk assessment in Chapter 4 of this plan.

Archuleta County Land Use Regulations, Amended 2017

The purpose of the Archuleta County Land Use Code is to promote the health, safety, and general welfare of the present and future inhabitants of Archuleta County by planning for and regulating the use of land to provide planned and orderly development and environmental protection in a manner consistent with constitutional rights. The regulations were originally adopted in May 2006 and were amended in April 2017. The intent of the code is to regulate development and activities in Archuleta County, to give special attention to hazardous areas, to protect lands from activities that would cause immediate or foreseeable material danger to significant wildlife habitats, to regulate the use of land based on impact on the communities or surrounding areas, and to secure safety from fire and other damages, among other things.

Archuleta County Administrative and Technical Mitigation Capabilities

Table 2-5 identifies the County personnel responsible for activities related to mitigation and loss prevention in Archuleta County.

Table 2-5 Archuleta County Administrative/Technical Mitigation Capabilities

Personnel Resources	Y/N	Comments
Emergency Manager	Y	Sheriff's Office – Division of Emergency Management: Director of Emergency Management and Deputy Director of Emergency Management
Floodplain Administrator	Y	Development Planning
Community Planning	Y	
Planner/Engineer (Land Development)	Y	Planning Department/County Engineer
Planner/Engineer/Scientist (Natural Hazards)	Y	County Engineer
Engineer/Professional (Construction)	Y	County Engineer, Building Department
Resiliency Planner	N	
Transportation Planner	N	
Full-Time Building Official	Y	Planning Department
GIS Specialist and Capability	Y	IS Department: GIS Specialist / Assessor's Office: GIS Specialist / Sheriff's Office: Director of Emergency Mgt.
Grant manager, Writer, or Specialist	Y	Department / Office Specific
Warning Systems/Services	Y	Reverse call-back and text messaging, Emergency Web Site, Twitter feeds, EAS, KWUF and KSUT
General	Y	
Flood	N	
Wildfire	N	
Tornado	N	
Geological Hazards	Y	Monitoring of landslide areas by Xcel and CDOT

The following departments are involved in hazard mitigation in Archuleta County:

Planning Commission

The Planning Commission consists of five members and makes recommendations to the County's governing body concerning matters related to planning, zoning, and land use regulations.

Development Services Department

Development services includes the Building and Planning departments and is responsible for planning and implementation of zoning, building, and land use regulations.

Public Works Department – County Engineer and Road and Bridge Department

The Road and Bridge Department is responsible for the repair and maintenance of County roads within the planning area.

Archuleta County Sheriff's Office – Division of Emergency Management

The Division of Emergency Management serves all of Archuleta County and assists Hinsdale and Mineral Counties with emergency management and coordination in the southern portions of their counties. The division contributes to hazard mitigation and loss reduction through coordination, response, recovery, and planning for large emergencies in Archuleta County and other county-level incidents, including search and rescue and wildland fire response. The division provides for protection of life, health, safety, welfare, and property of the public and community as well as assists community members in solving problems related

to emergency management. Emergency Management also coordinates training for the county in addition to Multi Agency Coordination (MAC), Joint Information System, Resource Management, and Incident Management. The division has three full time staff and two part time staff.

Floodplain Management Regulations and NFIP Participation

Ordinance No. 2009-01 and Resolution 2010-46 detail the floodplain management regulations for the County. The purpose of these regulations is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas. These regulations apply to all areas of special flood hazards within the jurisdiction of Archuleta County identified in FEMA's September 25, 2009, flood insurance rate maps (FIRM). Archuleta County has participated in the National Flood Insurance Program (NFIP) since January 3, 1979, by administering floodplain management regulations that meet the minimum requirements of the NFIP. Much of the Special Flood Hazard Area (SFHA, base flood, 100-year flood or 1% annual chance flood) in the unincorporated county is mapped as Zone A (Approximate) and lack detailed studies with base flood elevations. Where base flood elevation (BFE) data is available, the first finished floor elevation must be 1 foot above the BFE. The county maintains a file of elevation certificates. More details on NFIP policies and claims in Archuleta County are included in Chapter 4 in the flood hazard vulnerability section.

Table 2-6 Archuleta County Financial Capabilities

Financial Resources	Y/N	Comments
Has the community used any of the following to fund mitigation?		
Levy for Specific Purposes with Voter Approval	N	
Utilities Fees	N	
System Development Feed	N	
General Obligation Bonds to Incur Debt	N	
Special Tax Bonds to Incur Debt	N	
Withheld Spending in Hazard-Prone areas	N	
Stormwater service Fees	N	
Capital Improvement Project Funding	N	
Community Development Block Grants	N	

Table 2-7 Archuleta County Education and Outreach Capabilities

Education & Outreach	Y/N	Comments
Past or ongoing public education that address mitigation, such as for flood or fire safety, household preparedness, responsible water use, or environmental education.	N	
Local citizen groups that communicate hazard risks	N	
Firewise	Y	Echo Canyon Ranch (2014) Loma Linda (2014) Timber Ridge Ranch (2016) Wildfire Adapted Partnership
StormReady	N	
Other	N	

2.6.2 Town of Pagosa Springs Mitigation Capabilities

Town of Pagosa Springs Regulatory Mitigation Capabilities

Table 2-8 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Town of Pagosa Springs. Excerpts from applicable policies, regulations, plans, and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 2-8 Town of Pagosa Springs Regulatory Mitigation Capabilities Matrix

Regulatory Tool (ordinances, codes, plans)	Y/N	Comments
Building Codes	Y	See 2011 Pagosa Springs Land Use Code, Historic Buildings & District Guidelines, currently in the process of updating the LUDC
Building Codes Year	Y	2015
BCEGS Rating	N	
Capital Improvements Program (CIP) or Plan	Y	Updated annually, 10-year plan
Community Rating System (CRS)	N/A	
Community Wildfire Protection Plan (CWPP)	N	
Comprehensive, Master, or General Plan	Y	2011 Pagosa Springs Land Use and Development Code Pagosa Springs Forward (Master Comprehensive Plan) completed in April 2018 Downtown Master Plan, 2008
Economic Development Plan	Y	
Elevation Certificates	Y	In 2011 Pagosa Springs Land Use Code
Erosion/Sediment Control Program	Y	In 2011 Pagosa Springs Land Use Code
Floodplain Management Plan	N	N
Flood Insurance study	Y	FIS for Archuleta County, Colorado and Incorporated Areas" dated September 25, 2009
Growth management Ordinance	N	
Hazard-Specific Ordinance or Plan (Floodplain, Steep Slope, Wildfire)	Y	In 2011 Pagosa Springs Land Use Code, Article 6 Town to Pagosa Lakes Trail Master Plan, 2011 Pagosa Springs Streetscape, Furnishings, and Signage Plan, 2008
NFIP	Y	The Town of Pagosa Springs has participated in the National Flood Insurance Program (NFIP) since December 1, 1978
Site Plan Review Requirements	Y	In 2011 Pagosa Springs Land Use Code
Stormwater Program, Plan, or Ordinance	N	
Zoning Ordinance	Y	
Subdivision Ordinance	Y	Contained within 2009 Land Use Code
Hazard Overlay Districts	N	

As indicated in the table above, the Town of Pagosa Springs has several plans and programs that guide the City's mitigation of development in hazard-prone areas. Some of the plans identified in Table 2-8 are described in more detail in the following paragraphs.

Pagosa Springs Forward (Master Comprehensive Plan), 2018

Pagosa Springs adopted its first Comprehensive Plan in 2006 and initiated the 2018 update to the Comprehensive Plan to stay abreast of present trends, conditions, and changes to the community. The update process, known as "Pagosa Springs Forward," prioritized the longevity and future success of the community. It is intended that this plan will be useful for the Town of Pagosa Springs in guiding development, setting policy, and framing community conversations for the next decade or more. As to future development, the Comprehensive Plan establishes many of the standards and policies that support and regulate those projects.

Pagosa Springs Land Use Code, Updated 2011

The purpose of the Pagosa Springs Land Use Code is to promote the health, safety, and general welfare of the present and future inhabitants of Archuleta County by planning for and regulating the use of land so as to provide planned and orderly development and environmental protection in a manner consistent with constitutional rights. The intent of the code is to regulate development and activities in Pagosa Springs, to give special attention to hazardous areas, to protect lands from activities that would cause immediate or foreseeable material danger to significant wildlife habitats, to regulate the use of land on the basis of impact on the communities or surrounding areas, and to secure safety from floods, wildfires and other damages, among other things.

Pagosa Springs Downtown Master Plan, 2008

The Downtown Master Plan aims to encourage public and private investment that enables infill development and redevelopment. The Plan serves as a guide for public officials and provides direction for future land use policy decisions and design. The fundamental goals of the plan reflect the vision established by the Comprehensive Plan, valuing the town's unique character, culture, sustainability, history and community heritage, local business diversification, housing availability, multi-modal and connective transportation options, and abundant parks and open space.

Town of Pagosa Springs Administrative and Technical Mitigation Capabilities

Table 2-9 identifies the Town personnel responsible for activities related to mitigation and loss prevention in the Town of Pagosa Springs.

Table 2-9 Town of Pagosa Springs Administrative/Technical Mitigation Capabilities

Personnel Resources	Y/N	Comments
Emergency Manager	Y	Archuleta County Sheriff's Office- Division of Emergency Management
Floodplain Administrator	Y	Community Development Director
Community Planning	Y	
Planner/Engineer (Land Development)	Y	
Planner/Engineer/Scientist (Natural Hazards)	Y	
Engineer/Professional (Construction)	Y	Building Official, not P.E
Resiliency Planner	N	
Transportation Planner	N	
Full-Time Building Official	Y	Community Development Department/Building and Fire Code Official
GIS Specialist and Capability	Y	Coordinated with Archuleta County
Grant manager, Writer, or Specialist	Y	Shared with County; under Pagosa Springs CDC
Warning Systems/Services	Y	Archuleta County Sheriff's Office- Division of Emergency Management
General	Y	

Personnel Resources	Y/N	Comments
Flood	N	
Wildfire	N	
Tornado	N	
Geological Hazards	N	
Other	Y	Nixle system, coordinated with County

Floodplain Management Regulations and NFIP Participation

The Town of Pagosa Springs has participated in the National Flood Insurance Program (NFIP) since December 1, 1978, by administering floodplain management regulations that meet the minimum requirements of the NFIP. Floodplain management regulations apply to all areas of special flood hazards within the town of Pagosa Springs, as identified in FEMA's Flood Insurance Rate Maps, effective as of September 25, 2009. More details on NFIP policies and claims in Pagosa Springs are included in Chapter 4 in the flood hazard vulnerability section.

Table 2-10 Town of Pagosa Springs Financial Capabilities

Financial Resources	Y/N	Comments
Has the community used any of the following to fund mitigation?		
Levy for Specific Purposes with Voter Approval	N	
Utilities Fees	N	
System Development Feed	N	
General Obligation Bonds to Incur Debt	N	
Special Tax Bonds to Incur Debt	N	
Withheld Spending in Hazard-Prone areas	N	
Stormwater service Fees	N	
Capital Improvement Project Funding	N	
Community Development Block Grants	N	

Table 2-11 Town of Pagosa Springs Education and Outreach Capabilities

Education & Outreach	Y/N	Comments
Past or ongoing public education that address mitigation, such as for flood or fire safety, household preparedness, responsible water use, or environmental education.	Y	San Juan Water Shed Enhancement Partnership and Resilient Archuleta have conducted community education on water, environment, and wildfire preparedness.
Local citizen groups that communicate hazard risks	N	
Firewise	Y	Wildfire Adapted Partnership conducts residential fire mitigation projects.
StormReady	N	
Other?	N	

2.6.3 Special Districts

The Archuleta County Response Area includes several special service districts that meet the definition of a local government under the Disaster Mitigation Act (DMA) 2000. These special districts include:

- Los Pinos Fire Protection District
- Upper Pine Fire Protection District
- Upper San Juan Hospital District

- Archuleta School District
- Piedra Park Metro Improvement District
- Aspen Springs Metropolitan District
- Alpha-Rockridge Metropolitan District
- Loma Linda Metropolitan District
- San Juan River Village Metropolitan District
- San Juan Water Conservation District
- Pagosa Area Water and Sanitation District (PAWSD)
- Pagosa Fire Protection District

The PAWSD and Pagosa Fire Protection District participated in the 2011, 2017, and 2022 planning processes as participating jurisdictions in the plan. The Los Pinos Fire Protection District and Upper Pine Fire Protection District participated in the La Plata County Hazard Mitigation Plan. The other special districts mentioned previously did not choose to participate in this plan's initial development or 2017 and 2022 updates; however, as special service districts that meet the DMA (2000) definition of a local government within Archuleta County, they have the option to become full participants during future updates of this plan.

Pagosa Area Water and Sanitation District (PAWSD) Capabilities

PAWSD is a "quasi-municipal corporation and a political subdivision of the State of Colorado organized under Colorado Revised Statutes Title 32". The organization is governed by a Board of Directors with five members who are elected to serve four-year terms. Members may serve no more than two consecutive terms barring voter approval to alter the term of office in one way or another. PAWSD is responsible for water diversion, storage, and treatment in the San Juan River headwaters area. PAWSD is also responsible for wastewater collection and treatment. Regarding hazard mitigation capabilities, PAWSD is involved in drought management planning. PAWSD studies current water demand and forecasts future demand to help determine water storage needs in the district. PAWSD then studies reservoir storage capacity and develops drought management projects based on forecasted future water demand. Through the mitigation planning process, the District has identified ways to improve capabilities, including updating the drought management plan. The PAWSD service area is divided into two districts: water only and water/sanitation. The boundaries of these districts are shown in Figure 2-4. Although the Town of Pagosa Springs, and more specifically the Pagosa Springs Sanitation General Improvement District (PSSGID), is in district 2, PAWSD treats all wastewater generated within town boundary. The sewage is collected by the PSSGID and delivered to PAWSD via a 7-mile force main.

The following tables list the tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place by the Pagosa Area Water and Sanitation District.

Table 2-12 Pagosa Area Water and Sanitation District Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Comments
Building Codes	N/A	
Building Codes Year	N/A	
BCEGS Rating	N/A	
Capital Improvements Program (CIP) or Plan	N/A	
Community Rating System (CRS)	N/A	
Community Wildfire Protection Plan (CWPP)	N/A	
Comprehensive, Master, or General Plan	N/A	
Economic Development Plan	N/A	
Elevation Certificates	N/A	
Erosion/Sediment Control Program	N/A	

Regulatory Tool (ordinances, codes, plans)	Y/N	Comments
Floodplain Management Plan	N/A	
Flood Insurance study	N/A	
Growth management Ordinance	N/A	
Hazard-Specific Ordinance or Plan (Floodplain, Steep Slope, Wildfire)	N/A	
NFIP	N/A	
Site Plan Review Requirements	Y	Review site plans for water and sewer mains
Stormwater Program, Plan, or Ordinance	Y	Cross Connection Control Program
Zoning Ordinance	N/A	
Subdivision Ordinance	N/A	
Hazard Overlay Districts	N/A	
Special Plans	Y	Source Water Protection Plan; 2006 Stollsteimer Creek Watershed Master Plan;2008 Water Conservation Plan; 2018 Drought Management Plan

Table 2-13 Pagosa Area Water and Sanitation District Administrative/Technical Mitigation Capabilities

Personnel Resources	Y/N	Comments
Emergency Manager	N/A	
Floodplain Administrator	N/A	
Community Planning	N/A	
Planner/Engineer (Land Development)	N/A	
Planner/Engineer/Scientist (Natural Hazards)	Y	
Engineer/Professional (Construction)	Y	
Resiliency Planner	N/A	
Transportation Planner	N/A	
Full-Time Building Official	N/A	
GIS Specialist and Capability	Y	
Grant manager, Writer, or Specialist	N	
Warning Systems/Services		
General	Y	Drought: Per the Drought Management Plan, PAWSD monitors snow pack, San Juan River flow, and reservoir storage volume
Flood	N/A	
Wildfire	N/A	
Tornado	N/A	
Geological Hazards	N/A	

Table 2-14 Pagosa Area Water and Sanitation District Financial Capabilities

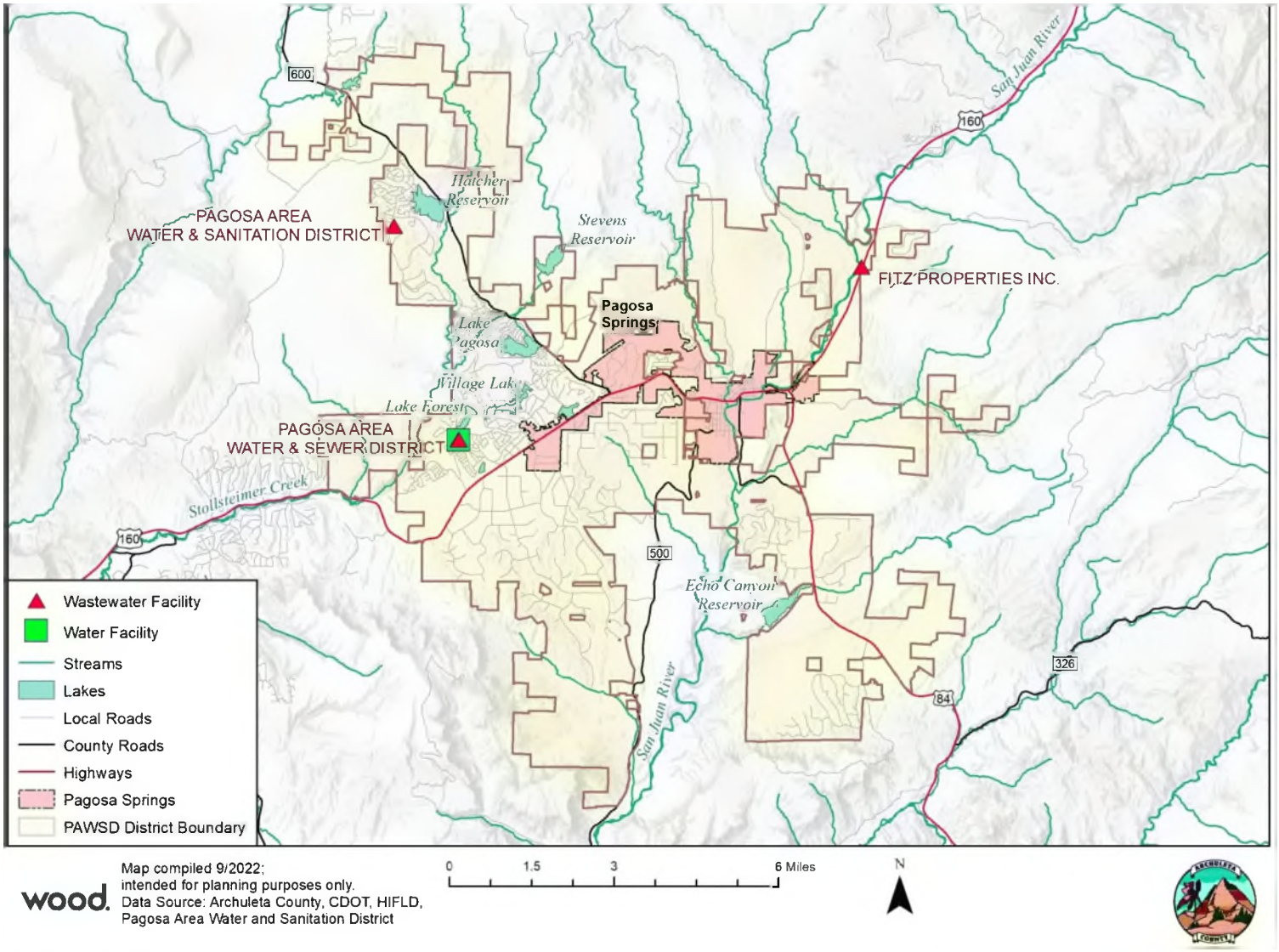
Financial Resources	Y/N	Comments
Levy for Specific Purposes with Voter Approval	Y	Operating Mill Levy; Debt Service Mill Levy
Utilities Fees	Y	Raw Water Acquisition Fees
System Development Fees	N	
General Obligation Bonds to Incur Debt	N	
Special Tax Bonds to Incur Debt	N	
Withheld Spending in Hazard-Prone areas	N/A	
Stormwater service Fees	N	

Financial Resources	Y/N	Comments
Capital Improvement Project Funding	N	
Community Development Block Grants	N	
Other?	Y	Capital Investment Fees; Equity by-in Fees; Raw Water Acquisition Fees and Availability Fees.

Table 2-15 Pagosa Area Water and Sanitation District Education and Outreach Capabilities

Education & Outreach	Y/N	Comments
Past or ongoing public education that address mitigation, such as for flood or fire safety, household preparedness, responsible water use, or environmental education.	Y	Water quality information, backflow prevention information on website; water conservation efforts
Local citizen groups that communicate hazard risks	N/A	
Firewise	N/A	
StormReady	N/A	
Other	Y	Regular public meetings

Figure 2-4 PAWSD Boundaries



Pagosa Fire Protection District (FPD) Capabilities

The Pagosa FPD provides fire protection and response for the Town of Pagosa Springs, the Pagosa Lakes Subdivisions, Aspen Springs Subdivision, south along Highway 84 to Loma Linda and Alpine Lakes Subdivisions, and the area around Chromo. The Pagosa FPD deals with the impacts of several types of hazards including fire, hazardous materials, rescue operations, natural disasters, technological disasters, and manmade disasters. The FPD's capabilities to address these issues depend on the type of risk. The Pagosa FPD is capable of making an effective response to most types of fire, hazmat, and rescue hazards up to a certain point. In regards to natural hazards, the FPD generally does not have the capability to cope with the impacts of natural disasters apart from winter storms, thunderstorms, lightning, and high winds. In the event of a hazard situation, the FPD's main station is equipped with backup power supply, apparatus-mounted generators, and small portable generators that could be used to support emergency needs during hazard incidents. However, the FPD does not have the capability to cope with communications outages. A map of the district boundary is provided in Figure 2-1.

The following tables list the tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place by the Pagosa Fire Protection District.

Table 2-16 Pagosa Fire Protection District Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Comments
Building Codes	N/A	
Building Codes Year	N/A	
BCEGS Rating	N/A	
Capital Improvements Program (CIP) or Plan	N/A	
Community Rating System (CRS)	N/A	
Community Wildfire Protection Plan (CWPP)	Y	
Comprehensive, Master, or General Plan	Y	
Economic Development Plan	N/A	
Elevation Certificates	N/A	
Erosion/Sediment Control Program	N/A	
Floodplain Management Plan	N/A	
Flood Insurance study	N/A	
Growth management Ordinance	N/A	
Hazard-Specific Ordinance or Plan (Floodplain, Steep Slope, Wildfire)	N/A	
NFIP	N/A	
Site Plan Review Requirements	N/A	
Stormwater Program, Plan, or Ordinance	N/A	
Zoning Ordinance	N/A	
Subdivision Ordinance	N/A	
Hazard Overlay Districts	N/A	
Fire District ISO	Y	3/6/10

Table 2-17 Pagosa Fire Protection District Administrative/Technical Mitigation Capabilities

Personnel Resources	Y/N	Comments
Emergency Manager	N/A	
Floodplain Administrator	N/A	
Community Planning	Y	

Personnel Resources	Y/N	Comments
Planner/Engineer (Land Development)	N/A	
Planner/Engineer/Scientist (Natural Hazards)	N/A	
Engineer/Professional (Construction)	N/A	
Resiliency Planner	N/A	
Transportation Planner	N/A	
Full-Time Building Official	Y	Fire Marshall / Inspection and Plan Review
GIS Specialist and Capability	N/A	
Grant manager, Writer, or Specialist	N/A	
Warning Systems/Services	N/A	
General	N/A	
Flood	N/A	
Wildfire	N/A	
Tornado	N/A	
Geological Hazards	N/A	
Other?		

Table 2-18 Pagosa Fire Protection District Financial Capabilities

Financial Resources	Y/N	Comments
Levy for Specific Purposes with Voter Approval	Y	
Utilities Fees	N/A	
System Development Fee	N/A	
General Obligation Bonds to Incur Debt	N/A	
Special Tax Bonds to Incur Debt	N/A	
Withheld Spending in Hazard-Prone areas	N/A	
Stormwater service Fees	N/A	
Capital Improvement Project Funding	N/A	
Community Development Block Grants	N/A	

Table 2-19 Pagosa Fire Protection District Education and Outreach Capabilities

Education & Outreach	Y/N	Comments
Past or ongoing public education that address mitigation, such as for flood or fire safety, household preparedness, responsible water use, or environmental education.	Y	Posting of fire restrictions on website Community Risk Reduction Public Information Officer
Local citizen groups that communicate hazard risks	N/A	
Firewise	Y	Wildfire Adapted Partnership
StormReady	N/A	
Other	Y	Public outreach program – Monthly PSAs; Website has information on kids' safety, wildland fire and winter fire safety; Public Education Events; HMP listed on district website

2.6.4 Opportunities for Capability Enhancement

The 2022-2023 update provided the County and participating jurisdictions an opportunity to review and update the capabilities currently in place to mitigate hazards. Based on the capability assessment, the jurisdictions have several existing regulatory, administrative/technical, fiscal mechanisms in place that help to mitigate hazards. This also provided an opportunity to identify where capabilities could be improved or enhanced.

Regulatory

- Update Land Use Development Code to consider hazards and cross-reference the HMP (Pagosa Springs)
- Updates of Capital Improvement Plan that cross-reference the HMP and hazard mitigation-related improvements (all jurisdictions).
- Update County Local Emergency Operations Plan (County)
- Update Comprehensive Plans to include linkages to the hazard mitigation plan and consideration of hazards in land use planning (County, Pagosa Springs).

Administrative/technical

- Consider resiliency planners or integrate resiliency in existing positions (all jurisdictions)
- Have staff attend mitigation grants training (see Fiscal below).

Fiscal

- Obtain training on FEMA Hazard Mitigation Assistance grants through FEMA or CO DHSEM to improve understanding of eligible projects and components of successful applications (all jurisdictions).

Outreach and Education

- Increasing opportunities for public education on fire and flood preparedness (Pagosa Springs).
- Become StormReady certified communities (County, Pagosa Springs)

2.6.5 Other Mitigation Plans in the Archuleta Response Area

Hinsdale and Mineral Counties have several plans that direct Archuleta County's actions related to hazard risk reduction and guide development in hazard-prone areas. Though Hinsdale and Mineral Counties only cover a small portion of the total land in the planning area, it is important to acknowledge existing mitigation efforts and plans in place that could supplement this plan and support the implementation of identified action items. Some of these plans and programs are described in more detail below.

Hinsdale County Hazard Mitigation Plan, 2019

Developed in 2003, the Hinsdale County HMP was updated in 2014 and again in 2019, aiming to protect the people, assets, and resources from hazards. The plan identifies and evaluates the risk associated with many of the same hazards that are described in Chapter 4 of this plan; however, there are a few variances. The most notable difference in the plans is that Hinsdale County focuses more attention on human-related hazards, which are more limited in this plan. Despite having a significantly smaller population base (788 people in 2020), the Hinsdale County plan examines the potential impacts of transportation accidents, technology failures/power outages, and acts of terrorism, whereas this plan only acknowledges human-health related hazards. Throughout the planning process, Hinsdale County emphasized the value of participation with surrounding jurisdictions, and in April 2014, Hinsdale established Mutual-Aid agreements and Memorandum of Understandings (MOU's) with the surrounding areas; of which Archuleta County was included.

Hinsdale County Community Wildfire Protection Plan, 2010

The Hinsdale County CWPP outlines the risk associated with the Wildland Urban Interface (WUI) land, and defines the community's priorities for protection of life, property, and critical infrastructure in the hazard-

prone areas. The Hinsdale County land included in this planning area is primarily owned by the US Forest Service, with some areas owned privately. The Piedra/Palisades WUI is located within the boundaries of this planning area and includes 155 structures in a high-risk area. This document is useful for identifying specific action items that relate to fire hazard in the planning area and can supplement any projects described later in Chapter 5.

Mineral County Hazard Mitigation Plan (2022-23 update in progress)

In 2010 Mineral County and the City of Creede developed a multi-hazard mitigation plan to reduce losses caused by natural hazards. Mineral County was one of five counties (Alamosa, Conejos, Mineral, Rio Grande, and Saguache) in the San Luis Valley preparing multi-hazard mitigation plans concurrently. The process was led by the Mineral County Emergency Manager. In addition to the individual county plans, the Emergency Managers and other stakeholders met collectively to strategize for regional mitigation efforts in the San Luis Valley. The plan was updated in 2016 and is undergoing a current update in 2022-2023.

Mineral County Community Wildfire Protection Plan, 2009

The Mineral County Fire Protection District covers the northern part of Mineral County, which is not relevant to this plan and not in close proximity to the planning area. The ideas and actions generated from the Mineral CWPP can be used as a reference and example of best practices that are applicable for Archuleta's study area; however, the capabilities described, resources, and personnel will be different.

2.6.6 Stakeholder Agencies and Other Mitigation Partnerships

Colorado State Forest Service – Durango District

The Colorado State Forest Service (CSFS) is a service and outreach agency in the Warner College of Natural Resources at Colorado State University. As the lead state agency for forestry and wildland fire expertise, CSFS foresters in 17 district offices throughout the state help landowners and communities accomplish sound forestry practices on their land. The CSFS also coordinates with other agencies to ensure that Colorado is prepared to respond to wildfires. Every year, the CSFS improves the health of approximately 25,000 acres of forest land, works with the state's 400 fire departments, and provides technical forestry assistance to more than 12,000 landowners to help them achieve their stewardship objectives.

The CSFS Durango District encompasses Archuleta, Dolores, La Plata, Montezuma, and San Juan Counties. The District office is located on the campus of Fort Lewis College in Durango, just north of the Center for Southwest Studies/Community Concert Hall complex. Areas of District emphasis include private and state land forest stewardship (i.e., Forest Agriculture Property Tax Classification Program, Tree Farm Program, NRCS EQIP Program, state land forest management, forest product utilization and marketing, and prescribed fire); wildfire education, prevention, and suppression (i.e., interagency coordination, fire training, equipment acquisition, community wildfire protection planning, wildfire hazard mitigation and fuels reduction, and land use planning); urban and community forestry; forest insect and disease identification, monitoring, and control; and conservation education.

San Juan National Forest/USDA Forest Service

San Juan National Forest/USDA Forest Service is a steward of the large majority of the land in the Response Area. As such they are active in wildfire mitigation and fuels treatment efforts. They were active participants in the development and update of the Archuleta County Hazard Mitigation Plan and are the lead entity on a new project to reduce wildfire hazards in the Upper Blanco Basin.

Wildfire Adapted Partnership (formerly FireWise of Southwest Colorado)

Wildfire Adapted Partnership's mission is to inspire, motivate, educate, and serve individuals, organizations and communities joining together to protect lives and property from wildfire. The council includes active chapters in Archuleta, La Plata, and Montezuma counties.

The Partnership focuses on three basic areas:

- Education and Outreach
- Planning – development of subdivision-level Community Wildfire Protection Plans, or CWPPs, and
- Implementation - on-the-ground mitigation efforts

The organization has monthly meetings and has been active in promotion of workshops and educating homeowners in Archuleta County about Firewise' techniques.

Pagosa Lakes Property Owners Association

The Pagosa Lakes Property Owners Association (PLPOA) has been working closely with homeowners in Pagosa Lakes to facilitate creating defensible space around private homes and properties. The Association purchased a 160HP horizontal drum grinder circa 2016 with the assistance of a Department of Natural Resources grant and provided a brush collection area in Pagosa Lakes where residents could bring brush and limbs for chipping. PLPOA assists approximately 200 homeowners annually with achieving improved defensible space and have processed over 50,000 cubic yards of brush and limb material into usable mulch since 2016. The PLPOA has worked closely with Wildfire Adapted Partnership in developing fuel mitigation programs for owners and owner educational forums and resources. Additionally, the PLPOA is working to mitigate wildfire fuels in over 800 acres of newly acquired greenbelts/open space and in 2022 contracted the thinning of 25 acres of greenbelts work in Twincreek and Hatcher Lake area. The greenbelts are on a 5-year thinning/mitigation thinning plan and utilizing grants and cost assistance programs when available will be treated to CSFS standards.

Colorado Department of Transportation

The Colorado Department of Transportation (CDOT) is a key partner in the mitigation of avalanche, rockfall and landslide hazards, as well as wildlife vehicle collisions and winter storm impacts, within the Archuleta County Response Area. CDOT is also a partner in mitigation of flood hazards at bridges and culverts on state highways. Improvement of the McCabe Creek crossing on Highway 160 in Pagosa Springs has long been identified as a needed mitigation project in the mitigation strategy, and construction is expected to be complete in 2023.

3 Planning Process

CFR Requirements §201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and

3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

3.1 Background on Mitigation Planning in Archuleta County

The planning process and development of this plan was originally initiated in the spring of 2010 under the coordination of the Archuleta County Sheriff's Office, Division of Emergency Management. The original plan was approved by FEMA and adopted by the County in April 2012 and was updated in 2017 to comply with the five-year update cycle required by the DMA 2000. In 2022 the plan again underwent a comprehensive as part of the five-year update cycle. The planning process followed during the 2022 update was similar to that used in the 2017 plan update. The planning process for the update of this plan was originally initiated in 2022 under the coordination of the Archuleta County Emergency Coordinator. Grant funding was secured through a DHSEM and FEMA to enable a consultant to be hired to facilitate the process and develop the plan. WSP Environment and Infrastructure Inc. (WSP) of Denver, Colorado (Formally Wood Environment and Infrastructure Solutions, Inc.) contracted with the County to provide professional planning services during the development of the original plan. The update of the plan followed a structured planning process that involved various local government departments and other public and private stakeholders. The planning process is described further in this section and documented in Appendix D.

3.1.1 What's New in the Plan Update

DMA Requirement §201.6(d)(3):	*A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.*

The updated HMP complies with Federal Emergency Management Agency (FEMA) guidance for Local Hazard Mitigation Plans. The update followed the requirements noted in the Disaster Mitigation Act (DMA) of 2000 and FEMA's 2013 Local Hazard Mitigation Planning Handbook.

This HMP update involved a comprehensive review and update of each section of the 2017 plan and includes an assessment of the progress in evaluating, monitoring, and implementing the mitigation strategy outlined in the previous plan. The planning process provided an opportunity to review jurisdictional

priorities related to hazard significance and mitigation action, and revisions were made where applicable to the plan. Only the information and data still valid from the 2016 plan was carried forward as applicable into this HMP update.

3.1.2 2017 Plan Section Review and Analysis

During the 2022 update process, the HMPC updated each section of the previously approved plan to include new information and improve the organization and formatting of the plan's contents. The HMPC and WSP analyzed each section using FEMA's local plan update guidance to ensure that the plan met the latest requirements. The overall format and structure of the plan did not change, but information within has been updated where appropriate or where available information permitted. A summary of the changes in this plan update is highlighted in the table below.

Table 3-1 Archuleta County Hazard Mitigation Plan Update Highlights

Plan Section	Summary of Plan Review, Analysis, and Updates
1. Introduction	Revised to reflect updated plan and 2022 planning process.
2. County Profile	Updated with recent census data and current economy description. Updated land use and development trends.
3. Planning Process	Describes and documents the planning process for the 2022 update, including. coordination among agencies. Describes how 2022 plan was integrated with/into other planning efforts. Removed 2017 planning process info. Describes changes to jurisdictional participation. Describes 2022 public participation process. Describes the Hazard Mitigation Planning Committee (HMPC). Describes the 10-step process followed for the update.
4. Hazard Identification and Risk Assessment	Added cyber-attacks to the hazards profiled. Considerations on future climate impact information has been added to each hazard profile. Updated list of disaster declarations to include recent data. Updated tables to include recent National Center for Environmental Information data. Updated past occurrences for each hazard to include recent data. Updated critical facilities identified from the 2017 plan. Updated growth and development trends to include recent Census and local data sources. Updated property values for vulnerability and exposure analysis, using updated building. information based on assessor's data. Updated estimate flood losses using the latest Digital Flood Insurance Rate Map (DFIRM) and assessor's data. Updated National Flood Insurance Program (NFIP) data and Repetitive Loss structure data from the previous plan. Incorporated new hazard loss estimates since 2017, as applicable. Used updated GIS inventory data for vulnerability analysis. Updated and re-organized information regarding specific vulnerabilities to hazards to be in one location for each hazard (instead of 2 separate sections previously), including maps and tables of specific assets at risk, specific critical facilities at risk, and specific populations at risk. Updated maps in plan where appropriate.
5. Mitigation Strategy	Indicated what actions have been implemented that may reduce previously identified vulnerabilities.

Plan Section	Summary of Plan Review, Analysis, and Updates
	Updated mitigation strategy based on the results of the updated risk assessment, completed mitigation actions, and implementation obstacles and opportunities since the completion of the 2017 plan. Reviewed and updated goals and objectives based on HMPC input. Added a new objective under goal 1 related to increasing public awareness and education around human caused hazards. Included updated information on how actions are prioritized, or how priorities changed. Reviewed mitigation actions from the 2017 plan and developed a status report for each; identified if actions have been completed, deleted, or deferred/carried forward. Updated priorities on actions. Identify examples of successful implementation to highlight positive movement on actions identified in 2017 plan. Identified new mitigation actions proposed by the HMPC with more detail on implementation than the previous plan. Developed a summary table of mitigation actions for all participating jurisdictions.
6. Adoption	Discussion of re-adoption process for 2023; Adoptions for Participating Jurisdictions in appendix
7. Plan Implementation and Maintenance	Updated to reflect 2022 process. Reviewed and updated procedures for monitoring, evaluating, and updating the plan. Revised to reflect current methods. Updated the system for monitoring progress of mitigation activities by identifying additional criteria for plan monitoring and maintenance. Updated process for incorporation of the HMP into existing mechanisms
Appendices	Appendix A Mitigation Actions from previous plan has been merged to have all mitigation strategy information in Chapter 5. Appendices reordered to list below: Appendix A Glossary Appendix B References Appendix C Hazard Mitigation Planning Committee Appendix D Planning Process Documentation Appendix E Plan Approval and Adoption

3.2 Local Government Participation

The Disaster Mitigation Act (DMA) planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the Hazard Mitigation Planning Committee (HMPC),
- Detail areas within the planning area where the risk differs from that facing the entire area,
- Identify specific projects to be eligible for funding, and
- Have the governing board formally adopt the plan.

For the Archuleta County Hazard Mitigation Plan's HMPC, "participation" meant:

- Attending and participating in the HMPC meetings,
- Providing available data requested of the HMPC,
- Reviewing and providing comments on the plan drafts,
- Advertising, coordinating, and participating in the public input process, and
- Coordinating the formal adoption of the plan by the governing boards.

Archuleta County's Hazard Mitigation Plan is a multi-jurisdictional plan that geographically covers everything within Archuleta County's Response Area, shown in Chapter 2 Community Profile. Unincorporated Archuleta County, the Town of Pagosa Springs, Pagosa Fire Protection District (FPD), and the Pagosa Area Water and Sanitation District (PAWSD) participated in the planning process and are seeking FEMA approval of this plan. These are the same entities that participated in and adopted the 2017 plan update also.

3.3 The 10-Step Planning Process

Archuleta County and WSP worked together to establish the planning process for Archuleta County's plan update using the DMA planning requirements and FEMA's associated guidance. The original FEMA planning guidance is structured around a four-phase process:

1) Organize Resources
2) Assess Risks
3) Develop the Mitigation Plan
4) Implement the Plan and Monitor Progress

FEMA's March 2013 Local Mitigation Planning Handbook recommends a nine-step process within the original four phase process. Into this four-phase process, WSP integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Assistance grants (including Hazard Mitigation Grant Program, Pre-Disaster Mitigation program, Flood Mitigation Assistance), Community Rating System, and the flood control projects authorized by the U.S. Army Corps of Engineers (USACE). Table 3-2 summarizes the four-phase DMA process, the detailed CRS planning steps and work plan used to develop the plan, the nine handbook planning tasks from FEMA's 2013 Local Mitigation Planning Handbook, and where the results are captured in the Plan. The sections that follow describe each planning step in more detail.

Table 3-2 Mitigation Planning Process Used to Update the Plan

FEMA 4 Phase Guidance	Community Rating System (CRS) Planning Steps (Activity 510) and WSP Work Plan Tasks	FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)	Location in Plan
Phase I: Organize Resources	Task 1. Organize Resources	1: Determine the Planning Area and Resources	Chapters 1, 2 and 3
		2: Build the Planning Team 44 CFR 201.6(c)(1)	Chapter 3, Section 3.1
	Task 2. Involve the public	3: Create an Outreach Strategy y 44 CFR 201.6(b)(1)	Chapter 3, Section 3.1, 3.3.1
	Task 3. Coordinate with Other Agencies	4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)	Chapter 3, Section 3.1, 3.3.1
Phase II: Assess Risks	Task 4. Assess the hazard	5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)	Chapter 4, Sections 4.1-4.3
	Task 5. Assess the problem		Chapter 4, Sections 4.1-4.3

FEMA 4 Phase Guidance	Community Rating System (CRS) Planning Steps (Activity 510) and WSP Work Plan Tasks	FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)	Location in Plan
Phase III: Develop the Mitigation Strategy	Task 6. Set goals	6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(ii); and 44 CFR 201.6(c)(3)(iii)	Chapter 5, Section 5.1
	Task 7. Review possible activities		Chapter 5, Section 5.2
	Task 8. Draft an action plan		Chapter 5, Section 5.3
Phase IV: Adopt and Implement the Plan	Task 9. Adopt the plan	8: Review and Adopt the Plan 44 CFR 201.6(c)(3)	Chapter 6, Appendix E
	Task 10. Implement, evaluate, revise	7: Keep the Plan Current	Chapter 6
		9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)	Chapter 6

3.3.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

WSP worked with the Archuleta County Sheriff's Office – Division of Emergency Management to establish the framework and organization for the update of this Plan. WSP and the County Emergency Coordinator identified the key county, municipal, and other local government and initial stakeholder representatives. Invitations were emailed to invite them to participate as a member of the HMPC and to attend a kickoff meeting. Representatives from the following County and municipal departments and special districts participated on the HMPC and the development of the plan:

Archuleta County

- County Office of Emergency Management
- County Sheriff's Office
- County GIS
- County Planning
- County Public Works
- County Administration

Town of Pagosa Springs

- Town Manager
- Building and Planning Department

Special Districts

- Pagosa Area Water and Sanitation District
- Pagosa Fire Protection District

A list of specific HMPC representatives is included in Appendix C. Other local, state, federal, and private stakeholders invited to participate in the HMPC are discussed under Planning Step 3.

During the plan update process, the HMPC communicated with a combination of face-to-face meetings, phone interviews, and email correspondence. Three planning meetings with the HMPC were held during the plan's update between May and September 2022. The meeting schedule and topics are listed in the

following table. The kickoff meeting was offered as a webinar/hybrid in person meeting, and meetings #2 and #3 were held at the Archuleta County Emergency Operations Center location in Pagosa Springs. The sign-in sheets and agendas for each of the meetings are included in Appendix D.

Table 3-3 Schedule of HMPC Meetings

HMPC Meeting	Meeting Topic	Meeting Date
1	Kickoff Meeting: Introduction to DMA Planning and overview of Update Process, Hazard Identification Review planning schedule	April 18, 2022
2	Risk Assessment Summary/Goals Development	August 3, 2022
3	Mitigation Strategy Development	September 20, 2022

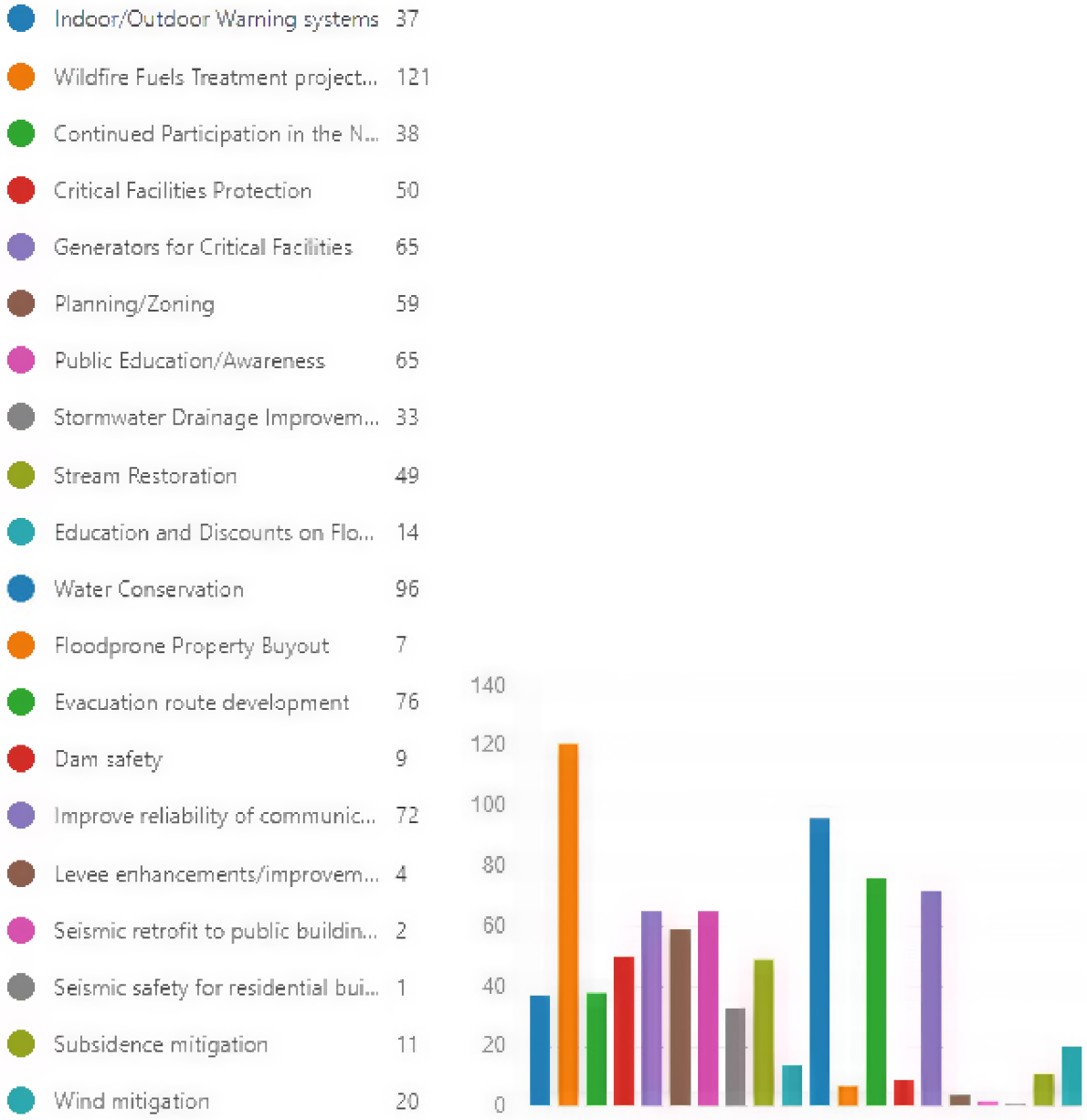
During the kickoff meeting, WSP presented information on the scope and purpose of the plan, participation requirements of HMPC members, and the proposed project work plan and schedule. This webinar was presented as part of an Archuleta County Multi-Agency Coordination System (MACS) group meeting. A plan for public involvement (Step 2) and coordination with other agencies and departments (Step 3) were discussed. WSP also revisited the hazard identification section of the plan with the HMPC members.

Planning Step 2: Involve the Public

At the kickoff meeting, the HMPC discussed options for soliciting public input on the mitigation plan and developed an outreach strategy by consensus. Public and stakeholder input was done through a combination of a public meeting and an online survey. During the plan update's drafting stage, the HMPC provided links to a public survey via Microsoft Forms. The survey was advertised by the County and participating jurisdictions through social media and posted to the County's website. The survey provided an opportunity for public input during the planning process, prior to finalization of the plan update. The public survey received responses from 141 individuals. Responses reflect the public perception that the most significant hazards to be wildland fire, drought, lightning, and severe winter storm.

Figure 3-1 below displays the results from Question 7, which asked respondents to consider potential mitigation actions and to indicate which types of actions should have the highest priority in the updated County Mitigation Strategy. These results were considered during the planning process and in the development of new mitigation actions. As indicated by the survey excerpt below, the highest priority action items should include wildfire fuels treatment projects (120 responses), water conservation (95 responses), evacuation route development (75 responses), improving reliability of communications systems (71 responses), public education/awareness (64), and generators for critical facilities (64). Further results of the public survey are provided in Appendix D.

Figure 3-1 Archuleta County Public Survey Results, Question 7



The public was given an opportunity to review and comment on the draft plan in February 2023. Archuleta County made it available on the County website with an online comment form. The plan was advertised by the County through an advertisement in *the Pagosa Sun* newspaper as well as the County website and Facebook pages. The public was given a two-week period to review and provide comments. The public review produced five comments, some of which resulted in modifications to some of the content specific to the hazards profiled in Chapter 4 including the Imminent Threat/Terrorism section. Others were addressed by one-on-one communication with the commenter and the Archuleta County Emergency Management Commander.

One comment from a community member expressed support for property owners to mitigate for wildland fire and to develop an emergency exit route, specifically some of the related mitigation actions in Section 5.3.2 (AC-4, AC-18, PFPD 2), and recommended partner organizations help coordinate efforts with homeowner associations. Another comment from a community member suggested that County conduct a Hazardous Materials Commodity Flow study, which would assess the traffic volume of such shipments by type/chemical. This study would help guide mitigation measures for hazard materials incidents. The County is intending to bolster traffic volume and evacuation planning through a

Record of public advertisements, public input, and sign-in sheets are on file with the County Emergency Management and in Appendix D.

Planning Step 3: Coordinate with Other Departments and Agencies

There are numerous organizations whose goals and interests' interface with hazard mitigation in Archuleta County. Coordination with these organizations and other community planning efforts is vital to the success of this plan's update and implementation. The HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting state and federal agencies and power and communications organizations to participate in the process. Based on their involvement in hazard mitigation activities, their role in land stewardship in the County, status as a neighboring jurisdiction or jurisdiction within the County Response Area, or their role in public safety, representatives from the following agencies were invited to participate on the HMPC. The agencies listed below regularly coordinate through participation on the Archuleta County MACs group. an asterisk indicates they attended HMPC meetings.

Neighboring communities

- Hinsdale County Emergency Management
- Mineral County Emergency Management*
- La Plata County Emergency Management
- Southern Ute Indian Tribe*
- Upper Pine Fire Protection District*
- Jicarilla Apache Nation*

Utility Providers and Local Business and Industry

- CenturyTel
- Black Hills Energy
- Tri-State Electric Association
- La Plata Electric Association
- Pagosa Springs Chamber of Commerce*
- KWUF Radio*
- Pagosa Springs Sanitation General Improvement District (PSSGID)

State Agencies

- Colorado Division of Homeland Security and Emergency Management*
- Colorado Department of Transportation
- Colorado State Forest Service

Federal Agencies

- U.S. Forest Service*
- U.S. Bureau of Reclamation*
- U.S. Bureau of Indian Affairs

- National Weather Service

Local/Citizen/Other

- Pagosa School District*
- Pagosa Lakes Property Owners Association
- American Red Cross
- San Juan Basin Public Health
- Pagosa Springs Medical Center
- Wildfire Adapted Partnership*
- Upperpine Fire Protection District*
- Colorado State*

Many of these stakeholders participated in the process by attending HMPC meetings. They were also given an opportunity to review and comment on the draft plan.

Coordination with specific state agencies is an additional requirement for local hazard mitigation plans per the FEMA Plan Review Tool modified by Colorado DHSEM in 2022. The following is the list of agencies and how they were coordinated with during the 2022 update process.

Table 3-4 Summary of State and Other Agency Coordination

Agency	Coordination Notes
Colorado Climate Center	Confirmed 2014 Climate Change in Colorado report was still the latest resource specific to Colorado
Colorado Geological Survey	Coordinated with on information on geologic hazards and utilized GIS data to inform landslide/rockfall/debris flow, land subsidence, earthquake, and avalanche hazards.
Colorado Water Conservation Board	Reviewed information on pasts droughts and their impacts on the planning area. Incorporated information from Drought Mitigation Plan into the risk assessment. Requested and reviewed information on flood insurance policies and claims including repetitive loss data; Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1)
Colorado Department of Transportation	Invited to and participated in HMPC meetings.
Colorado State Forest Service	Invited to and participated in HMPC meetings. CSFS provided a review of wildfire-related mitigation actions from the prior county plans and provided update and status.
Colorado Department of Natural Resources, Division of Water Resources - Office of Dam Safety	Provided database of dams with non-failure flood risk used to inform HIRA.
Colorado Resiliency Office	Outreach on related initiatives; CRO provided information on COVID-19 Regional Resiliency and Recovery roadmaps, with a focus on economic resiliency.

Agency	Coordination Notes
Other: High and Significant hazard dams Dam Owners	Agencies that own High and Significant Hazard Dams invited to participate on the RHMPC: • PAWSD • U.S. Forest Service Provided an opportunity to comment on public review draft: • Private dam owners: (Pagosa Lakes Property Owners Association)

Integration with Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability from natural hazards. Archuleta County uses a variety of comprehensive planning mechanisms, such as master plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

These documents and how they relate to hazard mitigation are summarized in Section 2.6 Mitigation Capabilities Assessment. The assessment consisted of identifying the existing mitigation capabilities of participating jurisdictions. This involved collecting information about existing government programs, policies, regulations, ordinances, and plans that mitigate or could be used to mitigate risk to disasters. Participating jurisdictions collected information on their regulatory, personnel, fiscal, and technical capabilities, as well as ongoing initiatives related to interagency coordination and public outreach.

Other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. A list of references is included in Appendix B.

Table 3-5 Summary of Key Plans, Studies, and Reports

Plan, Study, Report Name	How Plan, Study or Report Informed the HMPC
Colorado State Hazard Mitigation Plan (2018 Update)	Reviewed information on past hazard events and hazard risk information to inform the risk assessment Reviewed State goals and objectives
Colorado Drought Mitigation and Response Plan (2018 Update)	Reviewed information on pasts droughts and their impacts on the planning area. Incorporated information into the risk assessment
Colorado Water Conservation Board Future Avoided Cost Explorer (FACE) tool	Provided projections of future drought and wildfire costs for the planning area to inform the risk assessment
Colorado State Demographer Community Demographic Profiles (ACS 5-Year Estimates 2016-2021)	Provide demographic data and trends for Archuleta County and incorporated jurisdictions.
Archuleta County Community Wildfire Protection Plan 2020 and Archuleta County Forest Action Plan 2020 Summary	Informed the wildfire hazard profile update and mitigation strategy update

Plan, Study, Report Name	How Plan, Study or Report Informed the HMPC
USDA Risk Management Agency Crop Indemnity Reports (2007-2021)	Provided data related to crop losses due to drought and hail.

2017 Mitigation Plan Inclusion in Other Planning Mechanisms

In addition, the 2017 Hazard Mitigation Plan was cross referenced in other County plans updated since then, including:

- Archuleta County Emergency Operations Plan (informed the hazard identification)
- Archuleta County Community Plan Update 2017 (Comprehensive Plan that references the HMP, natural and man-made hazards, and includes related policies and an action specific to implementing the Hazard Mitigation Plan.)
- 2019 Hinsdale County Hazard Mitigation Plan update
- 2022-23 San Luis Valley Hazard Mitigation Plan update
- The plan was made available on the Pagosa Fire Protection District's website
- Pagosa Springs Land Use and Development Code update 2022

3.3.2 Phase 2: Assess Risks

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

Chapter 4 is the result of a comprehensive effort to identify and document all the hazards that have, or could, impact the planning area. This chapter was updated to reflect recent hazard events and current assets within the County and jurisdictions. Where data permitted, Geographic Information Systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. The HMPC conducted a capability assessment update to review and document the planning area's current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process and the results are included in Chapter 4. The capability assessment is included in Chapter 2 Community Profile and Capability Assessment.

3.3.3 Phase 3: Develop the Mitigation Plan

Planning Steps 6 and 7: Set Goals and Review Possible Activities

WSP facilitated a brainstorming and discussion session with the HMPC during their second meeting to update the goals and objectives from the 2017 plan. The HMPC determined the goals were still valid but decided to add an additional objective under goal 1. Refer to Chapter 5 for further details. During the third HMPC meeting WSP facilitated a discussion session with the HMPC around a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This included a review of progress on each action identified in the 2017 plan. Some new mitigation actions resulted from this process that were added to the plan in 2022. This process and its results are described in greater detail in Chapter 5.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, WSP produced a complete first draft of the plan. This complete draft was shared electronically for HMPC review and comment. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the second draft, which was advertised and distributed

to collect public input and comments. WSP integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the Colorado Division of Homeland Security and Emergency Management (DHSEM) and FEMA Region VIII to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

3.3.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the plan was adopted by the governing boards of each participating jurisdiction on the dates included in the adoption resolutions in Appendix E.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The HMPC developed and agreed upon an overall strategy for plan implementation and for monitoring and maintaining the plan over time. A discussion on the progress with implementation is included in Chapter 5. Each recommended action includes key descriptors, such as a lead manager and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Chapter 6.

Finally, there are numerous organizations within the Archuleta County planning area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and mitigation in Archuleta County and is addressed further in Chapter 6. An updated overall implementation strategy and maintenance and a strategy for continued public involvement are also included in Chapter 6.

4 Risk Assessment

44 CFR Requirement 201.6(c)(2): [The plan shall include] a risk assessment that provides the factual basis for activities proposed in the strategy to reduce the losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment followed the methodology described in the FEMA publication Local Mitigation Planning Handbook (March 2013), which breaks the assessment down to a four-step process:

1) Describe Hazards
2) Identify Community Assets
3) Analyze Risks
4) Summarize Vulnerability

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 4.1 Hazard Identification** identifies the hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Section 4.2 Asset Inventory** discusses the County's total exposure to natural hazards, considering assets at risk, critical facilities, and future development trends
- **Section 4.3 Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences.

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

4.1 Hazard Identification

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

The first step in developing a risk assessment is identifying the hazards. The Archuleta County Hazard Mitigation Planning Committee (HMPC) conducted a hazard identification study to determine the hazards that threaten the Planning Area and estimates of potential losses or assets that could be affected by those hazards (if/as applicable).

4.1.1 Results and Methodology

Using existing hazards data, plans from participating jurisdictions, and input gained through planning and public meetings, the HMPC agreed upon a list of hazards that could affect Archuleta County. Hazards data was obtained from FEMA, the Colorado Division of Homeland Security and Emergency Management (including the State of Colorado Hazard Mitigation Plan), and the National Oceanic and Atmospheric Administration National Center for Environmental Information (NCEI – formerly referenced as the National Climatic Data Center or NCDC), The NCEI database was used as the primary resource for the 2022 update. The HMPC contributed a significant amount of research from historic local newspaper articles. Together, these sources were examined to assess the significance of these hazards to the planning area. The hazards evaluated in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

The following natural hazards, listed alphabetically, were identified and investigated for the Archuleta County Hazard Mitigation Plan:

- Avalanche
- Dam Failure
- Drought
- Earthquake
- Extreme Cold
- Flooding
- Hail
- High Winds and Tornadoes
- Landslide/Rockfall/Debris Flow
- Land Subsidence
- Lightning
- Pandemic Disease
- Severe Winter Storm
- Volcano
- Wildland Fire
- Wildlife Hazards

Manmade hazards also exist in Archuleta County. Manmade hazards include:

- Cyber Attacks*
- Hazardous Materials Incident
- Imminent Threat/Terrorism

*New hazard identified in 2022 update

Members of the HMPC used a hazards worksheet to identify and rate the significance of a variety of possible hazards. Significance was measured in general terms, focusing on key criteria such as the likelihood of the event, past occurrences, spatial extent, damage, and casualty potential. Table 4-1 represents the worksheet used to identify and rate the hazards and is a composite that includes input from all the participating jurisdictions. Note that the significance of the hazard may vary from jurisdiction to jurisdiction. The most significant hazards, based on the subjective input from the team, listed alphabetically are floods, severe winter storms, and wildland fires. Drought, hazardous materials, landslide, and lighting were also ranked as high significance hazards based on the results of the risk and vulnerability assessment.

Part of the planning process involved issuing a public survey to assess the community's perception of hazards. Discussed further in Chapter 3, the results indicate that drought, lightning, winter storms, and wildfire are the most significant, which aligns with the HMPC hazard identification.

Table 4-1 Archuleta County Hazards Identification Worksheet

Hazard	Likelihood of Event/Frequency	Geographic Extent	Potential Magnitude	Significance
Avalanche	Highly Likely	Limited	Limited	Medium
Dam Failure	Occasional	Significant	Limited	Medium
Drought	Likely	Extensive	Critical	High
Earthquake	Occasional	Extensive	Limited	Low
Extreme Temperatures	Likely	Extensive	Negligible	Low
Flooding	Likely	Significant	Critical	High
Hailstorm	Likely	Extensive	Negligible	Low
High Winds and Tornadoes	Occasional	Extensive	Negligible	Medium
Landslide/Rockfall/Debris Flow	Likely	Extensive	Critical	High
Land Subsidence	Likely	Significant	Limited	Low
Lightning	Highly Likely	Extensive	Limited	High
Pandemic Disease	Occasional	Extensive	Critical	Medium
Severe Winter Storms	Highly Likely	Extensive	Limited	High
Volcano	Unlikely	Limited	Negligible	Low
Wildland Fires	Highly Likely	Significant	Critical	High
Wildlife Hazards	Highly Likely	Significant	Negligible	Low
Hazardous Materials Incident	Highly Likely	Limited	Limited	Medium
Imminent Threat/Terrorism	Occasional	Limited	Limited	Low
Cyber-Attack	Occasional	Significant	Critical	Medium

Likelihood of Event/Frequency

Highly Likely: Near 100% chance of occurrence in next year, or happens every year.

Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.

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

Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Geographic Extent

Limited: Less than 10% of planning area

Significant: 10-50% of planning area

Extensive: 50-100% of planning area

Potential Magnitude

Catastrophic: More than 50% of area affected

Critical: 25-50% of area affected

Limited: 10-25% of area affected

Negligible: Less than 10% of area affected

Significance

Low: minimal potential impact

Medium: moderate potential impact

High: widespread potential impact

The hazards discussed in this plan apply to Archuleta County's entire emergency response area. This response area includes the southern portions of Hinsdale and Mineral Counties because the Pagosa Springs area is the nearest major population center to those areas. Archuleta County's emergency personnel can provide a timelier response to those areas than Hinsdale and Mineral County's emergency response personnel. The northern boundary of the response area coincides with the Continental Divide. Archuleta County's response area is shown in Figure 2-1 in Chapter 2 Community Profile.

Hazard Identification Changes from 2018 Plan

During the 2022 update the HMPC decided to add a new hazard, cyber-attacks. Cyber-attacks were added as a new hazard profiled in the plan due to an increase of awareness related to cyber security and recent events of cyber-attacks impacting local governments The HMPC also decided to expand the extreme temperature profile to include extreme heat. Overall, since 2018, the significance ratings have mostly remained the same. However, the analysis in the hazard profile sections highlights the increased awareness of the interconnectedness of many hazards. For example, growing concern about post-fire debris flow is addressed in landslide and concern about hazardous trees being blown over in windstorms due to extensive beetle kill is noted in the wind hazard section.

Another addition to the plan update is the inclusion of an analysis of climate change impacts for each hazard profile. This section examines the potential for climate change to affect the frequency and intensity of each hazard in the future.

4.1.2 Excluded Hazards

The Planning Team also reviewed the natural and human-caused hazards listed in the 2018 Colorado State Hazard Mitigation Plan (SHMP) and determined that the plan generally aligns with the natural hazards with the exception of some other hazards in that plan that did present sufficient risk in the planning area to justify their inclusion. These include: dense fog, erosion and deposition, radon, carbon monoxide and methane seeps, pest infestation, chemical, biological, radiological and nuclear attack, explosive attack, infrastructure failure and power failure. Power failure is addressed as a consequence of applicable hazards. The HMPC did not know of any past impacts or current concerns with expansive soils. If expansive soils are encountered, they are typically mitigated in modern construction practices. Thunderstorm is not identified as an individual hazard, but is recognized for its role in the flooding, lightning, hail, and windstorm hazards.

4.1.3 Disaster Declaration History

One method the HMPC used to identify hazards was the researching of past events that triggered federal and/or state emergency or disaster declarations in the planning area. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

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

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected county as well as

contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans.

Table 4-2 provides information on federal emergencies and disasters declared that included Archuleta County between 1953 and 2021. Archuleta County has experienced eight Presidential disaster declarations and eight other federal declarations, and five state emergency declarations. Most these declarations are associated with drought events. Note that in some these declarations Archuleta County was not declared alone but was part of a statewide or regional declaration.

Table 4-2 Federal Disaster and Emergency Declarations: 1953-2021

Event/ Hazard	Year	Declaration Type	Remarks/Description
Heavy Rains and Flooding	1970	Presidential—Major Disaster Declaration	$3.3 million (2009 dollars) statewide
Flooding and Landslides	1973	Presidential—Major Disaster Declaration	$4.7 million (2009 dollars) statewide
Drought	1977	Presidential—Emergency Declaration	$4.8 million (2009 dollars) statewide
Drought	1989	USDA	
Drought	1996	USDA	
Landslides/Rockfalls	1998	Governor's Declaration	Archuleta, Garfield, Mesa, Gunnison, Rio Blanco
Drought	2002	Presidential—Emergency Declaration	Statewide
Wildland fires	2002	Presidential—Emergency Declaration	Statewide
Drought/Insects	2003	USDA	Archuleta included
Snow Emergency	2003	Governor's Declaration	Statewide
Hurricane Katrina Evacuation	2005	Presidential—Emergency Declaration	Statewide
Heat, high winds, insect pests, late freeze, drought	2006	USDA	Archuleta included
Severe Spring Snowstorm	2009	Governor's Declaration	Statewide
Severe Blizzard	2009	Governor's Declaration	Statewide
Drought	2011	USDA	
Drought, wind/high winds, heat/excessive heat	2012	USDA	
Drought, wind/high winds, fire/wildfire, heat/excessive heat, insects	2013	USDA	
Extreme Weather	2014	Governor's Declaration	Statewide
Drought	2015	USDA	Archuleta included in addition to 12 other counties
Drought	2018	USDA	
Drought	2019	USDA	
Drought	2020	USDA	
Covid-19	2020	Presidential – Emergency Declaration	Statewide

Event/ Hazard	Year	Declaration Type	Remarks/Description
Covid-19 Pandemic	2020	Presidential – Major Declaration	Nationwide
Drought	2021	USDA	

Sources: FEMA Disaster Declaration https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties 2018 State of Colorado Multi-Hazard Mitigation Plan

4.2 Assets Inventory

Assets inventoried for the purpose of determining vulnerability include people, buildings, critical facilities, and natural, historic, or cultural resources. For the regional planning process two standard databases were utilized for the basis of building and critical facility data. Archuleta County Assessor Data from 2022 was used for improved parcel and building inventory throughout the county. This information provided the basis for building exposure and property types. This data was then analyzed using GIS to identify numbers, locations, and values of improved properties exposed to various hazards, such as dam inundation, flood, fire, and landslide.

4.2.1 Methodology

This vulnerability assessment is an attempt to quantify assets at risk, by jurisdiction where possible, to further define populations, buildings, and critical facilities at risk to hazards identified in this plan. The hazards included in this assessment are those that were considered medium or high in planning significance, based on HMPC input and the hazard profiles, and for which suitable information was available for analysis. The methods of analysis vary by hazard type and data available.

Data to support the vulnerability assessment was collected and compiled from the following sources:

- County GIS data (hazards, base layers, and assessor's data)
- Written descriptions of inventory and risks provided by participating jurisdictions
- Existing plans and studies
- Personal interviews with planning team members, hazard experts, and County and Town staff

As a starting point for analyzing the Planning Area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. If a catastrophic disaster was to occur in the Planning Area, this section describes significant assets exposed or at risk in the Planning Area. Data used in this baseline assessment included:

- Total assets at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Population growth and land use/development trends.

The vulnerability assessment first describes the assets in Archuleta County, including the total exposure of people and property; critical facilities and infrastructure; natural, historic, and cultural resources; and economic assets. Development trends, including population growth and land status, are analyzed in relation to hazard-prone areas. During this 2022 planning update, the latest available parcel and critical facilities databases were used to reflect current development within the County. Next, where data was available, hazards are evaluated in more detail and potential losses are estimated.

This section assesses the population, structures, critical facilities and infrastructure, and other important assets in the Planning Area as an initial consideration of risk to hazards identified in this plan. It begins with an inventory of people and buildings (total exposure) in the County to provide a baseline for evaluating vulnerability by hazard.

Exposure/Potential Dollar Loss

Assessments in this plan are based on address points and parcels from the Archuleta County's Assessor's Office and from HAZUS 4.0 inventory for Hinsdale and Mineral County. The following tables shows the value of the buildings in Archuleta County from the Archuleta Assessor's Office (2022). GIS analysis utilized a combination of Address Points and Parcels to get the separate parcel and building counts. According to the assessor's data, the sum of the actual value improvements and estimated contents in the County is $4.5 billion (total building exposure). Contents exposure is estimated as a percent of the improvement value (specifically, 50% of the improvement value for residential structures, 150% for Industrial, and 100% for non-residential structures like Agricultural, Commercial, Exempt, Mixed-Use, and Improved Vacant properties), based on standard FEMA methodologies. These values are summarized in the tables below.

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.

Building exposure data for Hinsdale and Mineral County, which are included in the Pagosa Area Fire Protection District, is shown in Table 4-6 Pagosa Area Fire Protection District Total Exposure . This data was obtained from HAZUS 4.0 inventory which is based on 2010 Census block data.

Table 4-3 Building Exposure by Jurisdiction (Assessor's Office)

Jurisdiction	Building Count	Improvement Value ($)	Contents Exposure* ($)	Total Exposure ($)
Town of Pagosa Springs	1,269	$303,969,409	$195,908,370	$499,877,779
Unincorporated Areas	8,869	$2,641,035,909	$1,404,750,810	$4,045,786,719
Total	**10,138**	**$2,945,005,318**	**$1,600,659,179**	**$4,545,664,497**

Source: Archuleta County Assessor's Office Data 2022, Wood GIS Analysis

Table 4-4 Building Inventory Valuations by Property Type—Unincorporated Archuleta County

Occupancy Type	Parcel Count	Building Count	Improvement Value	Content Value	Total Value
Agricultural	375	419	$111,844,660	$111,844,660	$223,689,320
Commercial	198	216	$45,129,730	$45,129,730	$90,259,460
Exempt	44	50	$0	$0	$0
Industrial	15	15	$2,013,900	$3,020,850	$5,034,750
Mixed-Use	1	2	$458,320	$458,320	$916,640
Residential	7,638	7,916	$2,474,584,099	$1,237,292,050	$3,711,876,149
State Exempt	2	2	$0	$0	$0
Vacant	247	249	$7,005,200	$7,005,200	$14,010,400
Total	**8,520**	**8,869**	**$2,641,035,909**	**$1,404,750,810**	**$4,045,786,719**

Source: Archuleta County Assessor's Office Data 2022, Wood GIS Analysis

Table 4-5 Building Inventory Valuations by Property Type—Town of Pagosa Springs

Occupancy Type	Parcel Count	Building Count	Improvement Value	Content Value	Total Value
Agricultural	5	6	$1,627,240	$1,627,240	$3,254,480
Commercial	285	333	$84,671,080	$84,671,080	$169,342,160
Exempt	48	56	$0	$0	$0
Industrial	3	3	$399,680	$599,520	$999,200
Mixed-Use	1	1	$374,540	$374,540	$749,080
Residential	797	821	$216,521,759	$108,260,880	$324,782,639
Vacant	46	49	$375,110	$375,110	$750,220
Total	1,185	1,269	$303,969,409	$195,908,370	$499,877,779

Source: Archuleta County Assessor's Office Data 2022, Wood GIS Analysis

Table 4-6 Pagosa Area Fire Protection District Total Exposure

Jurisdiction	Parcel Count	Building Count	Improvement Value ($)	Contents Exposure* ($)	Total Exposure ($)
Town of Pagosa Springs	1,185	1,269	$303,969,409	$195,908,370	$499,877,779
Unincorporated Areas	7,620	7,918	$2,394,536,329	$1,254,060,295	$3,648,596,624
Total	8,805	9,187	$2,698,505,738	$1,449,968,664	$4,148,474,402

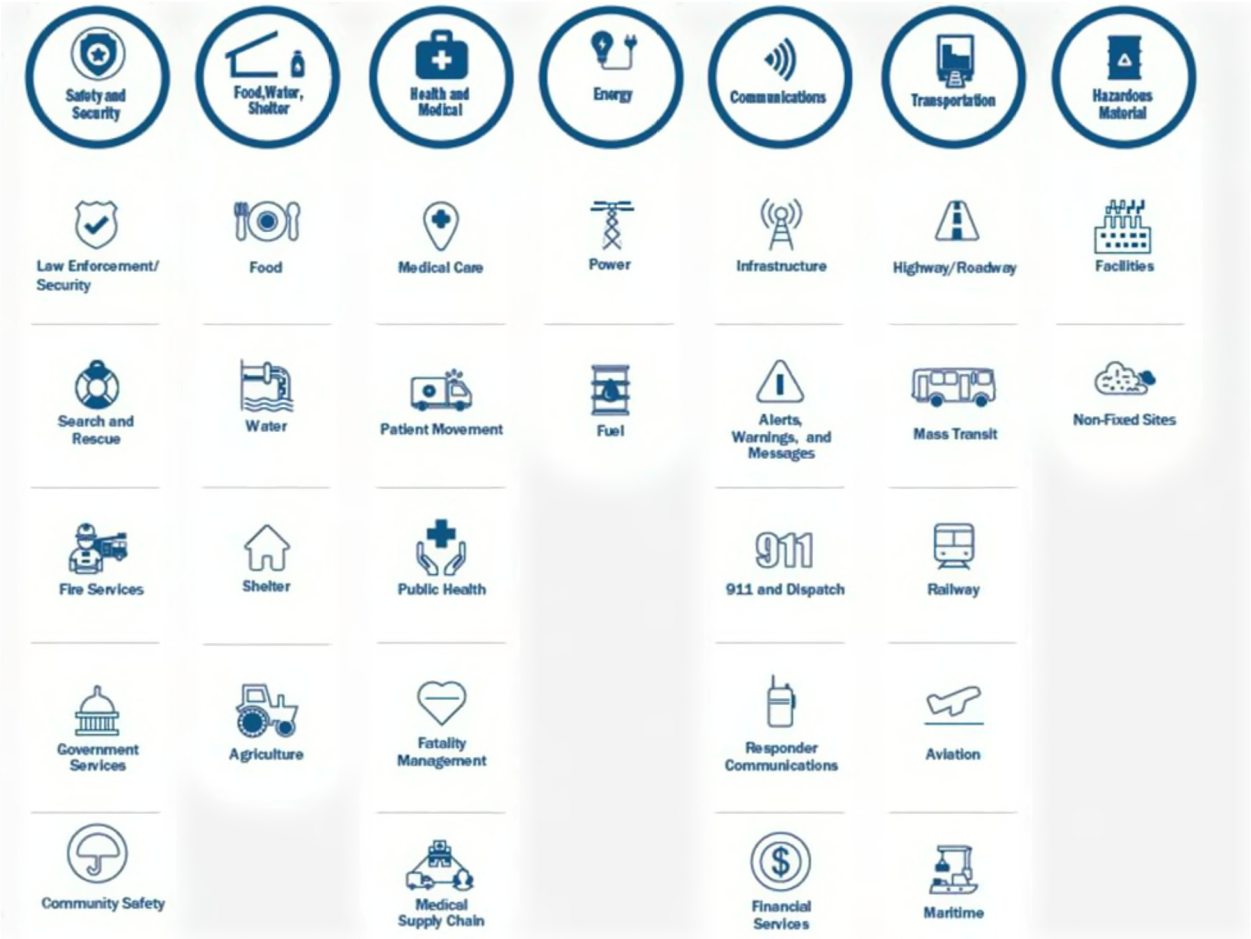
Source: Archuleta County Assessor Data 2022, Archuleta Community Wildfire Protection Agency, Wood GIS Analysis

Critical Facilities, Infrastructure, and Other Important Community Assets

A critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Much of this data is based on GIS databases associated with the 2022 Homeland Infrastructure Foundation-Level Data (HIFLD). Other critical facility databases were also used, such as the National Bridge Inventory (NBI), the Highway Safety Improvement Program, and data from Archuleta County. Where applicable, this information was used in an overlay analysis for hazards such as flood, landslide, and wildfire.

FEMA organizes critical facilities into seven lifeline categories as shown in Figure 4-1.

Figure 4-1 FEMA Lifeline Categories



Source: FEMA

These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g., infrastructure owners and operators).
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs.
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization.
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets.
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

HMPC members were asked to identify the assets in their respective jurisdictions that they considered to be critical facilities or of importance/value. Table 4-7 displays the inventory of these assets in Archuleta County, by jurisdiction, as provided by the County, Homeland Infrastructure Foundation-Level Data (HIFLD),

Highway Safety Improvement Program (HSIP), National Bridge Inventory (NBI), and Colorado Forest Atlas. Where known, hazards that threaten the asset have been noted by the HMPC. Maps of critical facilities can be found in the flood and wildland fire vulnerability sections.

Archuleta County Sheriff's Office – Division of Emergency Management identified several other critical facilities in addition to the assets listed in Table 4-8. These include grocery stores, radio and communication towers, the main fiber optic line, water supply pumps, power lines, and fuel storage facilities. Due to the lack of weather radar coverage, local weather stations, river gauges, and rain gauges are also considered critical. Some of the data concerning the location of critical utility facilities was determined to be sensitive in nature. Therefore, the utility providers did not release the data.

Critical facilities were also identified in southern Hinsdale and Mineral County using HAZUS. The two critical facilities identified in southern Hinsdale County include the Williams Creek Dam, rated as a high hazard dam, and a bridge. The bridge is not rated as scour critical. Five critical facilities were identified in Mineral County, including a wastewater facility owned by the Wolf Creek Ski Company, the Alberta Park Dam, and three bridges. The Alberta Park Dam is rated as significant but is on the opposite side of the Continental Divide from the Response Area. The three bridges in Mineral County are not scour critical.

Table 4-7 Archuleta County Critical Facilities by Lifeline

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Pagosa Springs	11	3	-	-	1	9	3	**27**
Unincorporated	68	4	6	-	2	13	48	**141**
Pagosa Area FPD	24	5	5	-	3	21	23	**81**

Source: Archuleta County, HIFLD, HSIP, NBI, Wood GIS Analysis

Table 4-8 Archuleta County Asset Inventory

Name of Asset	Type	Jurisdiction	Hazard Specific Information
1 | Pagosa SP CO Ute Electric	Electric Power	Pagosa Springs	1 percent flood
2 | Pagosa SP CO Ute Electric	Electric Power	Pagosa Springs	1 percent flood
1st Street Bridge	Transportation	Pagosa Springs	flood and debris hazards
Archuleta County High School	School	Pagosa Springs	None
Archuleta County Sheriff	Police	Pagosa Springs	0.2 percent flood
KWUF 1400	Communications	Pagosa Springs	None
Pagosa SP	Electric Power	Pagosa Springs	1 percent flood
Pagosa Springs Education Center	School	Pagosa Springs	None
Pagosa Springs Elementary School	School	Pagosa Springs	None
Pagosa Springs High School	School	Pagosa Springs	None
Pagosa Springs Intermediate School	School	Pagosa Springs	None
Pagosa Springs Junior High School	School	Pagosa Springs	None

Name of Asset	Type	Jurisdiction	Hazard Specific Information
Pagosa Springs Police and Town Hall	Police/Government	Pagosa Springs	Possibly vulnerable to > 0.2 Percent flood, access may be limited
San Juan National Forest, Pagosa Springs Office	Police	Pagosa Springs	None
Community Center	Vulnerable Facility	Pagosa Springs	Possibly vulnerable to > 0.2 Percent flood
Hot Springs Resort	Vulnerable Facility	Pagosa Springs	1 percent flood
Senior Housing at 9th and Apache	Vulnerable Facility	Pagosa Springs	1 percent flood
County Courthouse	Essential Facility/Sheriff Office/Government	Pagosa Springs	Possibly vulnerable to > 0.2 Percent flood
Archuleta County Emergency Operations Center / Nick's Hanger	EOC / Communications / Essential Facility	Unincorporated	None
CO State Patrol Field Office	Police	Archuleta	None
Fitz Properties, Inc.	Wastewater Facility	Archuleta	1 percent flood
KWUF-FM CH 292	Communications	Archuleta	None
Lake Capote Wastewater Facility	Wastewater Facility	Archuleta	None
Our Savior Lutheran School	School	Archuleta	None
Pagosa	Electric Power	Archuleta	None
Pagosa Area Water and Sanitation Dist.	Water Facility	Archuleta	None
Pagosa Area Water and Sanitation Dist.	Wastewater Facility	Archuleta	None
Pagosa Area Water and Sanitation Dist.	Wastewater Facility	Archuleta	None
Pagosa Springs Sanitation Dist.	Wastewater Facility	Archuleta	None
Station #1	Fire	Archuleta	None
Station #2	Fire	Archuleta	None
Station #3	Fire	Archuleta	None
Station #4	Fire	Archuleta	None
Station #5	Fire	Archuleta	None
Station #6	Fire	Archuleta	None
Archuleta County Combined Dispatch	LAW/Fire/EMS/EM/ SAR	Pagosa Springs	
Oakbrush Communications Site	Communications	Archuleta	
Reservoir Hill Communications Site	Communications	Archuleta	
Sandoval Communications Site	Communications	Archuleta Southern Ute Indian Tribe	
Lobo Communications Site	Communications	Mineral	
Devil Mountain Communications Site	Communications	Archuleta	
Downtown Hwy 160 Bridge	Transportation	Pagosa Springs	
Piedra Hwy 160 Bridge	Transportation	Archuleta	
City Market	Food/Fuel	Pagosa Springs	
Giant	Fuel	Pagosa Springs	
Conoco – Uptown	Fuel	Pagosa Springs	
Conoco – Downtown	Fuel	Pagosa Springs	
Shell	Fuel	Pagosa Springs	

Name of Asset	Type	Jurisdiction	Hazard Specific Information
Sonoco	Fuel	Pagosa Springs	
Everyday	Fuel	Pagosa Springs	
Geothermal System	Heating	Pagosa Springs	
All cell towers	Communications	Archuleta / Mineral / Pagosa Springs	
Transmission Lines	Power	Archuleta / Mineral / Pagosa Springs	
Inter-state Gas Lines	Natural Gas	Archuleta / Mineral	
Archuleta County Airport	Transportation	Archuleta	
Hwy 160	Transportation	Archuleta / Mineral / Pagosa Springs	
San Juan National Forest	Recreation	San Juan National Forest	
All Government Rain Gauges	Warning Systems	Archuleta / Hinsdale / Mineral / Pagosa Springs	
All Government Stream Gauges	Warning Systems	Archuleta / Mineral / Pagosa Springs	
All Government Weather Stations (Including SNOTEL and RAWS)	Warning Systems	Archuleta / Hinsdale / Mineral / Pagosa Springs	
Broadband Data Systems (wired / wireless)	Communications	Archuleta / Hinsdale / Mineral / Pagosa Springs	
Archuleta County Shop / Road and Bridge / Planning	Essential Facility	Archuleta	
Archuleta County Fair Grounds	Essential Facility	Archuleta	

Source: HMPC, HAZUS

Natural, Historic, and Cultural Assets

Assessing the vulnerability of Archuleta County to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.

Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

Natural resources are important to include in benefit-cost analyses for future projects and may be used to leverage additional funding for projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as attenuates and stores floodwaters.

Many natural resources exist in Archuleta County. This includes wetlands, endangered species, and imperiled plant communities. Also, the scenery itself, and access to the scenic backcountry, are economic drivers for the County and Pagosa Springs.

A significant natural resource is the geothermal resources found in the area. This resource provides heating for some of downtown Pagosa Springs. The Pagosa Hot Springs Resort is a significant tourist draw and economic driver within the County. Some of the lower pools at the resort are vulnerable to flooding from the San Juan River.

Wetlands

Wetlands are a valuable natural resource for communities, due to their benefits to water quality, wildlife protection, recreation, and education, and play a key role in hazard mitigation. Wetlands reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water. They also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital.

Endangered Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

According to the U.S. Fish and Wildlife Service, as of November 2010, there are ten Federal endangered, threatened, recovering, or candidate species in Archuleta County. These species are listed in Table 4-9 along with state listed species. State special concern is not a statutory category but suggests a species may be in danger.

Other significant wildlife species with limited suitable habitat include elk or wapiti, mule deer, black bear, and mountain lion.

Table 4-9 Select List of Important Species Found in Archuleta County

Common Name	Scientific Name	Type of Species	Status
Arctic peregrine falcon	*Falco peregrines tundrius*	Bird	Recovery
Mexican spotted owl	*Strix occidentalis lucida*	Bird	State Threatened

Common Name	Scientific Name	Type of Species	Status
Mountain Plover	*Charadrius montanus*	Bird	Proposed Threatened
Southwestern willow flycatcher	*Empidonax traillii extimus*	Bird	State Endangered
Yellow-billed cuckoo	*Coccyzus americanus*	Bird	Federal Candidate
Colorado pikeminnow*	*Ptychocheilus lucius*	Fish	Federal Endangered
Razorback sucker*	*Xyrauchen texanus*	Fish	Federal Endangered
Pagosa skyrocket	*Ipomopsis polyantha*	Flowering plant	Proposed Endangered
Black-footed ferret	*Mustela nigripes*	Mammal	Experimental population, non-essential
Canada lynx	*Lynx canadensis*	Mammal	Federal Threatened

Source: Endangered, Threatened, Proposed, and Candidate Species Colorado Counties (November 2010), U.S. Fish and Wildlife Service Mountain-Prairie Region, www.fws.gov/mountain-prairie/endspp/; Natural Diversity Information Source of the Colorado Division of Wildlife, http://ndis.nrel.colostate.edu/

* Water depletions in the Upper Colorado River and San Juan River Basins, may affect the species and/or critical habitat in downstream reaches in other states.

Note: State status information is from the NDIS, which does not track county occurrence of fish or insects at this time.

Historic and Cultural Resources

There are many important historic resources within Archuleta County. A historic property not only includes buildings or other types of structures, such as bridges and dams, but also includes prehistoric or Native American sites, roads, byways, historic landscapes, and many other features. Given the history of the County, these types of historic properties exist; some are inventoried and listed in this plan.

Information about historic assets in Archuleta County came from local sources as well as two historic inventories:

- The National Register of Historic Places is the Nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.
- The Colorado State Register of Historic Properties is a listing of the state's significant cultural resources worthy of preservation for the future education and enjoyment of Colorado's residents and visitors. Properties listed in the Colorado State Register include individual buildings, structures, objects, districts, and historic and archaeological sites. The Colorado State Register program is administered by the Office of Archaeology and Historic Preservation within the Colorado Historical Society. Properties listed in the National Register of Historic Places are automatically placed in the Colorado State Register.

Table 4-10 lists the properties and districts in Archuleta County that are on the Colorado State Register of Historic Properties. Those properties that are also on the National Register of Historic Places are indicated with an asterisk.

Table 4-10 Archuleta County Historic Properties/Districts in State and National Registers

Property	Jurisdiction	Location	Date Listed
Chimney Rock National Monument	Chimney Rock	San Juan National Forest	10/12/2012

Property	Jurisdiction	Location	Date Listed
Labo del Rio Bridge*	Arboles	County Rd. F50	6/24/1985
Chimney Rock Archaeological Area*	Chimney Rock	San Juan National Forest	8/25/1970
Chromo School	Chromo	US Hwy 84	6/12/1996
Denver & Rio Grande Western Railroad San Juan Extension*	Cumbres Pass	Antonita to Chama, New Mexico over Cumbres Pass	1/16/1973
La Casa Ruibalid	Pagosa Springs	County Rd. 335	6/14/1995
Pagosa Hot Spring	Pagosa Springs	Light Plant Rd.	8/14/1991

Sources: Directory of Colorado State Register Properties, www.coloradohistory-oahp.org/programareas/register/1503/; National Register Information System, www.nr.nps.gov/
*On both the Colorado State Register of Historic Properties and the National Register of Historic Places
n=national

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for this regulation.

Given the 50-year threshold for buildings to be eligible for consideration as a historic resource, many of the buildings in downtown Pagosa Springs and elsewhere in the County are potentially eligible for consideration. Several of the buildings in this area were built several decades ago and serve as important cultural and historic resources for the community. In addition to preserving such resources, joining a historic register can also provide tax incentives and preservation assistance. A list of locally designated historic properties is displayed below in Table 4-11.

Table 4-11 Locally Designated Historic Properties and Districts

Property	Location	Date Listed
Water Treatment Plant	92 1st St.	1999
Goodman's Department Store	404 Pagosa St.	2001
Metropolitan Hotel	418 Pagosa St.	2002
Liberty Theatre	418 Pagosa St.	2002
Phillips' House	138 Pagosa St.	2002
Warr House	121 Lewis St.	2003
Hatcher Nossaman House	274 Pagosa St.	2004
Hatcher Hardware	468 Pagosa St.	2004
Citizen's Bank	474 Pagosa St.	2004
Immaculate Heart of Mary's	451 Lewis St.	2004
Colton Building	101 Pagosa St.	2005
Old County Jail	380 Lewis St.	2006
Dr. McKinley's Residence	380 Lewis St.	2006
Pagosa Springs Cemetery	X.S. 10th St.	
Historic Business District	From 4th to 5th St. and San Juan St. to Lewis St.	

Source: San Juan Historical Society

Cultural Assets

Archuleta County's cultural assets include those associated with the Southern Ute Indian Tribal lands. Due to the sensitive nature of this information, it is not disclosed in this plan. The Tribe has a separate hazard mitigation plan specific to the reservation.

Economic Assets

Archuleta County's spectacular scenery is its primary economic asset. Much of Archuleta County's economy is tourism-based due to Archuleta's location in the San Juan Mountains of southwest Colorado. Tourists often flock to the county in the winter months during ski season, which coincides with avalanche and severe winter storm season. However, tourism is also common in the summer and fall months when hikers, fishers, and hunters come to the area. This places people at risk during flood and wildland fire season. Flooding could cause a short-term negative economic impact. A large wildland fire could impact the scenic view-shed and have longer term negative economic and environmental impacts. The Pagosa Hot Springs are a popular tourist draw and are vulnerable to flood.

4.2.2 Development Trends

As part of the planning process, the HMPC looked at growth and development trends. These trends are examined further in the context of each significant hazard, and how the changes in growth and development affect loss estimates and vulnerability.

According to the U.S. Census Bureau, the 2020 estimated population of Archuleta County was 13,588. This is a 12.4 percent increase from the 2010 population of 12,084. Table 4-12 shows the total population, number of housing units, and percent change for each by jurisdiction between 2010 and 2020.

Table 4-12 Population and Housing Units by Jurisdiction, 2010-2020

Jurisdiction	2010 Pop.	2020 Pop.*	# Change	% Change	2010 Housing Units	2020 Housing Units*	# Change	% Change
Town of Pagosa Springs	1,727	1,751	24	1.4%	945	974	29	3.1%
Unincorporated Areas	10,357	11,837	1,480	14.3%	7,817	8,503	686	8.8%
Total County	12,084	13,588	1,504	12.4%	8,762	9,477	715	8.1%

Source: U.S. Census Bureau.

* Housing unit numbers are calculated from the most recent available data, provided by the American Community Survey 2015-2020 estimates

As indicated above, Archuleta County has grown in recent years. There is a disproportionate level of growth in the number of housing units compared to the population growth, which reflects the growing issues of housing availability in many regions of Colorado.

Growth is projected to continue through 2035 at an average rate of 3.08 percent over every five-year period. Table 4-13 shows the population projections for the County through 2035.

Table 4-13 Population Projections for Archuleta County, 2010-2035

	2010	2020	2025	2030	2035
Population	12,744	17,805	20,866	24,110	27,330
Percent Change (%)		+3.5	+3.2	+2.9	+2.5

Sources: Colorado Department of Local Affairs Demography Section, www.dola.colorado.gov/dlg/demog/

According to the 2001 Archuleta County Community Plan, future growth is projected to occur in areas that are expected to be annexed by the Town of Pagosa Springs over the next few decades. Currently, most of the County's population is in the existing incorporated areas and the Pagosa Lakes subdivisions around Pagosa Springs, referred to as the Pagosa Hub area in the Community Plan. Growth is restricted due to the large amount of public land in the County. Roughly one-third of Archuleta County is privately owned, while the remaining two-thirds are held by federal, state, and tribal governments.

According to a summary of the Archuleta County building permit statistics, the number of building permits was typically in the range of 150-300 from 2008-2017. The number of building permits has increased from 149 in 2009 to 291 in 2017 to 193 in 2021, likely due to improved economic conditions.

4.3 Hazard Profiles

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

The hazards identified in Section 4.1 Hazard Identification are profiled individually in this section. Much of the profile information came from the same sources used to initially identify the hazards.

4.3.1 Profile Methodology

Each hazard is profiled in a similar format that is described below:

Hazard/Problem Description

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

Past Occurrences

This subsection contains information on historic incidents, including impacts where known. The extent or location of the hazard within or near the Archuleta County Planning Area is also included here. Information provided by the HMPC is included here along with information from other data sources.

Geographical Area Affected

This subsection discusses which areas of the County are most likely to be affected by a hazard event. Affected areas outside of the County but within the Archuleta County response area are also noted in this subsection.

Potential Magnitude

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

- **Catastrophic**—More than 50 percent of property severely damaged, and/or facilities are inoperable or closed for more than 30 days. More than 50 percent agricultural losses. Multiple fatalities and injuries. Critical indirect impacts.
- **Critical**—25 to 50 percent of property severely damaged, and/or facilities are inoperable or closed for at least 2 weeks. 10-50 percent agricultural losses. Injuries and/or illnesses result in permanent disability and some fatalities. Moderate indirect impacts.
- **Limited**—10 to 25 percent of area affected. Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged.

- **Negligible**—Less than 10 percent of area affected. Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.

Frequency/Likelihood of Occurrence

The frequency of past events is used in this section to gauge the likelihood of future occurrences. Based on historical data, the likelihood of future occurrences is categorized into one of the following classifications:

- **Highly Likely**—Near 100 percent chance of occurrence in next year or happens every year.
- **Likely**—Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
- **Occasional**—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
- **Unlikely**—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

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

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

This gives the percent chance of the event happening in any given year. An example would be three droughts occurring over a 30-year period which equates to 10 percent chance of that hazard occurring any given year. The potential for climate change to alter the likelihood or intensity of the hazard is briefly discussed in this section, if applicable to the hazard

Climate Change Considerations

Discusses how the projected impacts of climate change may affect the likelihood and severity of the hazard in the future.

Vulnerability Assessment

Describes the likely impacts of the hazard on people, property, critical infrastructure, the economy, historical, environmental, and cultural resources, and development trends

Risk Summary

Summarizes the key pieces of information for each hazard and the overall hazard ranking.

4.3.2 Avalanche

Hazard/Problem Description

An avalanche is a mass of snow sliding down a mountainside. An avalanche occurs when the stress (from gravity) trying to pull the snow downhill exceeds the strength (from bonds between snow grains) of the snow cover. There are four factors that contribute to an avalanche: a steep slope, a snow cover, a weak layer in the snow cover, and a trigger. About 90 percent of all avalanches start on slopes of 30-45 degrees; about 98 percent of all avalanches occur on slopes of 25-50 degrees. Avalanches release most often on slopes above timberline that face away from prevailing winds (leeward slopes collect snow blowing from the

windward sides of ridges). Nevertheless, avalanches can run on small slopes well below timberline, such as gullies, road cuts, and small openings in the trees. Very dense trees can anchor the snow to steep slopes and prevent avalanches from starting; however, avalanches can release and travel through a moderately dense forest.

Avalanche hazards occur predominantly in the mountainous regions of Colorado above 8,000 feet. The clear majority of avalanches occur during and shortly after winter storms, during the winter and spring months between November and April. The most avalanche-prone months are, in order, February, March, and January. Avalanches caused by thaw occur most often in April (Source: Colorado Avalanche Information Center). The avalanche danger increases with major snowstorms and periods of thaw. About 2,300 avalanches are reported to the Colorado Avalanche Information Center in an average winter. More than 80 percent of these occur during or just after large snowstorms.

An increase in backcountry recreation (skiers and snowmobilers) in recent years has led to more people being in avalanche-prone areas. Another trend among backcountry skiers and snowboarders is traveling into steeper and more "extreme" terrain, which tends to be more avalanche prone. Additionally, new snowmobile models make it easier to access hazardous areas in the backcountry, and their bigger size and weight increases the likelihood of triggering an avalanche. The planning area is known for its outdoor recreation opportunities, including skiing at Wolf Creek. Thus, avalanches pose a very real threat to people in the planning area.

This hazard generally affects a small number of people, such as the participants in backcountry recreation discussed above. Events have occurred in similar areas in Colorado and elsewhere where ten or more snowmobilers have been trapped and/or killed in a single avalanche event. Motorists along highways are also at risk of injury and death due to avalanches. Road and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches. Road closures can last several days until crews can clear debris safely. Recognizing areas prone to avalanches is critical in determining the nature and type of development allowed in each area.

Past Occurrences

Avalanches occur naturally every winter in Archuleta County. This discussion focuses on those avalanches that have collided with people or property. In the past, winter backcountry use has been fairly limited in the County. There was little mining activity in Archuleta County, so Archuleta County escaped the numerous fatalities in much of Colorado associated with winter mining activities in the 1800's.

The Colorado Avalanche Information Center (CAIC) noted that three backcountry skiers we caught in an avalanche near Wolf Creek Pass in the Gibbs Creek Drainage on February 16, 2012. The avalanche released on a west facing slope near treeline. The slide was 3 feet deep, 600 feet wide, and ran 600 feet vertically. One skier was uninjured. The second was injured and required evacuation. The third was killed in the accident.

There are 24 avalanche runout zones on the Archuleta side of Wolf Creek Pass. Beyond the threat to back country recreationalists, avalanche events have disrupted transit along Wolf Creek Pass. During the winter of 2016-2017, there were three closures of Wolf Creek Pass. Two of these closures lasted for eight hours while the other lasted 24 hours.

According to NCEI and the Colorado Avalanche Information Center, 46 avalanches caused property damage between 1998 and 2022, and has resulted in eight fatalities. These events are shown below in Table 4-14. Since the previous HMP in 2017, four fatalities and one injury have occurred as a result of avalanches.

Table 4-14 Archuleta County/Wolf Creek Pass Avalanche History

Date	Fatalities	Injuries	Property Damage
3/29/1998	0	0	$75,000
2/21/2002	0	0	$0
3/31/2002	0	0	$500
3/22/2003*	1	0	$5,000
2/22/2004	0	0	$0
2/29/2004	0	0	$0
1/4/2005	0	0	$0
1/6/2005	0	0	$0
2/8/2005	0	0	$0
2/8/2005	0	0	$0
2/13/2005	0	1	$0
2/19/2005	0	0	$0
2/20/2005	0	0	$0
3/21/2005	0	0	$0
3/30/2005	0	0	$0
4/15/2005	0	0	$0
4/16/2005	0	0	$0
4/28/2005	0	0	$0
12/18/2005	0	0	$0
1/20/2006	0	0	$0
1/26/2006	0	0	$0
2/2/2006	0	0	$0
3/10/2006	0	0	$0
3/12/2006	0	0	$0
3/14/2006	0	0	$0
3/18/2006	0	0	$0
3/20/2006	0	0	$0
3/23/2006	0	0	$0
3/29/2006	0	0	$0
3/30/2006	0	0	$0
3/30/2006	0	0	$0
4/6/2006	0	0	$0
3/13/2007	0	0	$1,000
1/3/2010	0	0	$0
1/6/2010	0	0	$0
3/21/2010	0	0	$0
1/15/2011*	0	0	$0
2/25/2012*	0	0	$0

Date	Fatalities	Injuries	Property Damage
3/30/2012	1	0	$0
1/27/2013	0	1	$0
2/2/2013	1	2	$0
1/6/2015	1	0	$0
2/13/2016*	0	0	$0
1/21/2018	1	0	$0
12/19/2020	2	1	$0
3/17/2022	1	0	$0
Total	**8**	**5**	**$81,500**

Source: Colorado Avalanche Information Center and NCEI

* Wolf Creek area

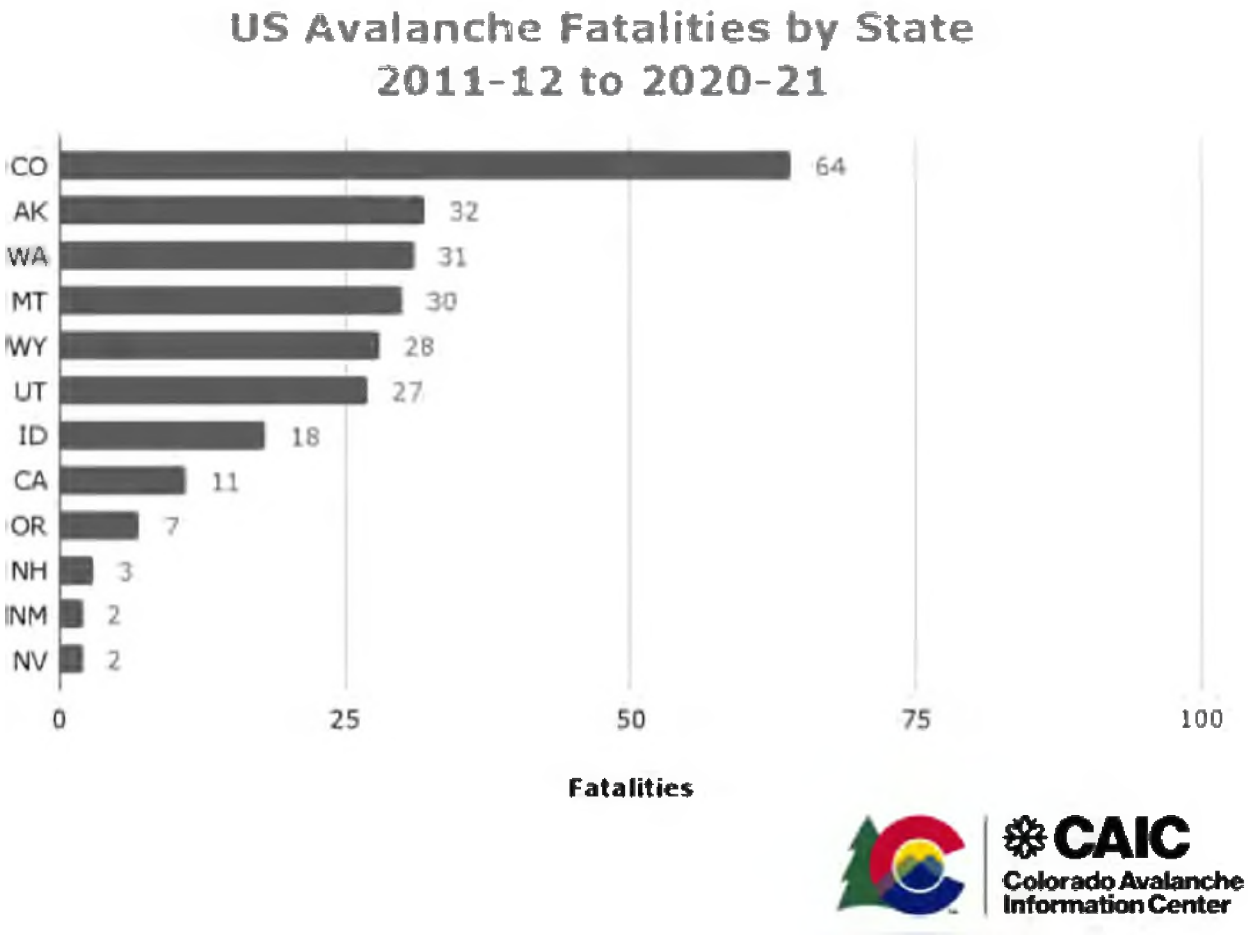
Geographical Area Affected

The San Juan Mountains form the dramatic scenery in northern and eastern Archuleta County. Due to the steep mountainous terrain, high elevations, and winter snows in Archuleta County, there are avalanches every winter.

The geographic extent of avalanches in the Archuleta County response area is limited. There are several steep slopes with potential to trigger small avalanches in Pagosa Springs, the most active being the shale bank adjacent to the Junction Restaurant parking lot near the junction of State Highways 160 and 84. The north-facing slope on Reservoir Hill above the San Juan River and the shale bank along South 6th Street are the other two. The shale banks along the San Juan River upstream of town are also very active during most winters.

Until recently, the most likely location in Archuleta County response area for avalanche encounters was on State Highway 160's corridor over Wolf Creek Pass in Mineral County. Avalanches sometimes close State Highway 160 over Wolf Creek Pass. The closures inconvenience travelers and commerce, but avalanche control work done by CDOT serves to minimize life safety impacts. However as recreational backcountry winter-use increases in Archuleta County, we may see an increase in avalanche encounters. Avalanches pose a serious threat to backcountry recreationists. There are more avalanche-related deaths in Colorado than any other state and is illustrated in Figure 4-2 below.

Figure 4-2 U.S. Avalanche Fatalities by State



Magnitude/Severity

Overall, avalanche impacts would likely be **limited** in Archuleta County, with 10-25 percent of the planning area affected. However, a road closed due to avalanche activity can result in serious transportation disruptions due to the limited number of roads in the County. State Highway 160 at Wolf Creek Pass sometimes experiences avalanche closures, thus obstructing all access to the County from the east. Backcountry avalanche incidents involve search and rescue teams and resources, which can put these personnel in areas of risk.

Frequency/Likelihood of Occurrence

Highly Likely—A 100 percent chance of occurrence in the next year or happen every year. Avalanches that result in death or injury happen less frequently, approximately every 10 years.

Climate Change Considerations

The likelihood and nature of future avalanches may be affected by climate change. Winters are becoming shorter, which means there is potential for weaker snow accumulations at the very bottom of the snowpack. As more snow piles on top of the weak layer, and temperatures remain warm, the upper, moisture-laden layers became vulnerable to sliding. More extreme precipitation events that deposit large amounts of snow in a short period of time could also periodically increase the potential for large avalanches.

Vulnerability Assessment

People

Backcountry recreationalists, road crews, and motorists along the shale bank adjacent to the Junction Restaurant parking lot near the junction of State Highways 160 and 84. The north-facing slope on Reservoir Hill above the San Juan River and the shale bank along South 6th Street are the other two. The shale banks along the San Juan River upstream of town are also very active during most winters.

In addition, rising numbers of outdoor enthusiasts may lead to an increase in fatal avalanche occurrences, as avalanche events can be triggered by people's recreational activities. Beyond backcountry skiing, there has been an increased interest in other forms of recreation such as snowmobiling and motorized and non-motorized snow biking. Backcountry avalanche incidents involve search and rescue teams and resources, which can put these personnel at risk. The key actions to limiting impacts to individuals recreating in hazardous areas include spreading knowledge and awareness of the hazard and being properly equipped for self-rescue, if necessary, with tools such as locater beacons, shovels, GPS units and other communication tools and probes.

Excessive winter storm cycles may result in risk to people in structures, though GIS analysis did not indicate specific structures at risk; this could be in part due to a data limitation.

Property

Every year, snow avalanches kill and injure winter recreationists in Colorado's high country, including cross-country skiers, downhill skiers/snowboarders, snowshoers, hikers, climbers, and snowmobilers. Private property losses are rare, due to local regulation of known avalanche zones, although lack of knowledge of avalanche run-out potential (the farthest reach of snow and debris) has occasionally resulted in damages to residences and private vehicles in other parts of Colorado. In particularly heavy snow years, the avalanche risk is greater. With prime conditions of wind or snow load, avalanches can be triggered easily.

Critical Facilities and Lifelines

Due to avalanches typically occurring on steep slopes and in more remote backcountry locations, most lifeline facilities are not located in areas vulnerable to this hazard. The most vulnerable lifelines would be transportation and possibly utilities. Avalanches can lead to the temporary blockage of roads, potentially impacting evacuation efforts with Archuleta County's limited number of transportation routes out of the county. Most structures, including the County's critical facilities, should be able to provide adequate protection from avalanches to individuals but the structures themselves could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle these types of hazards should the power go out. Significant damage to an essential government facility could force the temporary closure of that facility, disrupting the ability of local governments to provide the usual level of service to residents.

Economy

Avalanche activity inside or outside the County (along connecting roadways) can disrupt transportation in and out of the local communities, which could result in temporary economic impacts. Tourism is the main economic driver for Archuleta County, and a major closure of roads could leave Archuleta and the unincorporated portions without this vital sector, even during non-winter months.

Historical, Environmental, and Cultural Resources

Moderate damage occurred to forests below avalanche runout zones during the 2019 avalanche cycle, particularly in the Hinsdale County portion of the response area. This also disturbed stream habitat with debris piles, and debris removal costs were incurred by the County. There are also historic mining sites likely to be at risk throughout the county.

Development Trends

Avalanche vulnerability could increase to a degree with future development and population growth as there will be a higher number of people driving on roadways and taking part in backcountry recreation, as well as potentially requiring search and rescue and emergency response and services. Rising numbers of outdoor enthusiasts may lead to an increase in fatal avalanche occurrences in general in Colorado. Beyond backcountry skiing, there has been a growing interest in other forms of recreation, and an introduction of new snowmobiles that are bigger, heavier, and intensify avalanche susceptibility. The keys to limiting impacts to individuals recreating in the area are knowledge and awareness of the hazard and being properly equipped for self-rescue, if necessary, with tools such as locater beacons, shovels, and probes. Risk to structures can potentially increase without careful siting and planning.

Risk Summary

Based on the information collected for the hazard profile, avalanche has had a significant impact in Archuleta County with a high likelihood of occurrence. Nevertheless, it is only a problem in the unincorporated County, as the municipalities do not have avalanche-prone areas. In the Archuleta County response area, the greatest risk is in Mineral County along Highway 160.

Table 4-15 Avalanche Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Archuleta County	Extensive	Highly Likely	Limited	Moderate
Pagosa Springs	Limited	Highly Likely	Limited	Low
Pagosa Fire Protection District	Limited	Highly Likely	Limited	Low
Pagosa Area Water and Sanitation District (PAWSD)	Limited	Highly Likely	Limited	Low

- It is public safety that is threatened by this hazard. Those most vulnerable include individuals recreating in and traveling through or under avalanche hazard areas.
- While road closures help to mitigate impacts to travelers on the State Highway 160 corridor over Wolf Creek Pass, Colorado Department of Transportation snowplow drivers can still be exposed while clearing roads of snow or avalanche debris.
- Additionally, avalanches inside and outside of the County can disrupt transportation in and out of the County.
- In the Archuleta County response area, the greatest risk is in Mineral County along Highway 160 and Wolf Creek Pass

4.3.3 Dam Failure

Hazard/Problem Description

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are constructed for a variety of uses, including flood protection, power, agriculture/irrigation, water supply, and recreation. The water impounded behind a dam is referred to as the reservoir and is usually measured in acre-feet, with one acre-foot being the volume of water that covers one acre of land to a depth of one foot. Depending on local topography, even a small dam may have a reservoir containing many acre-feet of water.

Dams serve many purposes, including irrigation control, providing recreation areas, electrical power generation, maintaining water levels, and flood control.

Dam failures and releases from dams during heavy rain events can result in downstream flooding. Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. Two factors that influence the potential severity of a full or partial dam failure are the amount of water impounded and the density, type, and value of downstream development and infrastructure. The speed of onset depends on the type of failure. If the dam is inspected regularly then small leaks allow for adequate warning time. Once a dam is breached, however, failure and resulting flooding occurs rapidly. Dams can fail at any time of year, but the results are most catastrophic when the dams fill or overtop during winter or spring rain/snowmelt events.

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

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

The Colorado Division of Water Resources Dam Safety Branch assigns hazard ratings to large dams within the State. Two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in three categories that identify the potential hazard to life and property:

- High hazard (Class I) indicates that a failure would most probably result in the loss of life
- Significant hazard (Class II) indicates a failure could result in appreciable property damage
- Low hazard exists where failure would result in only minimal property damage and loss of life is unlikely.

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

Another type of dam commonly found on Colorado's rivers is called a Low Head Dam. A low head dam is an engineered structure built into and across stream and river channels. Low head dams were historically built for a variety of purposes to support industrial, municipal, and agricultural water usage through the diversion of water from streams. Low head dams have also been built to provide recreational amenities for boating, rafting, and tubing as well as improve aquatic habitats (Colorado DNR). Water flows over the dams creating a recirculating current that can trap unknowing river users. Due to the low height of this type of dam, low head dams can be difficult to see by river users that are not aware of them and because of the tranquil pool that gives the appearance there is no danger.

Low Head Dams

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Colorado DNR organizes these dams into one of three categories: Diversion Dams, Grade Control Structures, or Recreational. Diversion dams typically divert the flow of water to a side ditch or canal for municipal, agricultural, or industrial usage. Additionally, the attached ditches can divert water in various directions off the side of the main diversion structure. These dams are of the greatest concern for life safety and have been referred to as "drowning machines" by Colorado DNR.

According to the Colorado DNR, public safety at low head dams is becoming an increasingly important issue as the population of Colorado increases and citizens recreate more and more on waterways within the state. Safety measures can include anything from upstream signage recommending portage, modifications to the existing structure to eliminate the recirculating current, or removal if the structure is no longer serving its original purpose.

Non-Failure Inundation

The Colorado DNR has studied the potential for non-failure dam inundation statewide to show potential areas of flooding where outlet capacity exceeds the downstream channel capacity. Dams are ranked as high, moderate, or low likelihood for outlet releases to cause conditions that could require an emergency response to reduce potential downstream consequences. The ranking is based on a statewide database of high hazard dams that includes 441 high hazard dams that have been analyzed by the Colorado DNR for this aspect of dam incident flooding. The high, moderate, or low designations were assigned by DNR by dividing the total number of ranked dams across the state into thirds. Should there be a need to relieve pressure on the dam (e.g., if there was excess inflow from high rains or snowmelt) releases from the dams ranked as high or moderate may result in downstream flooding. The dams at the highest risk of non-failure inundation are noted in the Geographical Area Affected section.

Causes of Dam Failure

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

- Overtopping of the primary dam structure, which accounts for 34% of all dam failures, can occur due to inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors.
- Foundation defects due to differential settlement, slides, slope instability, uplift pressures, and foundation seepage can also cause dam failure. These account for 30% of all dam failures.
- Failure due to piping and seepage accounts for 20% of all failures. These are caused by internal erosion due to piping and seepage, erosion along hydraulic structures such as spillways, erosion due to animal burrows, and cracks in the dam structure.
- Failure due to problems with conduits and valves, typically caused by the piping of embankment material into conduits through joints or cracks, constitutes 10% of all failures.

The remaining 6% of U.S. dam failures are due to miscellaneous causes. Many dam failures in the United States have been secondary results of other disasters. The prominent causes are earthquakes, landslides, extreme storms, massive snowmelt, equipment malfunction, structural damage, foundation failures, and sabotage.

Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all

operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

Regulatory Oversight

The potential for catastrophic flooding due to dam failures led to passage of the National Dam Safety Act (Public Law 92-367). The National Dam Safety Program requires a periodic engineering analysis of every major dam in the country. The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect the lives and property of the public.

Colorado Rules and Regulations for Dam Safety and Dam Construction

The Colorado Rules and Regulations for Dam Safety and Dam Construction (2-CCR 402-1, January 1, 2007) apply to any dam constructed or used to store water in Colorado. These rules apply to applications for review and approval of plans for the construction, alteration, modification, repair, enlargement, and removal of dams and reservoirs, quality assurance of construction, acceptance of construction, non-jurisdictional dams, safety inspections, owner responsibilities, emergency action plans, fees, and restriction of recreational facilities within reservoirs. Certain structures (defined in Rule 17) are exempt from these rules. The purpose of the rules is to provide for the public safety through the Colorado Safety of Dams Program by establishing reasonable standards and to create a public record for reviewing the performance of a dam.

U.S. Army Corps of Engineers Dam Safety Program

The USACE is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The USACE has inventoried dams; surveyed each state and federal agency's capabilities, practices, and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety (USACE 1997).

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) cooperates with a large number of federal and state agencies to ensure and promote dam safety. More than 3,000 dams are part of regulated hydroelectric projects in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with the terms and conditions of a license

Every 5 years, an independent engineer approved by the FERC must inspect and evaluate projects with dams higher than 32.8 feet (10 meters) or with a total storage capacity of more than 2,000 acre-feet.

FERC monitors and evaluates seismic research and applies it in investigating and performing structural analyses of hydroelectric projects. FERC also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication Engineering Guidelines for the Evaluation of Hydropower Projects guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential

sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

Past Occurrences

Colorado has a history of dam failure, with at least 130 known dam failures since 1890 (Flood Hazard Mitigation Plan for Colorado, 2004). The Lawn Lake Disaster of 1982 caused four deaths and over $31 million in property damage when a privately-owned dam failed on Forest Service Property above the Town of Estes Park. The San Juan Mountains above Silverton experienced a dam failure flood, of sorts, when a natural lake (Lake Emma) was completely drained on June 4, 1979, by a series of abandoned mine tunnels beneath the lake. There has been no history of dam failure in Archuleta County. The HMPC noted that the Rio Blanco Dam has an outlet structure that backs up annually if not cleared by the Bureau of Reclamation.

Geographical Area Affected

The geographic extent of dam failure in the Archuleta County response area is **significant**. According to the National Inventory of Dams, Archuleta County has 21 registered dams, including three high hazard and seven significant hazard dams. The five high hazard dams within Archuleta County include Hatcher, Mountain View, and Stevens Dam. Stevens Dam was originally rated as a significant hazard but was upgraded when the dam was enlarged. Additionally, Williams Creek dam, a high hazard dam in Hinsdale County, and Alberta Park dam (below the ski area on the edge of the response area), a high hazard dam in Mineral County, could also impact the planning area, though most of the impacts of the Alberta Park dam would be outside of the response area.

Lake Capote Dam, also known as Pargin Dam, is located in the Southern Ute tribal lands. Lake Capote has a known seep which has been investigated by engineers from the Bureau of Reclamation and the Department of Interior. The dam is understood to be structurally sound by professional dam designers and builders. Thus, there is no immediate concern of dam failure. The dam is constantly monitored to ensure public safety downstream. There are several man-made lakes in the most heavily populated areas of the County. Stevens and Hatcher lie on two of these lakes, and Mountain View lies a few miles to the northwest. Mountain View Dam could impact downtown Pagosa Springs. Several significant hazard dams are located in the same area. If the dams on these lakes failed, the greatest impacts would be in the Pagosa Lakes subdivisions west of Pagosa Springs. The high and significant hazard dams in the planning area are described below in Table 4-16, and their location is illustrated in Figure 4-3.

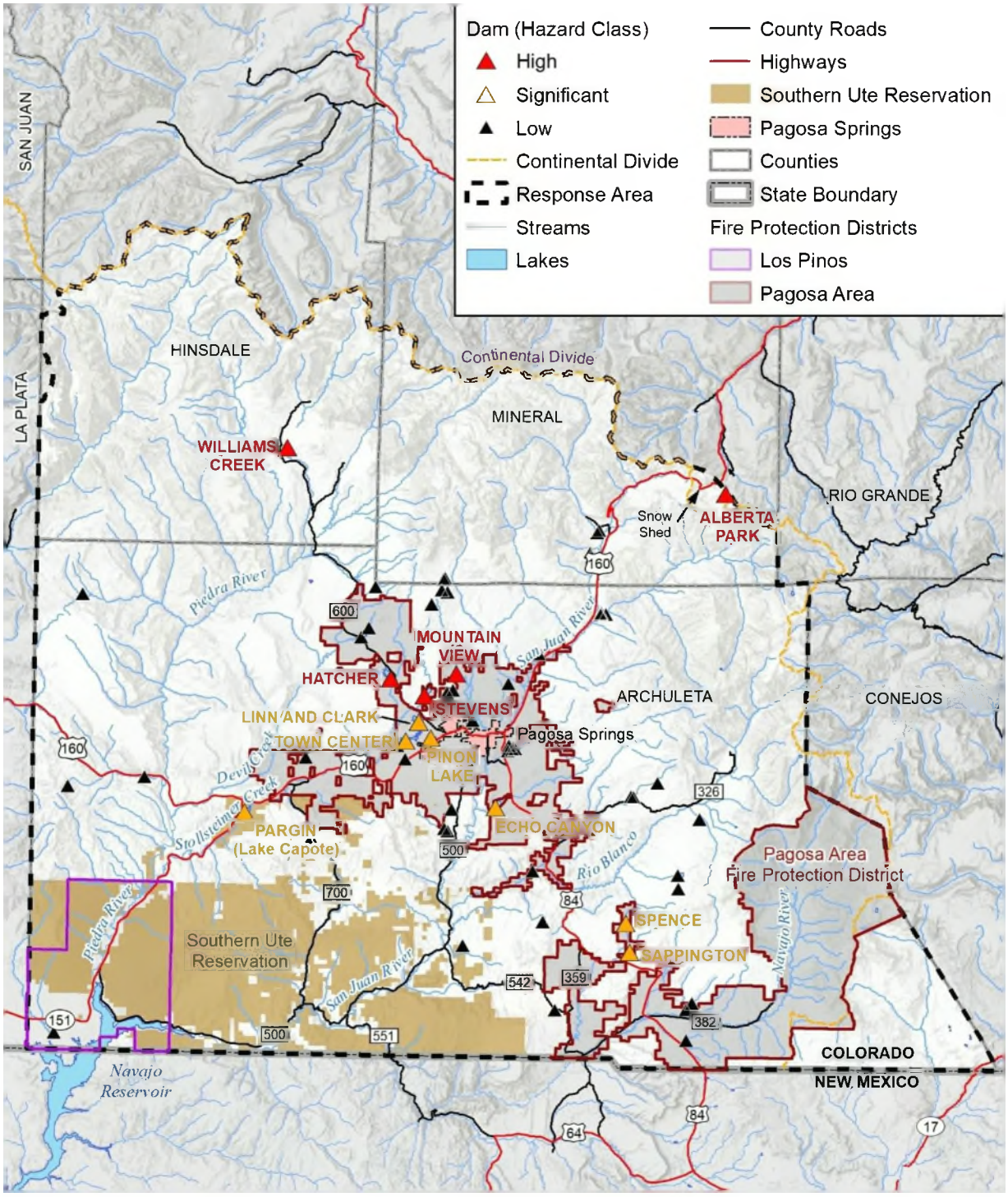
Table 4-16 High and Significant Hazard Dams in Response Area

Name	Owner	River	Hazard Class	Nearest Downstream City	Distance to Nearest Downstream City (miles)	EAP
Hatcher	Pagosa Lakes Property Owners Association	Martinez Creek-Tr	High	Pagosa Springs	60	Y
Williams Creek	Colorado Parks & Wildlife	Williams Creek	High	Piedra	26	Y
Mountain View	Hidden Valley Ranch Association	Hidden Valley	High	Pagosa Springs, CO	5	Y
Stevens	Pagosa Area Water & Sanitation District	Dutton Creek	High	Pagosa Springs	60	Y

Name	Owner	River	Hazard Class	Nearest Downstream City	Distance to Nearest Downstream City (miles)	EAP
Alberta Park	Colorado Parks & Wildlife	Pass Creek	High	South Fork	17	Y
Linn And Clark	Pagosa Lakes Property Owners Association	Stevens Draw	Significant	Pagosa Springs	0.0	Y
Spence	Alpine Lakes Ranch Ditch Co.	Spence Creek	Significant	Dulce, NM	20	Y
Echo Canyon	Colorado Parks & Wildlife	Echo Canyon	Significant	Trujillo	10	Y
Pinon Lake	Fairfield Pagosa	Martinez Creek-Tr	Significant	Blanco, NM	58	Y
Town Center	Pagosa Lakes Property Owners Association	Stevens Draw	Significant	Pagosa Springs	0.0	Y
Sappington	Alpine Lakes Ranch Ditch Co.	Coyote Creek	Significant	Dulce, NM	18	Y
Lake Capote (Pargin)	BIA; Southern Ute Indian Tribe	Stollsteimer Creek	High	Blanco, NM	40	Y

Source: National Inventory of Dams

Figure 4-3 Dams in Archuleta County Response Area



Map compiled 8/2022;
intended for planning purposes only.
Data Source: Archuleta County, CDOT, DWR Dam Safety

0 5 10 Miles

N

There are also numerous low hazard dams throughout the county, along the San Juan and Piedra Rivers. 18 of these are recreation structures, which are considered generally non-hazardous. However, the majority of these are diversion dams which, as previously mentioned, present the greatest risk to recreators along the county's rivers.

Non-Failure Dam Incidents

The dams at the highest risk of non-failure inundation are shown in the table below. The high, moderate, or low designations were assigned by DNR by dividing the total number of ranked dams across the state into thirds. Should there be a need to relieve pressure on the dam (e.g., if there was excess inflow from high rains or snowmelt) releases from the dams ranked as high or moderate may result in downstream flooding.

Table 4-17 Dams with Outlet Release Flood Potential in Planning Area

County	Dam ID	Dam Name	Outlet Description	Max Outlet Release Capacity (cfs)	Composite Ranking	Outlet Release Ranking
ARCHULETA	780105	STEVENS	High Draw to WTP 12" ductile iron concrete encased at el. 7715 Low Draw to WTP 12" ductile iron concrete encased at el. 7705 Low Level Outlet 30" ductile iron concrete encased at el. 7697	117	78	High
HINSDALE	780108	WILLIAMS CREEK	36" STEEL	187	245	Moderate
ARCHULETA	780102	HATCHER	18" RCP	33	289	Low
ARCHULETA	290118	MOUNTAIN VIEW	26" CONCRETE-ENCASED WSP W/ 21" GATE OPENING	78	319	Low
MINERAL	200101	ALBERTA PARK	18" CMP, lined w/ InSituForm in 1995, 16" diam.	16	354	Low

Magnitude/Severity

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

Information from the event of record is used to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. There is no event of record for Archuleta County with a sufficiently detailed profile that allows for a specific discussion on the severity and magnitude of such an event. However, the rating systems utilized in dam classification is a useful measurement for assessing the potential magnitude and severity of a dam failure. In addition, all high-hazard dams in Colorado are required to have Emergency

Action Plans (EAPs) that include predicted inundation maps for dam failure scenarios. These tools allow planners to measure the estimated worst-case or event-of-record occurrences for a dam failure.

Overall, dam failure impacts would likely be **limited** in Archuleta County, with 10-25 percent of the planning area affected. Roads closed due to dam failure floods could result in serious transportation disruptions due to the limited number of roads in the County. The most serious impacts would be in the Pagosa Lakes subdivisions area.

Specific impacts and downstream areas are analyzed in the Emergency Action Plans for Stevens Dam, Lake Capote Dam (a.k.a. Pargin Dam), Williams Creek Dam, and Echo Canyon Dam. These plans are on file at the Archuleta County Emergency Management office. According to HMPC members, Lake Capote recently updated and edited the Emergency Action Plan. Due to the sensitive nature of this information, it is not replicated in this publicly available plan.

The potential magnitude of a dam failure in the planning area could change in the future; the hazard significance of certain dams could increase if development occurs in inundation areas.

Frequency/Likelihood of Occurrence

The HMPC estimates that the likelihood of dams failing in Archuleta County is **occasional**. The structural integrity of dams depends on regular inspections and maintenance, which do not always happen. Additionally, snowmelt flooding can exceed the capacity and strength of dams, causing them to fail. Archuleta County's dams will continue to be tested by snowmelt, heavy rains, and other types of floods every year. Thus, dam failures could possibly threaten Archuleta County. There are no official recurrence intervals calculated for dam failures, so estimating the frequency of occurrence of dam failure is extremely difficult.

Climate Change Considerations

The potential for climate change to affect the likelihood of dam failure has been incorporated into the 2020 Rules and Regulations for Dam Safety and Dam Construction. The climate-change related Rule is based on a state-of-the-practice regional extreme precipitation study completed in 2018 (DWR, 2018). This study determined a very high likelihood of temperature increases, resulting in increased moisture availability to extreme storms. As such, an atmospheric moisture factor of 7% is required to be added to estimates of extreme rainfall for spillway design.

With a potential for increases in extreme precipitation events due to climate change, dam failure and dam incidents could become a larger issue if increased rainfall events result in large floods that stress dam infrastructure. Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hydrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams have historically experienced increases in stream flows from earlier dam releases.

Vulnerability Assessment

While dam failures are unlikely, a major failure could have severe consequences. Structures, aboveground infrastructure, critical facilities, and natural environments are all vulnerable to dam failure. Roads closed due to dam failure floods could result in serious transportation disruptions due to the limited number of roads

in the county. Information for the exposure analysis provided in the sections below is based off dam inundation data provided by the state.

The most significant issue associated with dam failure involves the properties and populations in the inundation areas. Flooding as a result of a dam failure would significantly impact these areas. There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides or severe weather, which limits their predictability and compounds the hazard.

People

Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable timeframe. This population includes the elderly and young who may be unable to get themselves out of the inundation area. The vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system. According to GIS analysis conducted for this plan update, there are an estimated 409 residents in the county living within dam inundation zones.

Low head dams pose a risk to even the most experienced recreational users of rivers due to the difficultly to detect the dams when approaching from upstream and risk of becoming trapped in the low head dam's recirculating currents. According to the Colorado Department of Natural Resources, Dam Safety Division, in recent years Colorado has experienced 1 fatality annually and there have been a total of 13 fatal incidents recorded since 1986 (Zimmer 2019). The Dam Safety Division, Low Head Dam Inventory Final Report (October 2019), notes an increase of low head dam incidents in the state directly correlated to increased recreational water usage by out-of-state tourists, new residents, and long-term residents (Zimmer 2019). As the population and number of visitors increases in Colorado and in Archuleta County there is the potential for increased fatalities from low head dams.

Property

Vulnerable properties are those within and close to the dam inundation area. These properties would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable since they are where the dam waters would collect.

Communities located below a high or significant hazard dam and along a waterway are potentially exposed to the impacts of a dam failure. High hazard dams threaten lives and property, while significant hazard dams threaten property only. Inundation maps that identify anticipated flooded areas (which may not coincide with known floodplains) are produced for many high hazard dams. Six of the high or significant hazard dams had dam inundation extents in spatial form that were analyzed to quantify risk across the planning area.

Table 4-18 Properties Exposed to Dam Inundation within Archuleta County

Jurisdiction	Occupancy Type	Parcel Count	Building Count	Improvement Value	Content Value	Total Value
Pagosa Springs	Commercial	72	75	$7,267,620	$7,267,620	$14,535,240
	Exempt	8	8	$0	$0	$0
	Industrial	1	1	$143,600	$215,400	$359,000
	Residential	95	98	$24,488,500	$12,244,250	$36,732,750
	Vacant	3	3	$28,320	$28,320	$56,640
	Total	179	185	$31,928,040	$19,755,590	$51,683,630

Unincorporated	Agricultural	14	15	$2,989,390	$2,989,390	$5,978,780
	Commercial	5	5	$710,340	$710,340	$1,420,680
	Exempt	4	4	$0	$0	$0
	Industrial	1	1	$8,990	$13,485	$22,475
	Residential	75	76	$18,095,600	$9,047,800	$27,143,400
	Vacant	6	6	$14,260	$14,260	$28,520
	Total	105	107	$21,818,580	$12,775,275	$34,593,855
	Grand Total	284	292	$53,746,620	$32,530,865	$86,277,485

Source: Archuleta County Assessor Data 2022, DWR Dam Safety, WSP GIS Analysis

Critical Facilities and Lifelines

A total dam failure can cause catastrophic impacts to areas downstream of the water body, including critical infrastructure. Any critical asset located under the dam in an inundation area would be susceptible to the impacts of a dam failure. Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues. Roads closed due to floods caused by dam failure or incident could result in serious transportation disruptions due to the limited number of roads in the County. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge. Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas.

Based on the critical facility inventory considered in the updating of this plan there are 28 critical facilities throughout the County which lie within dam inundation areas. Several other facilities and their respective inundation areas are located outside of Archuleta County. According to GIS analysis, no lifeline facilities or assets owned by PAWSD were found to be vulnerable to dam inundation. These at-risk facilities are listed in the table below by critical facility classification as based on the FEMA Lifeline categories (FEMA Community Lifelines, 2019). According to this analysis, critical facilities in the Transportation Lifeline category are most at risk to inundation from Dam Failure.

Table 4-19 Critical Facilities at Risk to Overall Dam Inundation Risk by Jurisdiction and Facility Type

Category	Pagosa Springs	Unincorporated	Pagosa Area FPD
Communications	-	-	-
Energy	3	-	3
Food, Water, Shelter	-	-	-
Hazardous Material	-	-	-
Health and Medical	-	-	-
Safety and Security	1	1	2
Transportation	2	11	5
Total	**6**	**12**	**10**

Source: Colorado DNR Dam Safety, Archuleta County, HSIP 2015, HIFLD, NBI, WSP GIS analysis

Economy

Extensive and long-lasting economic impacts could result from a major dam failure or inundation event, including the long-term loss of water in a reservoir, which may be critical for potable water needs. A major

dam failure and loss of water from a key structure could bring about direct business and industry damages and potential indirect disruption of the local economy. A dam failure can have long lasting economic impacts and could deter visitors for a period of time.

Historical, Environmental, and Cultural Resources

Reservoirs held behind dams affect many ecological aspects of a river. River topography and dynamics depend on a wide range of flows, but rivers below dams often experience long periods of very stable flow conditions or saw-tooth flow patterns caused by releases followed by no releases. Water releases from dams usually contain very little suspended sediment; this can lead to scouring of riverbeds and banks.

Dam failure can cause severe downstream flooding, depending on the magnitude of the failure. Other potential secondary hazards of dam failure are landslides around the reservoir perimeter, bank erosion on the rivers. The inundation could introduce many foreign elements into local waterways, potentially causing the destruction of downstream habitats.

Development Trends

The vulnerability to dam failure could increase if development occurs in inundation areas downstream of dams. Often these inundation areas are not shown on plat or planning maps or NFIP maps and thus are not regulated. This type of development can change the designation of a dam from low to high hazard. Guiding future land use and growth through the County and municipal comprehensive plans and zoning ordinances may help reduce future risk and exposure. Flood related policies in the comprehensive plans will help to reduce the risk associated with the dam failure hazard for all future development in the planning area.

Risk Summary

Table 4-20 Dam Failure Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Archuleta County	Significant	Occasional	Limited	Medium
Pagosa Springs	Significant	Occasional	Limited	Medium
Pagosa Fire Protection District	Significant	Occasional	Limited	Low
Pagosa Area Water and Sanitation District (PAWSD)	Significant	Occasional	Limited	Medium

Dam failure presents a relatively low likelihood of occurrence hazard, but due to potential consequences it is rated as Medium.

- Effects on people: There are an estimated 409 residents in the county living within dam inundation zones. Additionally, low head dams present a risk to recreationists using the county's rivers.
- Effects on property: There are 292 buildings and an estimated $86,277,485 in property value exposed to dam inundation risk throughout the county.
- Effects on economy: A dam failure and loss of water from a critical reservoir or structure could include direct and indirect business and industry damages or disruption of the local economy and key county resources (e.g., potable water).
- Effects on critical facilities and infrastructure: There are 28 critical facilities located in dam inundation areas in the county. Additionally, roads closed due to floods caused by dam failure or incident could result in serious transportation disruptions due to the limited number of roads in the County.
- Related Hazards: Earthquake, Landslide, Flooding

4.3.4 Drought

Hazard/Problem Description

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

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

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

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

Due to Colorado's semiarid conditions, drought is a natural but unpredictable occurrence in the state. However, because of natural variations in climate and precipitation sources, it is rare for all of Colorado to be deficient in moisture at the same time. Single season droughts over some portions of the state are quite common.

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

The onset of drought in western Colorado mountainous counties is usually signaled by a lack of significant winter snowfall. Archuleta County receives most of its precipitation as snow in the higher elevations between November and April. Hot and dry conditions that persist into spring, summer, and fall can aggravate drought conditions, making the effects of drought more pronounced as water demands increase during the growing season and summer months.

Past Occurrences

Colorado has experienced drought in 2018-2019, 2011-2013, 2000-2006, 1996, 1994, 1990, 1989, 1979-1975, 1965-1963, 1957-1951, 1941-1931, and 1905-1893 (Colorado Drought Mitigation and Response Plan,

2018). The most significant are listed in Table 4-21. Although drought conditions can vary across the state, it is likely that Archuleta County suffered during these dry periods.

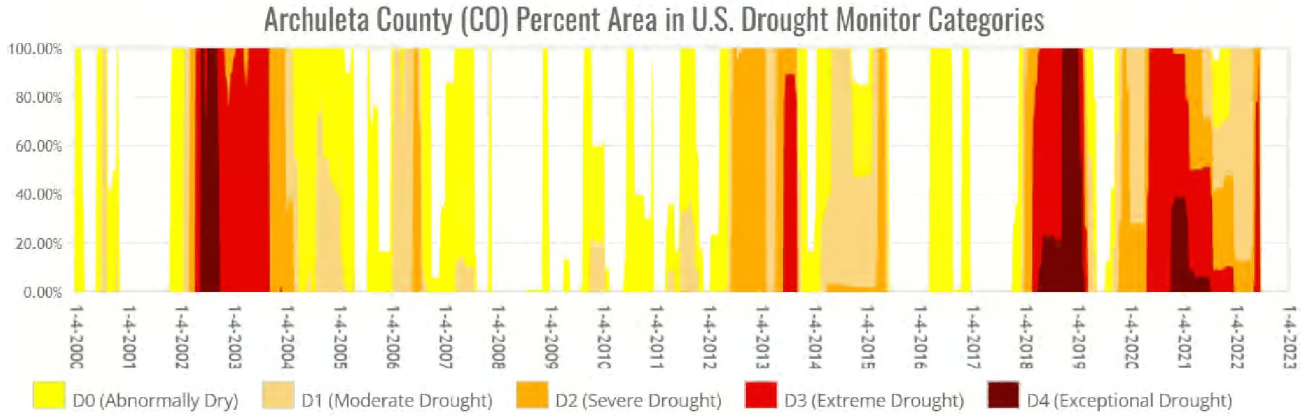
Table 4-21 Historical Dry and Wet Periods in Colorado

Date	Dry	Wet	Duration (years)
1893-1905	X		12
1905-1931		X	26
1931-1941	X		10
1941-1951		X	10
1951-1957	X		6
1957-1959		X	2
1963-1965	X		2
1965-1975		X	10
1975-1978	X		3
1979-1999*		X	20
2000-2006*	X		6
2007-2010*		X	3
2011-2013*	X		2
2018-2019**	X		2

Source: McKee, et al. *modified for the Colorado State Drought Plan in 2018 based on input from the Colorado Climate Center. **modified for Archuleta County HMP Update 2022

Southwestern Colorado and Archuleta County were impacted by the multi-year drought that began in 1997 and continued into 2004. The summer of 2002 was particularly severe and negatively affected local agriculture and irrigation. The wildland fires that burned that summer had a negative impact on the air quality in the region. Additionally, 2012 and 2013 brought drought conditions throughout the state, and information based on the U.S. Drought Monitor indicates that approximately 50% of Colorado was already under drought conditions by the beginning of 2012. By the end of May 2012, minimal snow accumulation and above average temperatures lead to a statewide drought and streamflows measured only slightly better compared to the extreme drought years of 1934, 1954, 1977 and 2002 (Ryan and Doesken, 2013). Figure 4-4 compares the severity of the drought in Archuleta County from 2000 to in June 2022. Since the plan was updated in 2017 Archuleta County has been in drought between 2018-2022. The graph illustrates the year-to-year variations in drought conditions in Archuleta County from exceptional drought conditions across the entire planning area in 2002 to virtually no drought conditions in July 2017 to severe drought conditions in 2021.

Figure 4-4 Archuleta County Drought Intensity 2000-June 21, 2022



Source: National Drought Mitigation Center

Between 2012 and 2021 Archuleta County was included in 22 USDA Secretarial Disaster Declarations.

The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. Information comes from the public who visit the website and submit a drought-related impact for their region, members of the media, and members of relevant government agencies. The database is being populated beginning with the most recent impacts and working backward in time.

The Drought Impact Reporter contains information on 42 drought impacts from droughts that affected Archuleta County between 2000 and 2021. The list is not comprehensive. Most of the impacts, 22, were classified as "relief, response and restrictions." Other impacts include "agriculture" (20), "plants and wildlife" (13), "water supply and quality" (12), "fire" (11) and "tourism and recreation" (7). These categories are described as follows:

- **Agriculture (20)** — Drought effects associated with agriculture, farming, aquaculture, horticulture, forestry, or ranching. Examples of drought-induced agricultural impacts include damage to crop quality; income loss for farmers due to reduced crop yields; reduced productivity of cropland; insect infestation; plant disease; increased irrigation costs; cost of new or supplemental water resource development (wells, dams, pipelines) for agriculture; reduced productivity of rangeland; forced reduction of foundation stock; closure/limitation of public lands to grazing; high cost or unavailability of water for livestock, Christmas tree farms, forestry, raising domesticated horses, bees, fish, shellfish, or horticulture.
- **Energy (0)** — This category concerns drought's effects on power production, rates and revenue. Examples include production changes for both hydropower and non-hydropower providers, changes in electricity rates, revenue shortfalls and/or windfall profits, and purchase of electricity when hydropower generation is down.
- **Water Supply and Quality (12)** — Drought effects associated with water supply and water quality include dry wells, voluntary and mandatory water restrictions, changes in water rates, increasing of water restrictions, increases in requests for new well permits, changes in water use due to water restrictions, greater water demand, decreases in water allocation or allotments, installation or alteration of water pumps or water intakes, changes to allowable water contaminants, water line damage or repairs due to drought stress, drinking water turbidity, change in water color or odor, declaration of drought watches or warnings, and mitigation activities.

- **Plants and Wildlife (13)**— Drought effects associated with unmanaged plants and wildlife, both aquatic and terrestrial, include: loss of biodiversity of plants or wildlife; loss of trees from rural or urban landscapes, shelterbelts, or wooded conservation areas; reduction and degradation of fish and wildlife habitat; lack of feed and drinking water; greater mortality due to increased contact with agricultural producers (as predators seek food from farms and producers are less tolerant of the intrusion); disease; increased vulnerability to predation (from species concentrated near water); migration and concentration (loss of wildlife in some areas and too much wildlife in others); increased stress on endangered species; salinity levels affecting wildlife; wildlife encroaching into urban areas; and loss of wetlands.
- **Fire (11)** — Drought often contributes to forest, range, rural, or urban fires, fire danger, and burning restrictions. Specific impacts include enacting or increasing burning restrictions, fireworks bans, increased fire risk, occurrence of fire (number of acres burned, number of wildfires compared to average, people displaced, etc.), state of emergency during periods of high fire danger, closure of roads or land due to fire occurrence or risk, and expenses to state and county governments of paying firefighters overtime and paying equipment (helicopter) costs.
- **Society and Public Health (2)** — Drought effects associated with human, public and social health include: health-related problems related to reduced water quantity or quality, such as increased concentration of contaminants; loss of human life (e.g., from heat stress, suicide); increased respiratory ailments; increased disease caused by wildlife concentrations; increased human disease caused by changes in insect carrier populations; population migration (rural to urban areas, migrants into the United States); loss of aesthetic values; change in daily activities (non-recreational, like putting a bucket in the shower to catch water); elevated stress levels; meetings to discuss drought; communities creating drought plans; lawmakers altering penalties for violation of water restrictions; demand for higher water rates; cultural/historical discoveries from low water levels; cancellation of fundraising events; cancellation/alteration of festivals or holiday traditions; stockpiling water; public service announcements and drought information websites; protests; and conflicts within the community due to competition for water.
- **Business and Industry (2)** — This category tracks drought's effects on non-agriculture and non-tourism businesses, such as lawn care, recreational vehicles, or gear dealers, and plant nurseries. Typical impacts include reduction or loss of demand for goods or services, reduction in employment, variation in number of calls for service, late opening or early closure for the season, bankruptcy, permanent store closure, and other economic impacts.
- **Tourism and Recreation (7)** — Drought effects associated with recreational activities and tourism include closure of state hiking trails and hunting areas due to fire danger; water access or navigation problems for recreation; bans on recreational activities; reduced license, permit, or ticket sales (e.g., hunting, fishing, ski lifts, etc.); losses related to curtailed activities (e.g., bird watching, hunting and fishing, boating, etc.); reduced park visitation; and cancellation or postponement of sporting events.
- **Relief, Response, and Restrictions (22)** — This category refers to drought effects associated with disaster declarations, aid programs, requests for disaster declaration or aid, water restrictions, or fire restrictions. Examples include disaster declarations, aid programs, U.S. Department of Agriculture (USDA) Secretarial Disaster Declarations, Small Business Association Disaster Declarations, government relief and response programs, state-level water shortage or water emergency declarations, county-level declarations, a declared "state of emergency," requests for declarations or aid, non-profit organization-based relief, water restrictions, fire restrictions, National Weather Service (NWS) Red Flag Warnings, and declaration of drought watches or warnings.

Beyond the impacts addressed by the Drought Monitor, Archuleta County also experienced significant impacts for recreation and tourism. Lower moisture levels result in less snowfall, which discourages visitors from engaging in snow sports. During drought years, ski ticket sales drop significantly leading to reduced park visitation, in addition to delayed opening for ski resorts, and an increase in costly artificial snow generation. Beyond winter recreation, a diminished snowpack will also lower the runoff levels, which affects white water rafting, kayaking, and tubing. Historically, drought has impacted the Navajo Reservoir and inhibited boat access.

Geographical Area Affected

The entire County is at risk to drought conditions including the populated areas of local water supplies for the Town of Pagosa Springs (domestic needs) and widespread areas of the County (agricultural needs). Therefore, the spatial extent rating for drought in Archuleta County is extensive.

The impacts will vary throughout the County, but a severe drought will affect the entire economy, particularly the tourism, recreation, and agricultural industries. Drought is one of the few hazards that has the potential to impact every person directly or indirectly within Archuleta County, as well as adversely affect the local economy. The impacts would be water restrictions associated with domestic supplies, agricultural losses and economic impacts associated with those losses, economic impacts to tourism and recreation industries, increased wildland firefighting costs, and increased costs for water.

Magnitude/Severity

Overall, drought impacts could be **critical** in Archuleta County, with 25 to 50 percent of the planning area affected and 10 to 50 percent agricultural losses. The magnitude of a drought's impact will be directly related to the severity and length of the drought. Secondary effects include increased susceptibility to wildland fires and pine beetle infestations. Fire restrictions in the County and on Public Lands impact agriculture, construction, and outdoor recreation with economic consequences.

Frequency/Likelihood of Occurrence

Likely—Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less. Historical drought data for the planning area indicates there have been 6 significant droughts in the last 60 years (1950-2010). This equates to a drought every 10 years on average or a 10 percent chance of a drought in any given year, which corresponds to a likely occurrence rating.

Climate Change Considerations

Climate change can have impacts both in terms of inter-annual droughts and intra-annual runoff patterns (State of Colorado Drought Mitigation and Response Plan Update, 2018). Temperatures increased and resulting changes in evaporation and soil moistures will also add to the trend of decreasing runoff in a majority of Colorado Basins. The following table shows the challenges water managers may face with the projected changes in climate.

Table 4-22 Future Drought Vulnerability Due to Climate Change and Challenges Faced by Colorado Water Managers

Challenge	Observed and/or Projected Change
Water demands for agriculture and outdoor watering	Increasing temperatures raise evapotranspiration by plants, lower soil moisture, alter growing seasons, and thus increase water demand.
Water supply infrastructure	Changes in snowpack, streamflow timing, and hydrograph evolution may affect reservoir operations including flood control and storage. Changes in the

Challenge	Observed and/or Projected Change
	timing and magnitude of runoff may affect functioning of diversion, storage, and conveyance structures.
Legal water systems	Earlier runoff may complicate prior appropriation systems and interstate water compacts, affecting which rights holders receive water and operations plans for reservoirs
Water quality	Although other factors have a large impact, "water quality is sensitive both to increased water temperatures and changes in patterns of precipitation" (CCSP SAP 4.3, p. 149). For example, changes in the timing and hydrograph may affect sediment load and pollution, impacting human health.
Energy demand and operating costs	Warmer air temperatures may place higher demands on hydropower reservoirs for peaking power. Warmer lake and stream temperatures may affect water use by cooling power plants and other industries.
Mountain habitats	Increasing temperature and soil moisture changes may shift mountain habitats toward higher elevation.
Interplay among forests, hydrology, wildfires, and pests	Changes in air, water, and soil temperatures may affect the relationships between forests, surface and groundwater, wildfire, and insect pests. Water-stressed trees, for example, may be more vulnerable to pests.
Riparian habitats and fisheries	Stream temperatures are expected to increase as the climate warms, which could have direct and indirect effects on aquatic ecosystems (CCSP SAP 43.), including the spread of instream non-native species and diseases to higher elevation and the potential for nonnative plant species to invade riparian areas. Changes in streamflow intensity and timing may also affect riparian ecosystems.
Water – and snow – based recreation	Changes in reservoir storage affect lake and river recreation activities; changes in streamflow intensity and timing will continue to affect rafting directly and trout fishing indirectly. Changes in the character and timing of snowpack and the ratio of snowfall to rainfall will continue to influence winter recreational activities and tourism.
Groundwater resources	Changes in long-term precipitation and soil moisture can affect groundwater recharge rates; coupled with demand issues, this may mean greater pressure on groundwater resources.

Source: State of Colorado Drought Mitigation and Response Plan 2018, Reproduction from CWCB

Vulnerability Assessment

The Colorado State Drought Mitigation Plan includes vulnerability to state owned buildings and critical infrastructure, state land board lands, state operated recreational activity, aquatic habitat and species, agriculture activities, protected environments, recreation, socioeconomics, and the municipal and industrial (M&I) sectors. Archuleta County generally ranked moderate in vulnerability across the sectors, with the exception of Socioeconomic where the County ranked higher in vulnerability compared to rest of the state. The sector vulnerability scores for Archuleta County are shown in Table 4-23. A score of 3.0 or above means that sector is highly vulnerable to drought; Socioeconomic is the only section where Archuleta County reaches above a 3.0 score.

Table 4-23 Archuleta County Drought Vulnerability Score by Sector

Sector	Score
Recreation	2.75
Energy	1.75
Agriculture	2.17
State Assets	2.84
Socioeconomic	3.20
Environment	1.94
Average Overall Vulnerability	2.44

Source: 2018 State of Colorado Drought Mitigation and Response Plan

People

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

Property

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

Critical Facilities and Lifelines

Critical facilities as defined for this plan will continue to be operational during a drought. Critical facility elements such as landscaping may not be maintained due to limited resources, but the risk to the planning area's critical facilities inventory will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

Note the Snowball Water Treatment plant as a potential asset at risk for PAWSD (look at mit actions)

Economy

The County's economy is largely dependent on tourism, recreation and, to a lesser extent, agriculture. The tourist industries in Archuleta County are highly vulnerable to drought. A lack of precipitation can impact skiing, white water activities, fishing, hunting, and more.

Drought can also exacerbate the potential occurrence and intensity of wildland fires. The wildland areas of the County will see an increase in dry fuels, beetle kill, and associated wildland fires and some loss of tourism revenue. The agricultural areas of the County will experience hardships, including agricultural losses, associated with a reduction in water supply. Water supply issues for domestic needs will be a concern for the entire County and PAWSD during droughts.

Drought impacts on the County's natural environment and the cascading impacts to the recreation sector could lead to less people visiting and spending money in County which could have a negative impact on the entire local economy. Both the summer river sports industry and winter ski industry are important aspects of Archuleta County's economy and rely on adequate snowpack; a drought year or consecutive drought years can drastically affect both industries. The Colorado Water Conservation Board (CWCB), Future Avoided Cost Explorer (FACE) tool which estimates annual damages from drought, Archuleta County could potentially experience an average annual loss of $100,000 due to drought conditions under current population and climate scenarios.

Historical, Environmental, and Cultural Resources

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

Development Trends

Each municipal planning partner in this effort has an established comprehensive plan that includes policies directing land use and dealing with issues of water supply and the protection of water resources. These plans provide the capability at the local municipal level to protect future development from the impacts of drought. All planning partners reviewed their general plans under the capability assessments performed for this effort. Deficiencies identified by these reviews can be identified as mitigation initiatives to increase the capability to deal with future trends in development. Vulnerability to drought will increase as population growth increases, putting more demands on existing water supplies. Future water use planning should consider increases in population as well as potential impacts of climate change.

The Colorado Water Conservation Board (CWCB), Future Avoided Cost Explorer (FACE) provides an in-depth look at the potential economic impacts and expected annual damages from future flood, drought, and wildfire events. The tool looks at three different climate scenarios (current climate conditions, 2050 future – moderately warmer climate and 2050 – severely warmer climate) as well as compares current population to low, medium and high growth population scenarios. The following table compares the estimated annual damages for Archuleta County due to drought events for each of the climate and population scenarios.

Table 4-24 Potential Fiscal Impacts due to Drought by Climate and Population Scenarios

Climate Scenarios	Population Scenarios Low Growth (~17,100)	Medium Growth (~26,600)	High Growth (~38,300)
Current	Total damages: $100K	Total damages: $190K	Total damages: $100K
	Total damages per person: Less than $10	Total damages per person: $10	Total damages per person: Less than $10
Moderate Climate	Total damages: $190K	Total damages: $190K	Total damages: $190K
	Total damages per person: $10	Total damages per person: Less than $10	Total damages per person: Less than $10
	Total damages: $300K	Total damages: $300K	Total damages: $310K

Climate Scenarios	Population Scenarios Low Growth (~17,100)	Medium Growth (~26,600)	High Growth (~38,300)
More Severe Climate	Total damages per person: $20	Total damages per person: $10	Total damages per person: Less than $10

Source: CWCB FACE Tool

Risk Summary

Based on Archuleta County's past multi-year droughts and Colorado's drought history, it is evident that all the Archuleta County response area is vulnerable to drought. Aspects of each participating jurisdiction (County, Pagosa Springs, Pagosa Fire Protection District and PAWSD) could be impacted by drought. However, the impacts of future droughts will vary by jurisdiction.

In summary, drought is considered high significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-25 Drought Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Likely	Critical	High
Pagosa Springs	Extensive	Likely	Critical	High
Pagosa Fire Protection District	Extensive	Likely	Critical	High
Pagosa Area Water and Sanitation District	Extensive	Likely	Critical	High

- There have been 22 USDA Disaster Declaration specifics to Drought in the County since 2012.
- Archuleta County experiences an average annual loss of $100,000 due to drought under current population and climate scenarios, with potential to increase in future climate and growth scenarios to $300,000 annually.
- Effects on people: Potential for recreation and tourism sector job loss. An increased risk of public health issues such as impaired drinking water, increased incidence of mosquito-borne illness, an increase in wildlife-human confrontations and respiratory complications as a result of declined air quality.
- Effects on property: limited
- Effects on economy: Reduced tourism due to wildfires or camping/hunting/fishing restrictions
- Effects on critical facilities and infrastructure: Greatest impact on water-supply and distribution, as well as critical facilities dependent on steady water supply.
- Related Hazards: Wildfire, flooding, subsidence

4.3.5 Earthquake

Hazard Problem/Description

How Earthquakes Happen

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called

"seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds.

Earthquakes can last from a few seconds to over five minutes; they may also occur as a series of tremors over several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris, because the shocks shake, damage, or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer, and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides, or releases of hazardous material, compounding their disastrous effects.

Earthquakes tend to reoccur along faults, which are zones of weakness in the crust. Even if a fault zone has recently experienced an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake could still occur.

Small, local faults produce lower magnitude quakes, but ground shaking can be strong, and damage can be significant in areas close to the fault. In contrast, large regional faults can generate earthquakes of great magnitudes but, because of their distance and depth, they may result in only moderate shaking in an area.

Geologists classify faults by their relative hazards. Active faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). Potentially active faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years). Determining if a fault is "active" or "potentially active" depends on geologic evidence, which may not be available for every fault. Although there are probably still some unrecognized active faults, nearly all the movement between the two plates, and therefore most of the seismic hazards, are on the well-known active faults.

Faults are more likely to have earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve accumulating tectonic stresses. A direct relationship exists between a fault's length and location and its ability to generate damaging ground motion at a given site. In some areas, smaller, local faults produce lower magnitude quakes, but ground shaking can be strong, and damage can be significant because of the fault's proximity to the area. In contrast, large regional faults can generate great magnitudes but, because of their distance and depth, may result in only moderate shaking in the area.

Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity.

Magnitude

Currently the most used magnitude scale is the moment magnitude (Mw) scale, with the follow classifications of magnitude:

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

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

Intensity

Currently the most used intensity scale is the modified Mercalli intensity scale, with ratings defined as follows (US Geological Survey [USGS] 1989):

Table 4-26 Modified Mercalli Intensity (MMI) Scale

Magnitude	Mercalli Intensity	Effects	Frequency
Less than 2.0	I	Micro-earthquakes, not felt or rarely felt; recorded by seismographs.	Continual
2.0-2.9	I to II	Felt slightly by some people; damages to buildings.	Over 1M per year
3.0-3.9	II to IV	Often felt by people; rarely causes damage; shaking of indoor objects noticeable.	Over 100,000 per year
4.0-4.9	IV to VI	Noticeable shaking of indoor objects and rattling noises; felt by most people in the affected area; slightly felt outside; generally, no to minimal damage.	10K to 15K per year
5.0-5.9	VI to VIII	Can cause damage of varying severity to poorly constructed buildings; at most, none to slight damage to all other buildings. Felt by everyone.	1K to 1,500 per year
6.0-6.9	VII to X	Damage to a moderate number of well-built structures in populated areas; earthquake-resistant structures survive with slight to moderate damage; poorly designed structures receive moderate to severe damage; felt in wider areas; up to hundreds of miles/kilometers from the epicenter; strong to violent shaking in epicenter area.	100 to 150 per year
7.0-7.9	VIII<	Causes damage to most buildings, some to partially or completely collapse or receive severe damage; well-designed structures are likely to receive damage; felt across great distances with major damage mostly limited to 250 km from epicenter.	10 to 20 per year
8.0-8.9	VIII<	Major damage to buildings, structures likely to be destroyed; will cause moderate to heavy damage to sturdy or earthquake-resistant buildings; damaging in large areas; felt in extremely large regions.	One per year
9.0 and Greater	VIII<	At or near total destruction - severe damage or collapse to all buildings; heavy damage and shaking extends to distant locations; permanent changes in ground topography.	One per 10-50 years

Ground Motion

Earthquake hazard assessment is also based on expected ground motion. This involves determining the annual probability that certain ground motion accelerations will be exceeded, then summing the annual probabilities over the time period of interest. The most mapped ground motion parameters are the

horizontal and vertical peak ground accelerations (PGA) for a given soil or rock type. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage "short period structures" (e.g., single-family dwellings). Longer period response components create the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 4-27 lists damage potential and perceived shaking by PGA factors, compared to the modified Mercalli scale.

Table 4-27 Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a]
		Resistant Buildings	Vulnerable Buildings	(%g)
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/ Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X - XII	Extreme	Very Heavy	Very Heavy	>124%

PGA Peak Ground Acceleration
PGA measured in percent of g (%g), where g is the acceleration of gravity
Sources: USGS 2008; USGS 2010

Effect of Soil Types

The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, distance from the source of the earthquake, and liquefaction, a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil. Liquefaction generally occurs in soft, unconsolidated sedimentary soils. A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. Table 4-28 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E, and F. In general, these areas are also most susceptible to liquefaction.

Table 4-28 NEHRP Soil Classification System

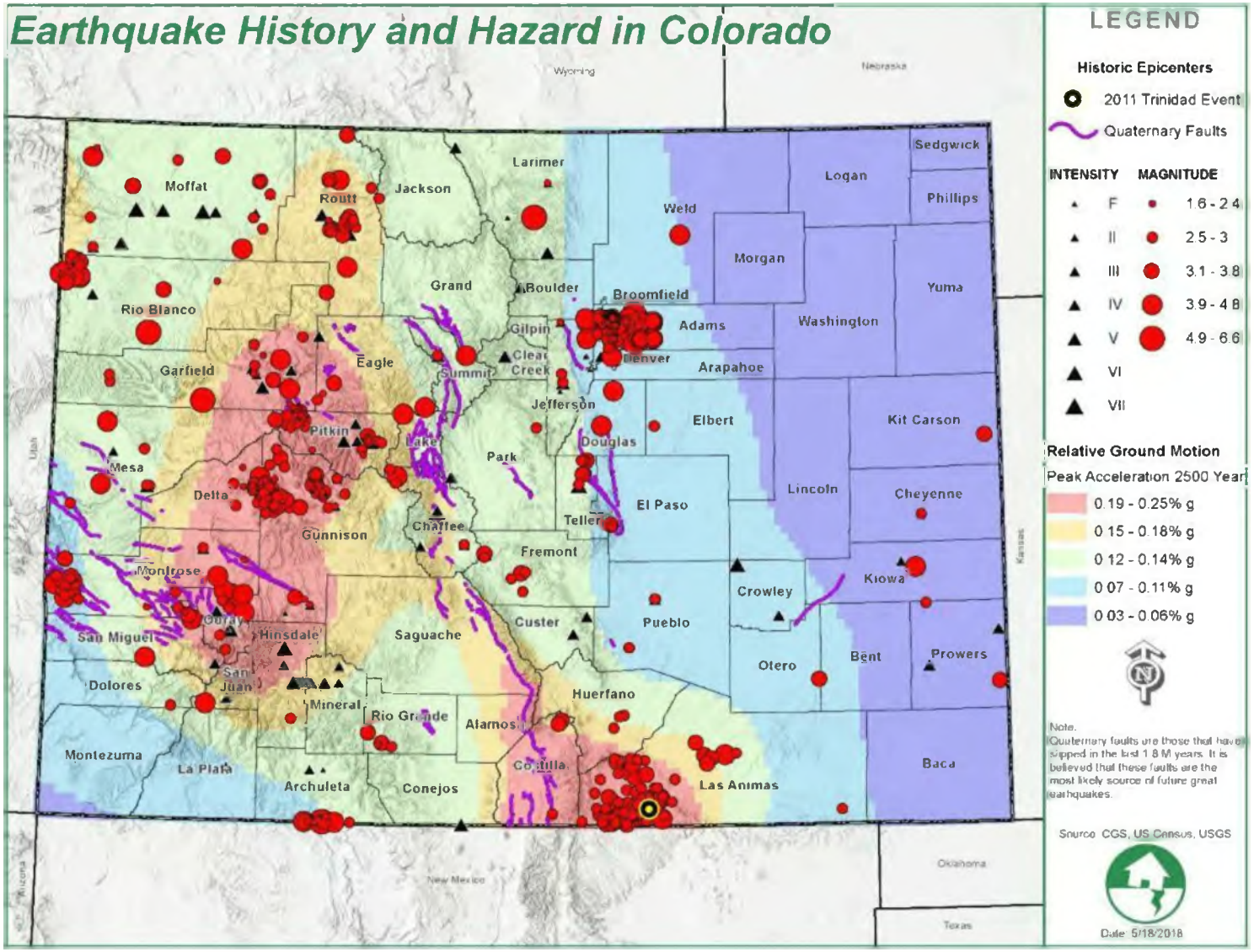
NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organicsoils, soft clays >36 m thick)	

Notes:
m Meters
m/s Meters per second

Past Occurrences

Although not as frequent or as large as California, Colorado has experienced earthquakes in its relatively brief period of historic record. Colorado has a relatively short period of historical records for earthquakes. According to the 2018 Colorado State Hazard Mitigation Plan, more than 700 earthquakes of magnitude 2.5 or higher have been recorded in Colorado since 1867. Higher magnitude earthquakes have only occurred a few times in the last 150 years. Figure 4-5 below was taken from the 2018 Colorado State HMP and shows the locations and magnitudes of past recorded earthquakes in the state, as well as known fault lines and peak ground acceleration statewide. In Archuleta County, the majority of past recorded earthquakes are clustered along the county's southern border with New Mexico.

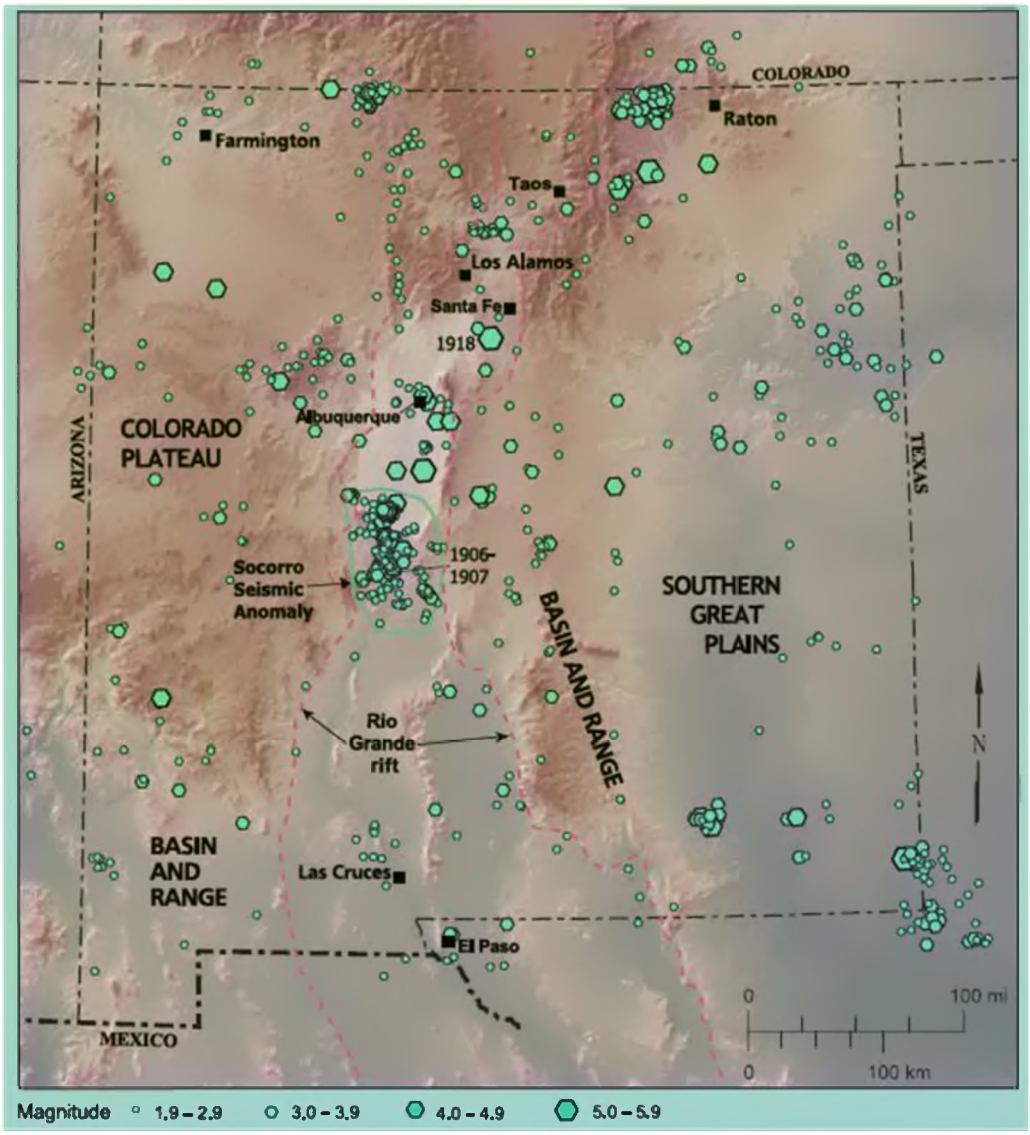
Figure 4-5 Earthquake History and Hazard in Colorado



The strongest earthquakes experienced in the County occurred in 1882 and 1966. The series of earthquakes on the Colorado–New Mexico border south of Pagosa Springs were related to a 5.5 mainshock at Dulce, New Mexico on January 23, 1966, and its sequence of aftershocks. Seismic activity at Dulce may possibly be related to the Archuleta Anticlinorium, a structure which forms the eastern margin of the Colorado Plateau (Source: Colorado Earthquake Information, 1867-1996, Colorado Geological Survey). As of June 2022, the Dulce earthquake remains the largest within the vicinity of Archuleta County. The February 12, and May 12, 1882, Pagosa Springs earthquakes had a felt Intensity of IV.

Figure 4-6 shows historic seismicity in New Mexico from 1869 to 2008, based on data from the United States Geological Survey (USGS) and New Mexico Tech, which also shows the Dulce New Mexico and a cluster of smaller earthquake epicenters near the Colorado-New Mexico border near Archuleta County.

Figure 4-6 Historic Seismicity in New Mexico: 1869-2008



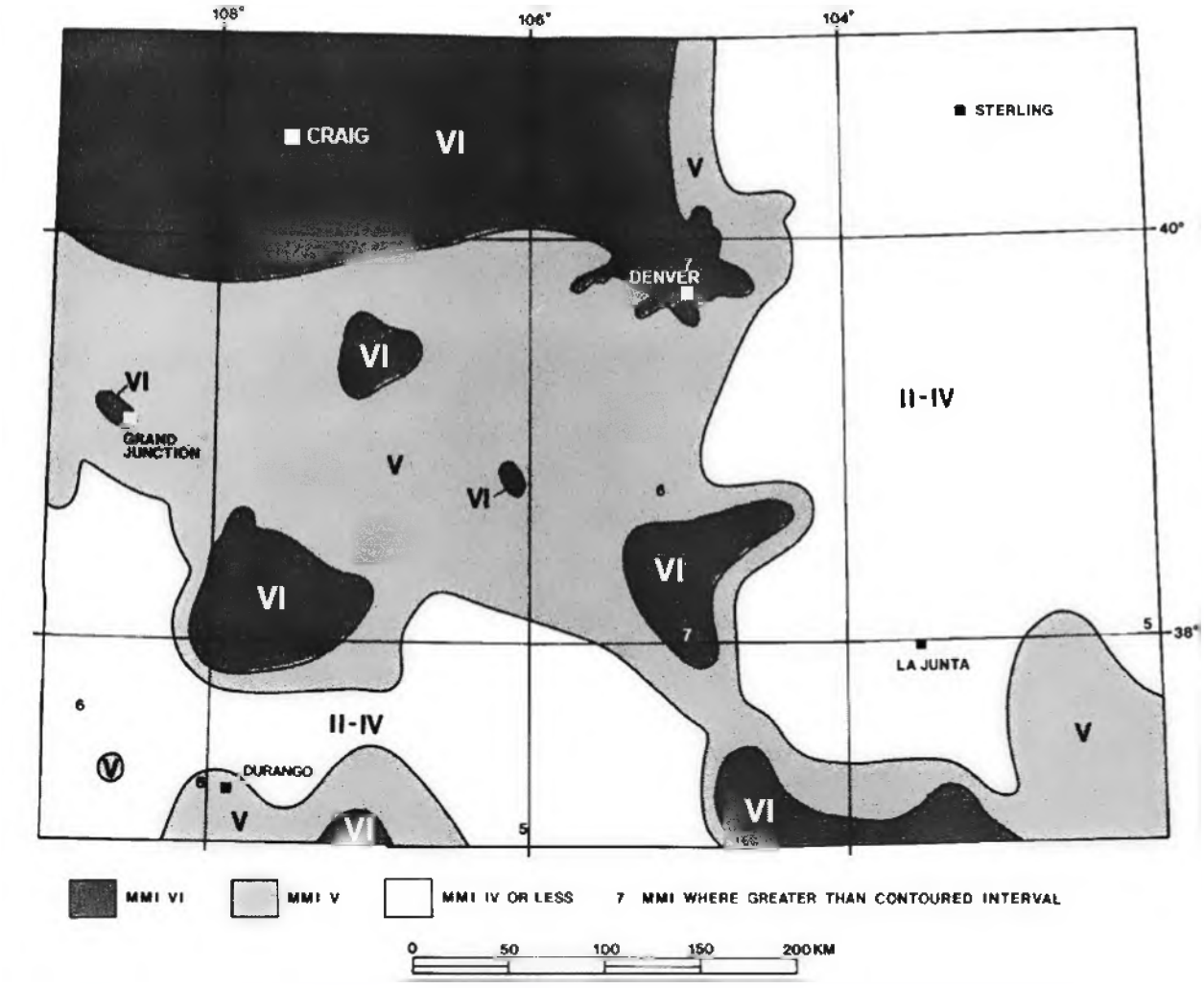
Source: New Mexico Bureau of Geology and Mineral Resources Earth Matters Report Volume 9, No. 1 http://geoinfo.nmt.edu/publications/periodicals/earthmatters/9/EMv9n1_09.pdf

The following sections detail a few notable recent earthquake events, neither of which occurred in Archuleta County but nearby.

- On August 23, 2011, a magnitude 5.3 earthquake occurred as part of a seismic swarm. A swarm is a set of shocks where more than one earthquake occurs at nearly the same location within a period of several days. This event was preceded by a magnitude 4.7 quake the day before. The shock of August 2011 occurred as the result of normal faulting, at a shallow depth of focus. The preliminary location, depth, and style of faulting for the 2011 earthquake are very similar to earthquakes in a previously cited 2001 swarm.
- On December 23, 2016, a magnitude 4.2 quake occurred 27km N of Cimarron, New Mexico.

Maximum historical earthquake Intensities felt in Colorado are shown in Figure 4-7. This map includes past earthquakes that have affected neighboring Hinsdale County, including an Intensity VI event on August 3, 1955, in Lake City.

Figure 4-7 Maximum Historical Earthquake Intensities in Colorado



Source: Colorado Earthquake Information, 1867-1996, Colorado Geological Survey; Red oval indicates approximate location of Archuleta County

Geographical Area Affected

The geographic extent of earthquakes in the planning area is **extensive**. All of Archuleta County's response area, including Pagosa Springs, could be impacted by earthquakes, but the south-central portion of the County is likely to have the potential for higher ground shaking relative to other parts of the county, based on a limited number of historic events.

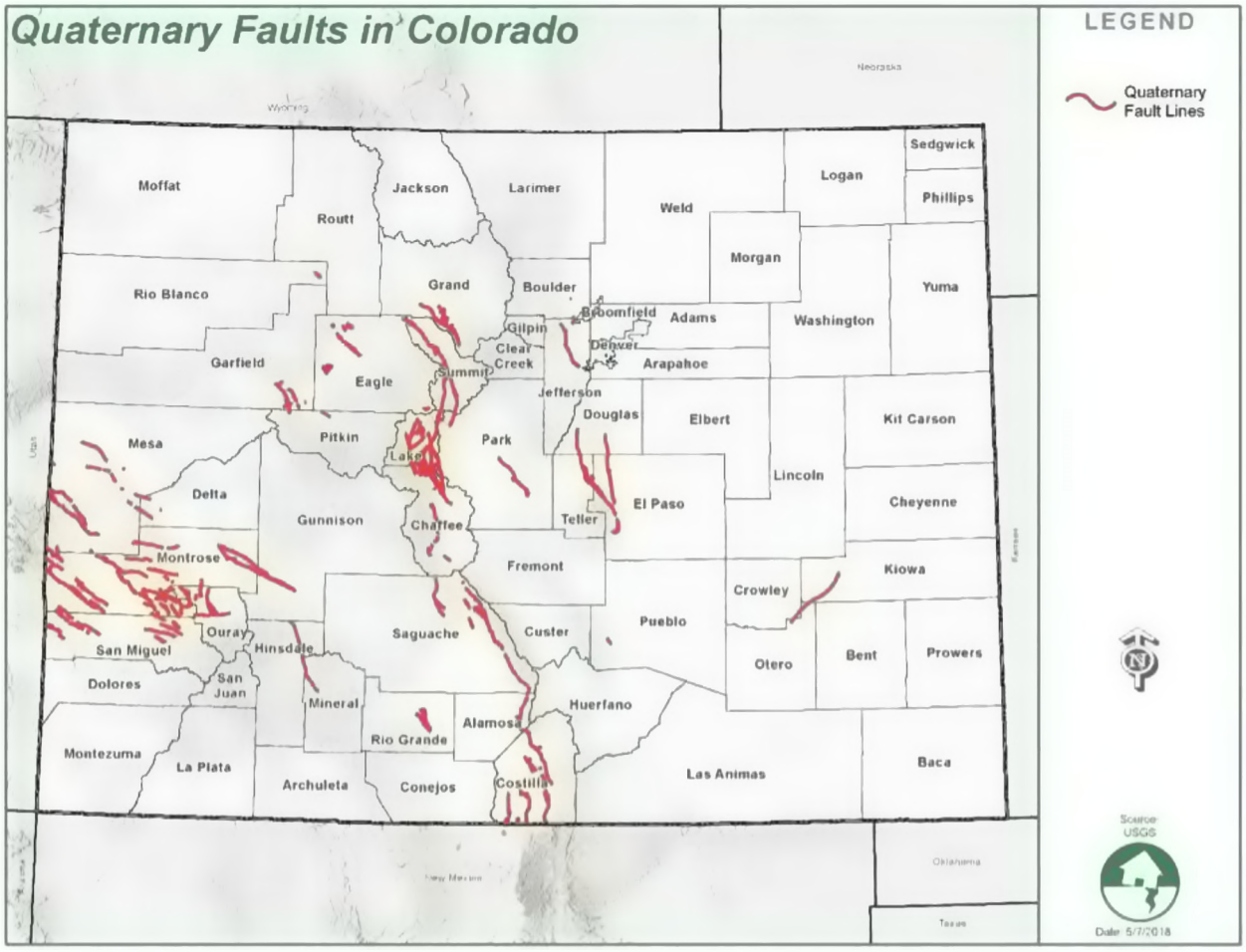
Geological research indicates that faults capable of producing earthquakes are prevalent in Colorado. There are approximately 90 potentially active faults in Colorado with documented movement within the last 1.6 million years; these are shown in Figure 4-8 below. More than 700 earthquake tremors of magnitude 2.5 or higher have been recorded in Colorado since 1867. This is considered relatively infrequent for a western state, but instrument recording of earthquakes did not begin in Colorado until the 1960s so the data may be incomplete.

Faults are classified based on the time frame of their latest suspected movement (in order of activity occurrence, most recent is listed first):

- **H**—Holocene (within past 15,000 years)
- **LQ**—Late Quaternary (15,000-130,000 years)
- **MLQ**—Middle to Late Quaternary (130,000 – 750,000 years)
- **Q**—Quaternary (approximately past 2 million years)
- **LC**- Late Cenozoic (approximately past 23.7 million years)

No potentially active faults have been identified within Archuleta County. However, this does not mean that no potentially active faults exist in the Archuleta County response area. The earthquake hazards in Colorado are not well identified or understood. Since earthquakes are a low frequency event in Colorado, there is less funding and interest for earthquake studies in comparison to more seismically active areas of the country. The Cannibal fault in Hinsdale County is the closest Late Quaternary fault that has been identified (Source: State of Colorado Natural Hazards Mitigation Plan 2004 Earthquake Evaluation Report).

Figure 4-8 Colorado Quaternary Fault Map



Source: State of Colorado Hazard Mitigation Plan, 2018

Magnitude/Severity

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, communication, and transportation lines. Damage and life loss can be particularly devastating in communities where buildings were not designed to withstand seismic forces (e.g., historic structures). Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground. Secondary impacts can include landslides, rock falls, liquefaction, fires, dam failure, and hazardous materials (HAZMAT) incidents.

In simplistic terms, the severity of an earthquake event can be measured in the following terms:

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

Due to the lack of potentially active faults in the planning area there has been no HAZUS studies conducted by the Colorado Geological Survey. A probabilistic HAZUS earthquake scenario was performed as part of

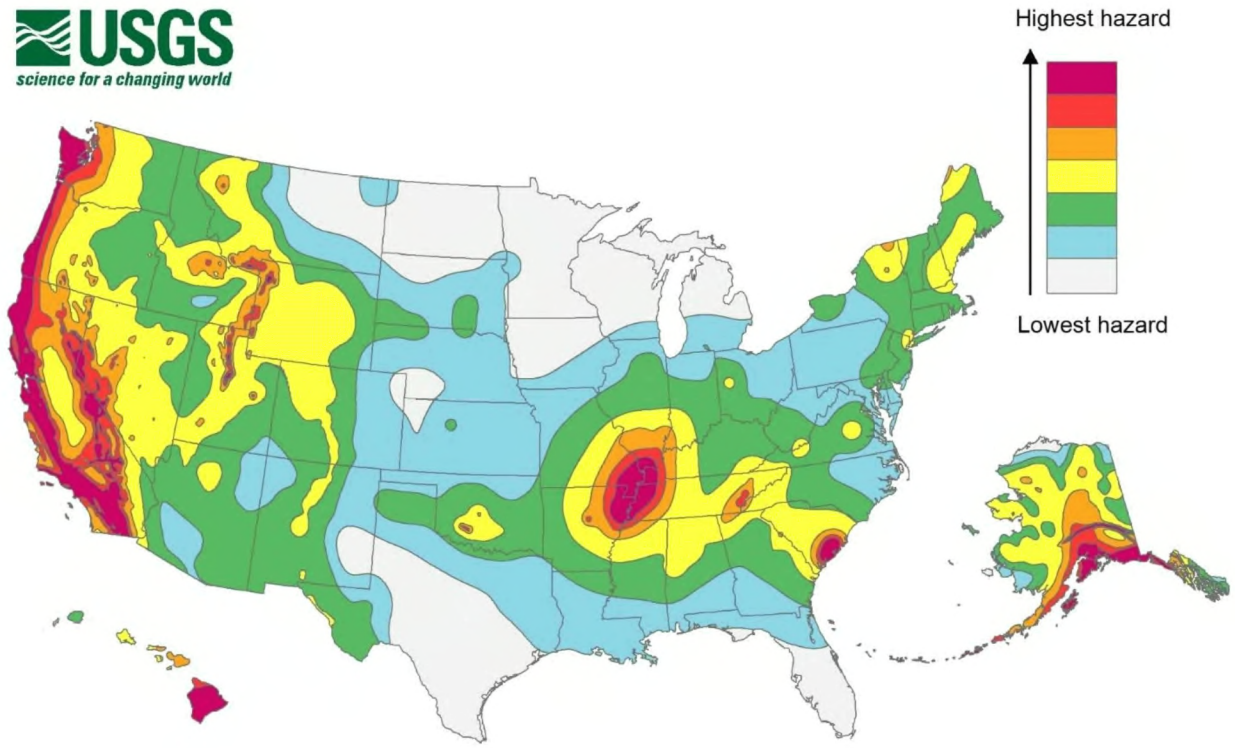
this mitigation plan development and the results can be referenced below in the Vulnerability Assessment section. According to that analysis, which was a more worst-case probabilistic scenario, there is the potential for 12% of the total number of buildings in the County to be affected, with roughly 938 buildings experiencing at least moderate damage. The Town of Pagosa Springs, due to the older building stock as well as being a population center, could endure the greatest losses if a significant earthquake were to occur. Overall, earthquake impacts in Archuleta County could be **limited**, with 10 to 25 percent of the planning area affected. Due to the low probability of a damaging earthquake occurring, as discussed below, the planning significance of earthquakes is considered low by the HMPC.

Frequency/Likelihood of Occurrence

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

Research based on Colorado's earthquake history suggests that an earthquake of 6.3 or larger has a one percent (1 percent) probability of occurring each year somewhere in Colorado (Charlie, Doehring, Oaks Colorado Earthquake Hazard Reduction Program Open File Report 93-01, 1993). Figure 4-9 below is from the most recent USGS models for the conterminous U.S., showing peak ground accelerations having a 2 percent probability of being exceeded in 50 years, for a firm rock site. The models are based on seismicity and fault-slip rates and take into account the frequency of earthquakes of various magnitudes. Locally, the hazard may be greater than shown, because site geology may amplify ground motions, however this map shows the relatively low risk for future occurrence in Archuleta County compared to other parts of Colorado.

Figure 4-9 USGS Long-Term National Seismic Hazard Map



Source: USGS

Climate Change Considerations

The impacts of global climate change on earthquake intensity and probability are largely unknown but there is not expected to be a direct correlation.

Vulnerability Assessment

Earthquake vulnerability data was generated during the 2022 update using a Level 1 Hazus-MH analysis. Hazus-MH estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up.

People

The entire population of Archuleta County is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of the structures people live in, the soil type their homes are constructed on, their proximity to fault location, etc. Whether impacted directly or indirectly, the entire population will have to deal with the consequences of an earthquake to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of functions of utilities could impact populations that suffered no direct damage from an event itself.

Three population groups are particularly vulnerable to earthquake hazards:

- **Linguistically Isolated Populations**—Approximately 1.1% of the planning area population over 5 years old speaks English "less than very well." Problems arise when there is an urgent need to inform non-English speaking residents of an earthquake event. They are vulnerable because of difficulties in understanding hazard-related information from predominantly English-speaking media and government agencies.
- **Population below Poverty Level**—Families with incomes below the poverty level in 2020 made up 5% of the total county population. These families may lack the financial resources to improve their homes to prevent or mitigate earthquake damage. Poorer residents are also less likely to have insurance to compensate for losses in earthquakes.
- **Population over 65 Years Old**—Approximately 25.8% of the residents in Archuleta County are over 65 years old. This population group is vulnerable because they are more likely to need special medical attention, which may not be available due to isolation caused by earthquakes. Elderly residents also have more difficulty leaving their homes during earthquake events and could be stranded in dangerous situations

Impacts on persons and households in the planning area were estimated for the 2,500-Year Probabilistic Earthquake. Table 4-29 summarizes the results. Further impacts to the population as estimated by Hazus are detailed in Table 4-29. It is estimated in a 2 p.m. time of occurrence scenario, which is likely to be a worst-case scenario, that there would be thirteen injuries across the county, two of which would require hospitalization. There could also be increased risk of damage or injury from rock fall to travelers, hikers, and others recreating outdoors at the time of the earthquake.

Table 4-29 Estimated Earthquake Impact on Persons and Households

	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
2,500-Year Earthquake	18	9

Source: HAZUS-MH Global Summary Report, Wood Analysis

Property

The HAZUS analysis estimates that there are 8,000 buildings in the planning area, with a total replacement value of $1.75 billion. Because all structures in the planning area are susceptible to earthquake impacts to varying degrees, this total represents the countywide property exposure to seismic events. Most of the buildings (93%) and most of the associated building value (86%) are residential. According to the model about 938 buildings will be at least moderately damaged (including moderate, extensive, and complete damage). A summary of these damage estimates is included in Table 4-30 below:

Table 4-30 Estimated Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	17.19	0.29	4.05	0.28	2.88	0.38	0.83	0.51	0.06	0.62
Commercial	242.61	4.05	69.31	4.81	53.35	6.95	15.51	9.55	1.22	13.00
Education	3.53	0.06	0.76	0.05	0.56	0.07	0.14	0.09	0.01	0.09
Government	9.76	0.16	2.26	0.16	1.61	0.21	0.36	0.22	0.02	0.23
Industrial	81.53	1.36	23.94	1.66	19.99	2.61	6.11	3.76	0.43	4.63
Other Residential	821.41	13.72	321.95	22.36	272.83	35.57	47.94	29.54	2.86	30.60
Religion	25.65	0.43	6.35	0.44	4.70	0.61	1.21	0.75	0.09	0.91
Single Family	4784.77	79.93	1011.15	70.23	411.21	53.60	90.21	55.58	4.67	49.92
Total	**5,986**		**1,440**		**767**		**162**		**9**	

Source: HAZUS-MH Global Summary Report, Wood Analysis

Property losses were estimated through the Level 1 HAZUS-MH analysis for a 2,500-year probabilistic earthquake. The table below is an excerpt from the HAZUS global summary report and shows the results for two types of building loss:

- Direct building losses, representing damage to building structures.
- Business interruption losses.

For the 2,500-year probabilistic earthquake scenario the estimated damage potential is $59.1 million.

Table 4-31 HAZUS Building Related Economic Loss Estimates for 2,500 Year Scenario

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.2436	1.3574	0.0470	0.0894	1.7374
	Capital-Related	0.0000	0.1040	1.3373	0.0273	0.0162	1.4848
	Rental	1.0532	0.6835	0.8354	0.0158	0.0367	2.6246
	Relocation	3.7623	0.7807	1.1937	0.1308	0.2726	6.1401
	Subtotal	**4.8155**	**1.8118**	**4.7238**	**0.2209**	**0.4149**	**11.9869**
Capital Stock Losses							
	Structural	5.1331	1.2934	1.4326	0.2902	0.3091	8.4584
	Non_Structural	17.7223	5.2036	3.3456	0.8390	0.7017	27.8122
	Content	6.6244	1.2934	1.8476	0.5047	0.4293	10.6994
	Inventory	0.0000	0.0000	0.0562	0.0989	0.0107	0.1658
	Subtotal	**29.4798**	**7.7904**	**6.6820**	**1.7328**	**1.4508**	**47.1358**
	Total	**34.30**	**9.60**	**11.41**	**1.95**	**1.87**	**59.12**

Source: HAZUS-MH Global Summary Report, Wood Analysis; values shown are in millions of dollars

The HAZUS analysis also estimated the amount of earthquake-caused debris in the planning area for the 2,500-Year probabilistic earthquake scenario event is estimated to be 20,000 tons.

Critical Facilities and Lifelines

All critical facilities and infrastructure in the planning area are exposed to the earthquake hazard. HAZMAT releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding HAZMAT are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

HAZUS-MH classifies the vulnerability of critical facilities to earthquake damage in two categories: at least moderate damage or complete damage. The analysis did not indicate any damages in these categories to specific facilities. The model does however anticipate pipeline breaks and leaks in the county's potable water, wastewater, and natural gas lines. The model also estimates lifeline damages to linear networks such as transportation and utilities. Damage to the transportation system is estimated at $740,000 and utility lifelines at $73.8 million. The steep terrain in the County adjacent to the highway and road corridors would likely create multiple rockslides that could damage roadways and disrupt traffic, which could further complicate evacuations which may be necessary following a major event

Economy

HAZUS-MH models total economic losses that includes building and lifeline related losses previously described. Total earthquake scenario loss estimates are summarized in Table 4-32 below.

Table 4-32 HAZUS-MH Earthquake Loss Estimation 2,500-Year Scenario Results

Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 1,440 Moderate: 767 Extensive: 162 Complete: 9

Type of Impact	Impacts to County
Building and Income Related Losses	$59.1 million 74% of damage related to residential structures 20% of loss due to business interruption
Total Economic Losses (includes building, income, and lifeline losses)	$133.7 Million Building: $47.1 Million Income: $12 Million Transportation/Utility: $74.6 Million
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 7 Requiring hospitalization: 1 Life threatening: 0 Fatalities: 0
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 11 Requiring hospitalization: 2 Life threatening: 0 Fatalities: 0
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 8 Requiring hospitalization: 1 Life threatening: 0 Fatalities: 0
Fire Following Earthquake	0 Ignitions
Debris Generation	20,000 tons of debris generated 800 truckloads
Displaced Households	18
Shelter Requirements	9

Source: HAZUS-MH Global Summary Report, Wood Analysis

Historical, Environmental, and Cultural Resources

Secondary hazards associated with earthquakes will likely have some of the most damaging effects on the environment. Earthquake-induced landslides can significantly impact surrounding habitat. Streams can be rerouted after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology. Historic building stock is commonly made of unreinforced masonry, which is vulnerable to damage from earthquakes, which are present in Pagosa Springs.

Development Trends

Land use in the planning area will be directed by the comprehensive plans adopted by the county and its planning partners as well as local permitting departments and zoning maps. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced with modern code adoption and enforcement, which includes seismic standards appropriate to the region.

Risk Summary

Table 4-33 Earthquake Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Archuleta County	Extensive	Occasional	Limited	Low
Pagosa Springs	Extensive	Occasional	Limited	Low

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Pagosa Fire Protection District	Extensive	Occasional	Limited	Low
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Occasional	Limited	Low

- Earthquakes represent a high consequence but low probability hazard. The overall significance is rated as **low**.
- Effects on people: Hazus estimates 13 injuries in the county and no fatalities under a more worst-case scenario. Certain vulnerable populations may be at increased risk from earthquakes, specifically in the aftermath.
- Effects on property: Resulting damages to building stock and utility lifelines, and income related losses could equate to millions of dollars based on Hazus-MH modeling.
- Effects on economy: Hazus estimates the total economic loss of a worst-case scenario event to be $133.7 Million, including building and infrastructure damages and lost wages and income. The cost of retrofitting buildings to meet earthquake seismicity standards may be cost-prohibitive, but low-cost non-structural measures can reduce property loss and prevent injury.
- Effects on critical facilities and infrastructure: Hazus estimates damage to the transportation system to be $740,000 and utility lifelines at $73.8 million.
- Related Hazards: Dam Failure, Landslide/Rockfall/Debris Flow

4.3.6 Extreme Temperatures

Hazard/Problem Description

Extreme temperature events, both cold and hot, can have severe impacts on human health and mortality, natural ecosystems, agriculture, and the economy. Temperature extremes – both cold and hot – cause more deaths every year than any other disaster, including hurricanes.[1]

Extreme Cold

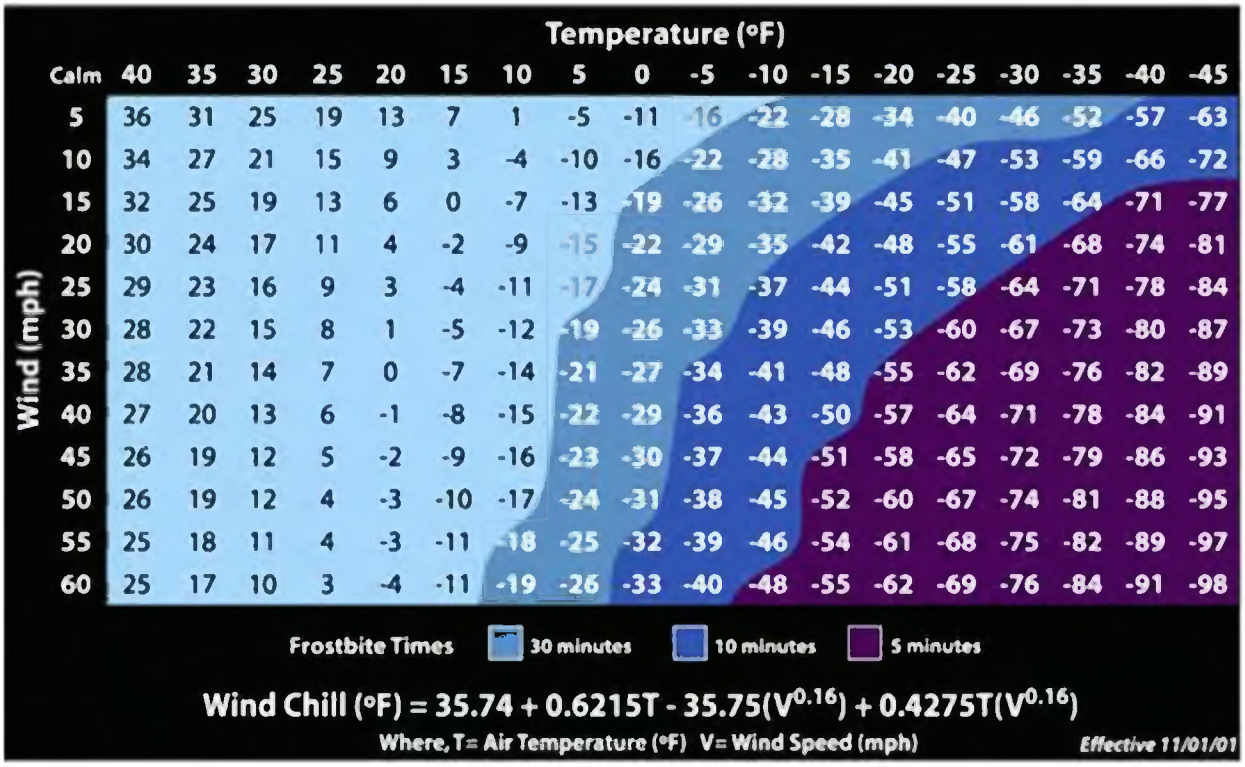
Extreme cold often accompanies a winter storm or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities. In Colorado, when temperatures drop at least 20 degrees below normal winter lows, the cold is considered extreme and begins to impact the daily operations of the county. On average, January is the coolest month and the average last freeze/frost day in Archuleta County is May 29.

The effects of extremely cold temperatures are amplified by strong to high winds that can accompany winter storms. As wind increases, heat is carried away from the body faster, driving down the body temperature, which in turn causes the constriction of blood vessels, and increases the likelihood of severe injury or death to exposed persons. In 2001, the National Weather Service updated the wind-chill temperature index to

[1] Kevin A. Borden and Susan L. Cutter "Spatial Patterns of Natural Hazards Mortality in the United States." International Journal of Health Geographics 2008, 7:64. Available online at http://www.ij-healthgeographics.com/content/7/1/64 last accessed July 13, 2009.

take advantage of advances in science and computer modeling technology (see Figure 4-10). This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. The NWS will issue a Wind Chill Advisory for Archuleta County when wind and temperature combine to produce wind chill values of -18 to -24°F.

Figure 4-10 National Weather Service Wind Chill Chart



Source: National Weather Service, www.nws.noaa.gov/om/windchill/index.shtml

Extreme Heat

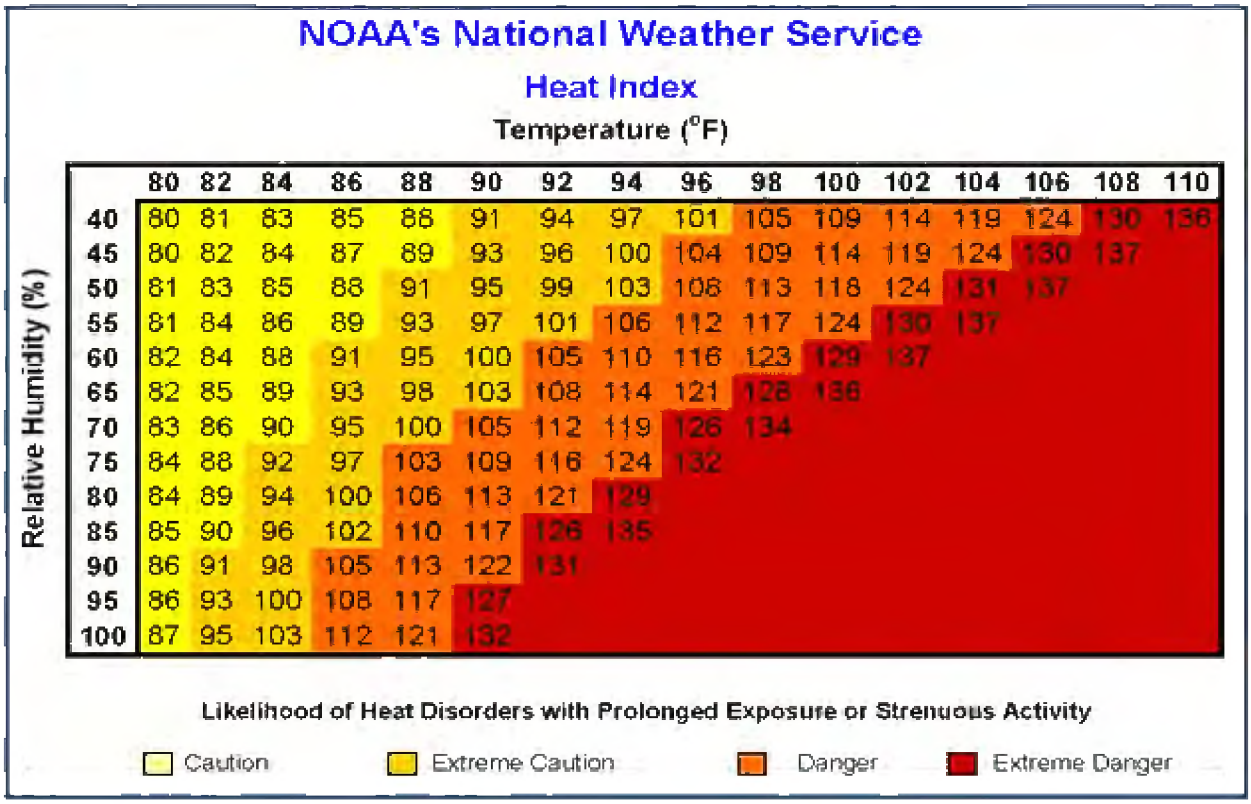
The Colorado State Hazard Mitigation Plan defines extreme heat as "temperatures over 90 degrees for an extended period of time, or that hover 10 degrees or more above the average high temperature for the region and last for multiple consecutive days." In a normal year, about 175 Americans succumb to the demands of summer heat. According to the National Weather Service (NWS), among natural hazards, only the cold of winter—not lightning, hurricanes, tornadoes, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise, and heat-related illness may develop. Elderly persons, small children, those with chronic illnesses, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails. Extreme heat does not present the same level of threat to Archuleta County as extreme cold does. The average elevation in the County is high

enough that temperatures generally do not reach extreme highs. In the future, changing climate conditions may alter this trend, making extreme heat a more relevant hazard to the planning area. For now, extreme heat will not be profiled to the same extent as extreme cold in this plan.

The National Weather Service (NWS) has in place a system to initiate alert procedures (advisories or warnings) when the heat index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime high is expected to equal or exceed 105°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days. Figure 4-11 displays the NOAA's National Weather Service Heat Index table and associated likelihood of heat disorders.

Figure 4-11 Heat Index Table



Source: National Weather Service, https://www.weather.gov/safety/heat-index

Past Occurrences

According to NCEI data, there have been 33 days with "frost/freeze" events reported in Archuleta County between 1996 and March of 2022 and one recorded "cold/wind chill" event, recorded in 2005. These events took place because of winter weather, but their primary feature was extreme cold. There was no monetary or crop losses due to "frost/freeze" or "cold/wind chill" reported by the NCEI dataset. The NCEI had no reported events for "excessive heat", "extreme cold/wind chill", or "heat" from 1996-2022 in Archuleta County. There have been no reported disaster declarations in Archuleta County due to extreme heat or cold.

Table 4-34 displays temperature summaries related to extreme heat and extreme cold for the county. The average maximum temperature in July is 80.8°F and the average minimum temperature in January is 8.2°F. The Western Regional Climate Center also reported extreme temperatures from the Pagosa Springs weather

station in Archuleta County between 1957-2001. The max extreme temperature in the County was 101°F on June 30th, 1934, and the minimum extreme temperature reached -46°F on February 1st, 1951. The Pagosa Springs weather station also reported that, on average, the area experiences 3.2 days a year with temperatures over 90°F and 240.9 days a year with temperatures below 32°F. The HMPC noted that the southern portions of Archuleta County experience significantly hotter temperatures than reported in this dataset due to the station's location in the central portion of the County.

Table 4-34 Temperature Data for Archuleta County, 1991 – 2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Temperature (degrees Fahrenheit)											
Average Maximum Temperature	37.0	40.6	48.8	55.9	65.3	76.5	80.8	78.3	71.5	60.3	47.4	37.3
Average Temperature	22.7	26.6	34.3	40.8	49.5	58.9	64.7	62.7	55.6	44.7	33.1	23.7
Average Minimum Temperature	8.2	12.4	19.7	25.5	33.6	41.2	48.4	47.1	39.5	29.0	18.8	10.1

Source: High Plains Regional Climate Center (HPRCC), County Level Data, https://hprcc.unl.edu/datasets.php?set=CountyData#

Geographical Area Affected

The inherent nature of temperature hazards makes them a regional threat, impacting all the planning area simultaneously due to the relatively limited geographical extent of the County, although the impacts may vary by location. Urbanized areas can experience pockets of heightened temperatures where surfaces such as pavement and roofs become hotter than the air temperatures, a phenomenon known as the urban heat island effect. However, the largest city in Archuleta County is Pagosa Springs, and with a population of 2,203 in 2020, there is limited infrastructure within the city and plenty of surrounding vegetation. Due to the lack of urban areas in Archuleta County, in addition to its high elevation and presence of green spaces and trees across the County, extreme cold is more likely to impact a greater geographic extent of the County than extreme heat. Overall, the geographic location of extreme temperatures in Archuleta County is rated as **extensive.**

Magnitude/Severity

To calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. Based on NCEI records of the 34 extreme temperature events in Archuleta County, there was no documented monetary losses, injuries, or fatalities from extreme heat or cold in Archuleta County. There were also no documented crop losses by the United States Department of Agriculture (USDA) in Archuleta County due to extreme temperature events. This is more likely due to incomplete data from unreported events, rather than no losses occurring.

Overall, extreme temperature impacts would likely be **negligible** in Archuleta County, with less than 10 percent of the planning area affected and minimal impact to quality of life and critical facilities or services. Extreme cold can occasionally cause problems with communications facilities. Pagosa Springs has frequent problems with frozen water lines. Extreme cold can also impact livestock and even crops if the event occurs during certain times of the year.

Frequency/Likelihood of Occurrence

According to NCEI data, there were 34 extreme cold events and 0 extreme heat events in Archuleta County over a 26-year period between 1996 and March 2022. We can calculate the probability of an extreme cold event occurring in the County in any given year:

$$(34 \div 26) \times 100\% = 131\%$$

Therefore, Archuleta County is likely to experience at least one extreme cold event a year. This corresponds to a probability of future occurrences rating of **highly likely**. Despite the relative lack of reported events, it is important to consider that this does not necessarily indicate a lack of frequency or likelihood of occurrence. Given Archuleta County's typical climate, extreme cold events may largely be accepted as a normal part of life by residents. Therefore, events may not be reported to the extent that they would be in other locations.

There are no recorded instances of extreme heat or heat events in Archuleta County from 1996 to 2022 in the National Centers for Environmental Information's Storm Events Database. In addition, average temperatures show that the County rarely exceeds 90°F, with the max recorded temperature in the planning area reaching only 101°F. Therefore, extreme heat is considered unlikely to occur in the future. Figure 4-12 displays the average annual temperatures in Archuleta County by month.

Figure 4-12 Temperature Data for Archuleta County, 1991 – 2020

Source: High Plains Regional Climate Center (HPRCC), County Level Data, https://hprcc.unl.edu/datasets.php?set=CountyData#

Climate Change Considerations

Climate change is projected to increase the uncertainty of weather patterns and produce more extreme climate induced events. Scientists have suggested that warming in the Arctic has been linked to changes in the jet stream which may lead to increased polar vortex events in Colorado. The polar vortex is well documented and is described as large areas of low pressure and cold air surrounding the North and South poles. Increased temperatures in the polar regions have weakened and destabilized the jet stream leading to polar air to dip into lower latitudes, bringing it farther south than typical (UC Davis).

Research cited in the Fourth National Climate Assessment indicates that average temperatures have already increased across the southwest portion of the United States and will likely continue to rise. This trend toward higher temperatures is expected to continue and would cause more frequent and severe droughts in the Southwest as well as drier future conditions and an increased risk of megadroughts—dry periods lasting 10 years or more). Additionally, current models project decreases in snowpack, less snow and more rain, shorter snowfall seasons, and earlier runoff, all of which may increase the probability of future water shortages (Gonzalez et al., 2018).

Vulnerability Assessment

People

According to the EPA, the individuals with the following combinations or characteristics are typically at greater risk to the adverse effects of extreme temperature events: individuals with physical or mobility constraints, cognitive impairments, economic constraints, and social isolation. Populations living in densely populated urban areas are likely to be more exposed to extreme heat events; however, these events are rare and of low magnitude. People who live at higher elevations would be more susceptible to cold events. While both extreme heat and cold events can impact people, a study from the National Center for Health Statistics found that cold kills twice as many U.S. Citizens as heat.

Property

Extreme cold/wind chill presents a minimal risk to the structures in Archuleta County. Property damage occurs occasionally when water pipes freeze and break. Homes without adequate insulation or heating may put owners at a higher risk for damages or cold-related injury. The risks of carbon monoxide poisoning, or structure fires increases as individuals attempt to warm cars in garages and use space heaters. Vehicles may stall once started or not start at all due to the cold temperatures, which may result in minor economic loss if individuals are unable to commute between work, school, and home. Driving conditions may deteriorate if extreme cold/wind chill prolongs icy road conditions, which will impact commutes and emergency response times as well. Landscaping and agriculture may be damaged or destroyed by unseasonable occurrences of extreme cold/wind chill, causing plants to freeze and die. This may increase the indirect vulnerabilities to severe cold by causing greater economic costs and losses for the year.

Typically, the only impact extreme heat has on general building stock is increased demand on air conditioning equipment, which in turn may cause strain on electrical systems. Excessive heat events can cause failure of motorized systems such as ventilation systems used to control temperatures inside buildings. The HMPC noted that new buildings in the county are built with air conditioning, but many existing buildings in Archuleta County do not have air conditioning.

Critical Facilities and Lifelines

Like general property, extreme cold/wind chill events have a limited impact on the physical property of essential infrastructures and facilities. Communications lines such as fiber optic cables can freeze. There may be incidents of delayed emergency response due to stalled vehicles, delays in dispatching due to frozen communications lines, or an increased volume in calls. Hospitals may see an increase in cold-related injuries

directly or injuries associated as secondary effects of the cold (traffic accidents, broken bones, or severe cuts due to slips, etc.) and a prolonged extreme cold/wind chill event may impact hospital personnel capabilities. Personnel working in the cold, such as firefighters, EMTs, police officers and construction workers, have a higher vulnerability due to exposure times, and response capabilities may be hindered. Human services programs that care for at-risk individuals and families may be stressed, but usually can still adequately provide services through the duration of the extreme cold/wind chill event. Unusually high volumes of individuals seeking shelter or food may overwhelm some facilities if the event is prolonged. There may be an increased number of displaced individuals or families due to flooding caused by ruptured pipes, which may strain local aid organizations such as the Red Cross. If the event is extremely extended and impacts multiple other counties and states, which in turn impacts the availability of mutual assistance, the risk factors may increase.

Extreme heat also has limited impact on critical infrastructure. Regional power outages may occur because of extreme heat events. Past power outages have been reported during high temperature events due to sagging in the power lines. Hospitals may also see an increase in the number of patients due to heat-related illness and a prolonged extreme heat event may impact hospital personnel capabilities. Transportation infrastructure, such as concrete roads, have been known to crack and shift due to extreme high temperatures. Mechanical failures in diesel trucks are also likely to increase due to additional stress placed on vehicles by high temperatures, which could cause disruptions in the supply chain and transportation of goods. It is not anticipated that extreme heat will rise to the level to have significant impacts on local critical infrastructure due to the higher elevation of the planning area.

Economy

While there were no reported monetary losses from extreme heat or cold events in Archuleta County, there are many potential economic consequences of extreme temperatures. Agriculture and livestock are vulnerable to these temperature extremes, which could result in significant losses to farmers and the local economy. In addition to agriculture, economic exposure is largely associated with industries that use water or depend on water for their business. Recreation and tourism industries, including rafting, angling, and ski resorts, have experienced past losses due to low flows and/or low snowpack due to temperature extremes. Impacts to roads, vehicles, and the energy system due to extreme temperatures can also create significant economic losses for repairs or disruption of distribution systems.

Historical, Environmental, and Cultural Resources

Older venues or historical properties suffer the same vulnerabilities associated with private and general properties that are older, with the added vulnerability of damaging historic and often irreplaceable property in the process. Environmental resources may be damaged by extreme cold and freezing temperatures, including broken trees and death of wildlife. Unseasonable temperatures may damage or kill plants and wildlife, which may impact natural food chains until the next growing seasons. Most of these impacts would be short-term.

Long term extreme heat that results in drought can be associated with several environmental impacts, such as damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Additionally, extremely hot temperatures can make it more difficult to extinguish a fire. Extreme heat may also increase the speed at which dead and fallen trees dry out and become more potent fuel sources for wildfires.

Development Trends

Overall, extreme cold is a more commonly occurring hazard event in Archuleta County than extreme heat. Due to the relative prevalence of cold incidents across the County, it is common practice to build

infrastructure with the appropriate safeguards to protect it from extreme cold incidents. This practice will continue as infrastructure is built. However, new development can add stress to the electric grid, potentially increasing the possibility of brownouts or blackouts, though this is not anticipated with current development trends.

Pre-emptive cautions such as construction of green buildings that require less energy to heat, use of good insulation on pipes and electric wirings, and smart construction of walkways, parking structures, and pedestrian zones that minimize exposures to severe temperatures may help increase the overall durability of the buildings and the community to the variations. Continued development also implies continued population growth, which raises the number of individuals potentially exposed to variations. Public education efforts should continue to help the population understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of extreme temperatures.

Risk Summary

In summary, extreme temperatures is considered low significance overall for the county, with little variability by jurisdiction.

Table 4-35 Extreme Temperatures Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Highly Likely	Negligible	Low
Pagosa Springs	Extensive	Highly Likely	Negligible	Low
Pagosa Fire Protection District	Extensive	Highly Likely	Negligible	Low
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Highly Likely	Negligible	Low

- The overall significance of extreme temperature hazard in Archuleta County is **low**
- Extreme temperatures are a regional hazard and can impact the entire planning area, so the geographic extent is rated as extensive
- Based on NCEI recorded extreme temperature events, extreme cold events are highly likely to occur once a year. Extreme heat events are much rarer in the County, as there were 0 reported events in the County from 1996 to March 2022
- There have been no reported economic losses, crop losses, or loss of human life in the County due to extreme temperatures, therefore magnitude is rated as negligible
- The greatest risk for both extreme heat and extreme cold often is to those who are outdoors and exposed to these temperatures, individuals with physical or mobility constraints, cognitive impairments, economic constraints, and who live in social isolation
- On average, Archuleta County experiences 3.2 days a year with temperatures over 90°F and 240.9 days a year with temperatures below 32°F
- The effects of climate change may result in an increase in frequency of extreme heat events and is projected to increase the uncertainty of weather patterns
- Related hazards: Wildland Fire, Flood, Drought, Winter Storm

4.3.7 Flooding

Hazard/Problem Description

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

The potential for flooding can change and increase through various land use changes and changes to land surface. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining watersheds or natural drainage channels. These changes are commonly created by human activities. These changes can also be created by other events such as wildland fires. Wildland fires create hydrophobic soils, a hardening or "glazing" of the earth's surface that prevents rainfall from being absorbed into the ground, thereby increasing runoff; erosion, and downstream sedimentation of channels.

Archuleta County is susceptible to the following types of flooding:

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

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

The average total annual precipitation near Pagosa Springs is roughly 20 inches. The average total annual snowfall is 82 inches, although this number is significantly higher in areas such as Wolf Creek Pass. According to the Colorado Climate Center, the average annual snowfall at Wolf Creek Pass is estimated to be over 400 inches (http://climate.colostate.edu/climateofcolorado.php). The Wolf Creek Ski Area website claims that this number is closer to 465 inches. Generally, the flood season extends from late spring and early summer, when snowmelt runoff swells rivers and creeks, to fall. Much of the rainfall occurs with thunderstorms during April to August. Archuleta County is affected by a seasonal wind shift and moisture increase known as the "southwest monsoon." The monsoon typically begins every year in mid-July and ends by mid-August but has been known to vary in duration and intensity. During La Nina years the monsoon can be particularly wet and enduring. This seasonal rainfall is the most common cause of flooding in Archuleta County. The fall months can also be wet and rainy in southwest Colorado, with one of the worst floods on the San Juan River occurring in October.

The San Juan River and its tributaries are Archuleta County's primary flood hazards. Among the tributaries are McCabe Creek, the Rio Blanco, Stollsteimer Creek, and the Piedra River. The San Juan River originates in the San Juan Mountains and flows southwesterly through the middle of Pagosa Springs. Flooding along the San Juan typically occurs during the fall and is caused by long rainstorms. Flooding may also occur during the spring due to snowmelt runoff. Localized thunderstorms during the summer monsoons can also result in flooding in the planning area.

Stakeholder comments during a review of the original development of this plan suggested that future updates to the plan may want to include more details and research on the conditions that typically result in dangerous flood conditions in the County. These conditions may include researching thresholds such as percent of average snowpack, snow water equivalent, or rainfall amounts/rates that may result in flooding. Snowmelt driven flooding alone is typically rare in Colorado and extremely dependent on temperature fluctuations. Rainfall on melting snow during the months of April-June certainly has the potential to exacerbate flood conditions. Historic incidents noted below indicates an event in May 2005 associated with snowmelt, but more damaging floods have occurred in the Fall and mid-summer months.

Past Occurrences

Archuleta County and the Town of Pagosa Springs have witnessed several major floods on the San Juan River and its tributaries. Some of the more noteworthy floods and more recent floods are profiled in the following text and is summarized in Table 4-36 below.

- **October 4, 1911** – Pagosa Springs was subjected to massive flooding in October 1911. To date, this is the most severe flooding event ever to occur in the County. This flood was likely a 0.2% annual chance event, or 500-year flood. A localized rainstorm stalled over Pagosa Springs for 24 hours. The soil was already saturated, and the water level in the San Juan rose to 17.8 feet. A *Pagosa Springs Sun* article from the time reported that the river was flowing at an estimated 20 miles per hour. Every highway bridge in the County was washed out, and a large section of the Rio Grande Railroad track was severely damaged. Major utility companies and houses were literally washed off their foundations. The Water Works plant and pipelines supplying the town with water were washed away, forcing locals to use the river itself for their water supply. At the time, Pagosa Springs largely depended on its logging operation to fuel the local economy. The flood inflicted major damage on the sawmill, effectively putting it out of commission. Other businesses were located away from the riverbanks, but the overall damage to the town caused great injury to Pagosa Springs' economy. Two people died after being swept away in the floodwaters. Damages are estimated at $1 million in 1912, which equates to over $22 million today.
- **June 29, 1927** – An estimated 1% annual chance flood event occurred in 1927. The event washed out two bridges after the San Juan reached a flood stage of 13.5 feet in Pagosa Springs.
- **August 31, 1967** – A cloudburst caused McCabe Creek to overtop its banks. The flood washed mud and debris up around several homes.
- **July 7, 1998** – Heavy rainfall resulted in flash flooding and mudslides which damaged two roads on private land.
- **July 26, 2000** – Heavy rains which fell for about 60 minutes resulted in rapid water runoff along with mud and rock slides across Highway 160 near Chimney Rock.
- **May 22, 2005** -- Warm spring temperatures resulted in rapid melting of snowpack which caused flooding along the Rio Blanco River near Pagosa Springs. After years of drought and a lack of flushing flows, debris buildup in rivers and creeks enhanced flooding. Flood waters inundated 4 homes with water up to 12 inches above the foundation on some homes. Portions of County Roads 335, 337, and 339 were flooded with water up to 16 inches deep in places. Flood waters damaged County Road 326

and washed out a culvert. One person is believed to have fallen over a cliff into the swollen river and drowned. The person was not found. Property damages are estimated to be close to $50,000.

- **August 7, 2007** – Flash flooding occurred along the Rio Blanco following heavy rainfall. The flooding deposited mud, boulders, and other debris downstream, and water six inches deep flowed across County Road 326.
- **April 17, 2010** – Following heavy rainstorms, flooding along Stollsteimer Creek washed out part of the road along County Road 359. The ground was already saturated from previous rains.
- **July 15-16, 2014** – Heavy rainfall resulted in flash flooding in and near Pagosa Springs. High volumes of flowing water (up to 18 inches deep) ran across Highway 160 and other major areas of town. The river gauge in the San Juan River within Pagosa Springs measured a stage rise of just over 3 feet in less than 1.5 hours. Numerous residences and businesses faced significant damages totaling $250,000.
- **May/June 2019** – According to the HMPC spring runoff after an above average snowpack caused a rail washout, river braiding and created new channels in Pagosa Springs. County Road 500 experienced bank stability issues. At mile marker17: a residential home was flooded and displaced a family. It was suspected that there were unauthorized changes to the river front that contributed to flooding
- **August 1st, 2022** - Abundant monsoon moisture remained over the Four Corners region. Additionally, a shortwave disturbance moved overhead. This led to widespread showers and thunderstorms across western Colorado. Storms were slow moving and produced heavy rain. Some storms produced localized debris flows across the region and washouts on Fish Creek Road and some BLM roads.

Figure 4-13 April 17, 2010 Flood and Culvert Washout Along Stollsteimer Creek

Source: HMPC

The NCEI include 8 significant flood events between 1972 and 2022. These incidents are noted in Table 4-36.

Table 4-36 NCEI and Archuleta County Flood Records, 1950 – 2022

Location	Date	Type	# of Deaths	# of Injuries	Damages
ARCHULETA CO.	7/7/1998	Flash Flood	0	0	$1,000
ARCHULETA CO.	7/26/2000	Flash Flood	0	0	$0
SAN JUAN RIVER BASIN (ZONE)	5/22/2005	Flood	0	0	$50,000
ARCHULETA CO.	8/7/2007	Flash Flood	0	0	$0
ARCHULETA CO.	4/17/2010	Flood	0	0	$5,000
ARCHULETA CO.	7/15/2014	Flash Flood	0	0	$250,000
ARCHULETA CO.	7/16/2014	Flash Flood	0	0	$25,000
ARCHULETA CO.	8/1/2022	Flash Flood	0	0	$5,000
Total			0	0	$336,000

Source: NCEI Database Archuleta County

Despite the frequency and ferocity of the flood events, loss of life from flooding in Archuleta County has been rare. According to historical record, the 1911 flood is the only known flood to have claimed any lives. There also has been a total of two federally declared disasters in Archuleta County dating back to 1950 and are shown in Table 4-37 below.

Table 4-37 Archuleta County FEMA Declarations (Flooding, 1950-2022)

FEMA Declaration	FEMA Declaration Year	Declaration Title	Designated Area
DR-396-CO	1973	FLOODING & LANDSLIDES	Archuleta (County)
DR-293-CO	1970	HEAVY RAINS & FLOODING	Archuleta (County)

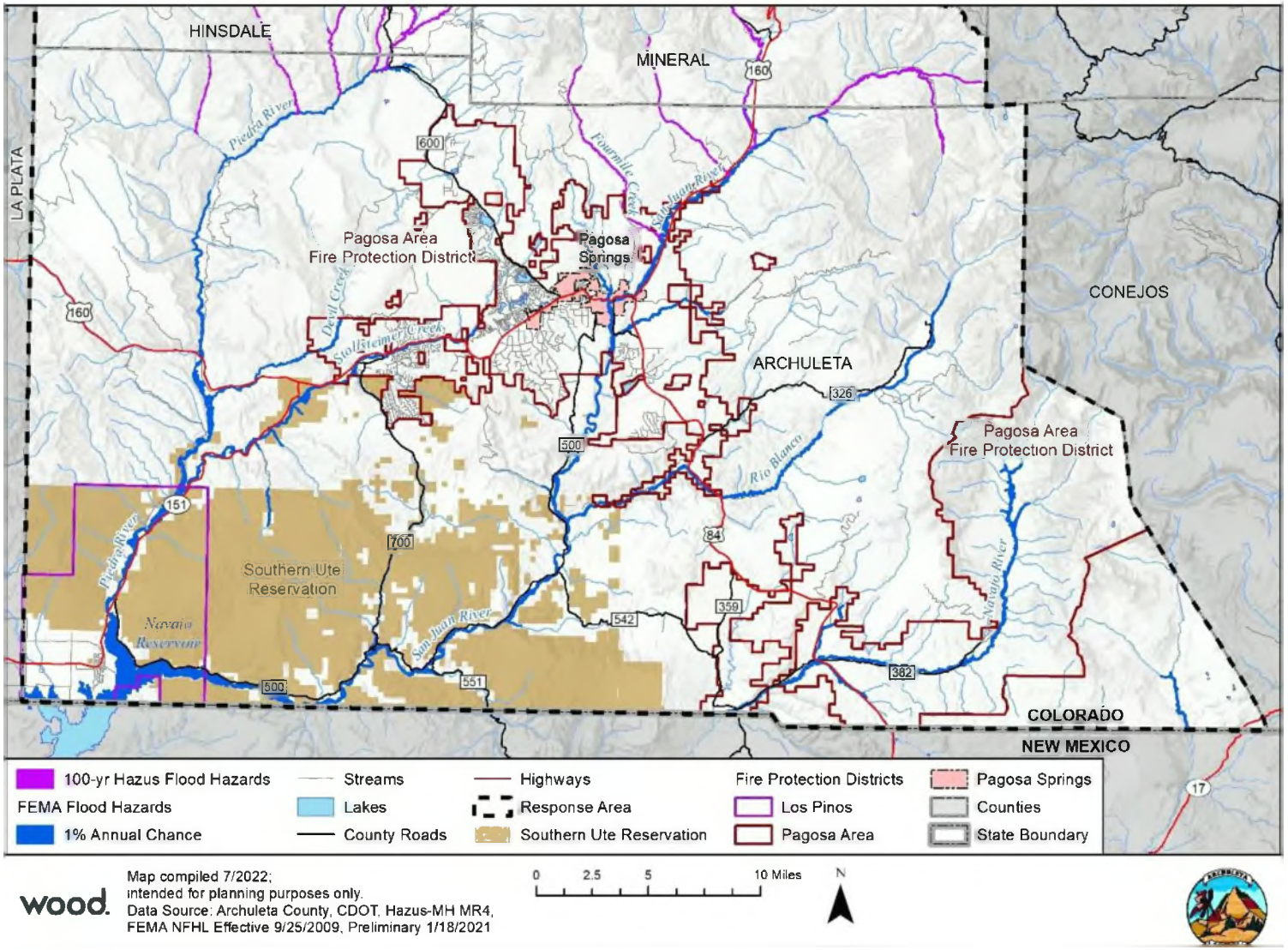
Fema.gov

Geographical Area Affected

Most of the planning area lies within the San Juan River basin. The San Juan River's headwaters originate in the San Juan Mountains, and the River's drainage area upstream of Pagosa Springs is roughly 300 square miles. The river then flows in a southwesterly direction through Archuleta County before flowing into Navajo Reservoir and eventually into New Mexico. It joins the Colorado River in Utah.

The Piedra and San Juan River tributaries are the main sources of flood problems for the planning area. The San Juan's tributaries include the Rio Blanco, McCabe Creek, and Stollsteimer Creek. These rivers and creeks are highly subject to snowmelt and rainfall flooding and is shown below in Figure 4-14. The smaller channels can quickly become overwhelmed and overtop their banks.

Figure 4-14 Archuleta County FEMA Flood Hazard Areas



The southwestern portion of the county, that does not include Pagosa Springs utilized preliminary National Flood Hazard Layer (NFHL) data. Address Points were also used in conjunction with parcel data for the mapping analysis. The geographic extent rating for flooding in Archuleta County is **significant**, meaning that a flood event could impact 10-50% of the planning area. The blue shading on these figures represents different flood zones as defined by FEMA. The various zones are defined in Table 4-38.

Table 4-38 FEMA Flood Zone Definitions

Zone	Definitions
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. The 'E" stands for Engineering Study and represents areas where base flood elevations have been determined. AE zones are now used on new format FIRMs instead of A1-A30 Zones.
AO	River or stream flood hazard areas and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these flood zones.
HAZUS 100 year	Areas with a 1% annual chance of flooding based on HAZUS modeling by FEMA. Used where DFIRM does not exist. Results are approximate and should be used with caution.
Shaded Zone X or 0.2%	Areas with a 0.2% annual chance of flooding; also referred to as the 500-year floodplain.

Source: https://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA%2520Flood%2520Zone%2520Designations

In addition to flood hazards delineated by the FEMA flood zones, the HMPC has noted the following areas of concern:

- The East Fork and Rio Blanco campsites.
- McCabe culvert under Highway 160 at Pagosa Springs; still undersized, requiring $9 million in funding for necessary CDOT improvements. Approximately 30% of the work was completed during this first phase of work, which will help to establish a new downstream channel, allowing for better drainage along the road. The project is expected to be completed in 2022.
- The Rio Blanco; two non-conforming RV parks and a mix of temporary and permanent occupancies.
- Development pressures in the San Juan floodplain; lots of non-conforming buildings that were constructed before NFIP participation
- Rumbaugh/Horse Gulch; debris stuck in culvert caused flooding; needs maintenance.
- Many properties in the planning area are second homes, which are less likely to have a mortgage. Without a mortgage, there is no requirement for flood insurance, leaving these structures and homeowners more vulnerable.

Magnitude/Severity

Magnitude and severity can be described or evaluated in terms of a combination of the different levels of impact that a community sustains from a hazard event. Specific examples of negative impacts from flooding on Buena Vista County span a comprehensive range and are summarized as follows:

- Floods cause damage to private property that often creates financial hardship for individuals and families;
- Floods cause damage to public infrastructure resulting in increased public expenditures and demand for tax dollars;
- Floods cause loss of personal income for agricultural producers that experience flood damages;
- Floods cause loss of income to businesses relying on recreational uses of County waterways;
- Floods cause emotional distress on individuals and families; and
- Floods can cause injury and death.

The magnitude and severity of the flood hazard is usually determined by not only the extent of impact it has on the overall geographic area, but also by identifying the most catastrophic event in the previous flood history. Sometimes it is referred to as the "event of record." The flood of record is almost always correlated to a peak discharge at a gage, but that event may not have caused the worst historic flood impact in terms of property damage, loss of life, etc. The October 4, 1911 flood is the flood of record for Archuleta County. This event resulted in the deaths of two people and an estimated $22 million in damages (in 2022 dollars). There is potential for larger floods to occur in the region.

In recent years, NCEI notes that Archuleta County experienced 2 floods and 4 flash floods between 2000 and 2022. These events generated $330,000 in property damages, which equates to an average of $15,000 per year.

The impact of a flood event can vary based on geographic location to waterways, soil content and ground cover, and construction. The extent of the damage of flooding ranges from very narrow to widespread based on the type of flooding and other circumstances such as previous rainfall, rate of precipitation accumulation, and the time of year.

The HMPC estimates that the potential magnitude for a flood event in Archuleta County is critical. An event of critical magnitude would result in multiple severe injuries, complete shutdown of critical facilities and services for at least two weeks, and severe damage to more than 25% of property in the planning area. Roads closed due to floods can result in serious transportation disruptions due to the limited number of roads in the County. Mud and debris flows often accompany floods.

Frequency/Likelihood of Occurrence

According to the 2009 Flood Insurance Study, "history has shown that major flooding, with moderate damage has occurred at 50-year intervals, while minor flooding and flash floods have occurred approximately every 6 years" (pg. 7). This is consistent with data based on local historic records and NCEI data. Given six flood events in the past 22 years (2000-2022), a flood occurs somewhere in the County about 3.7 years. The probability that a flood event will occur in any given year is 25%. This corresponds to a probability rating of **likely**. Flooding potential can also increase due to wildfires removing vegetation in a watershed.

Climate Change Considerations

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.

- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management, and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness, and emergency response.

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more mountain area to contribute to peak storm runoff. High frequency flood events (e.g., 10-year floods) in particular will likely increase with a changing climate. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to climate change, there is potential for more floods following fire, which increase sediment loads and water quality impacts.

Vulnerability Assessment

A flood vulnerability assessment was performed for Archuleta County using Geographic Information Systems (GIS). The flood vulnerability assessment was performed for Archuleta County using the following GIS methodology. The County's parcel layer, building footprint data, and associated assessor's building improvement valuation data were provided by the County and were used as the basis for the inventory. GIS was used to spatially join the building footprint layer to the County parcel layer to obtain the number of buildings per parcel. Only parcels with improvement values greater than zero were used in the analysis, this method assumes that improved parcels have a structure of some type. The National Flood Hazard Layers (NFHL) were then overlaid in GIS on the building footprint layer to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event.

The flood zones were overlaid in GIS on the building point data to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event. Building improvement values for those points were then extracted from the parcel/assessor's data and summed for the unincorporated county and for the Town of Pagosa Springs. Contents values were estimated for the buildings based on their occupancy type, based on FEMA values. This includes 100% of the structure value for commercial and agricultural structures, 50% for residential structures, and 100% for industrial structures. Building and contents values were totaled, and a 20% loss factor was applied to the totals, also based on FEMA depth damage functions, assuming a two-foot-deep flood.

The analysis focuses on the Archuleta County portion of the Response Area. Previous iterations of this plan have shown that southern Mineral and Hinsdale counties only have Hazus flood hazard mapping, and analyses based on this data have not identified properties in the floodplain there.

People

With the analysis performed it was estimated that the exposed population for the entire county is 515 persons within the 100-year floodplain. For the unincorporated portions of the County, it is estimated that the exposed population consist of 255 people within the 100-year floodplain. For the Town of Pagosa Springs, it is estimated the exposed population to the 100-year floodplain is 260. Table 4-39 summarizes the total area and number of structures in the 100-year floodplains by jurisdiction.

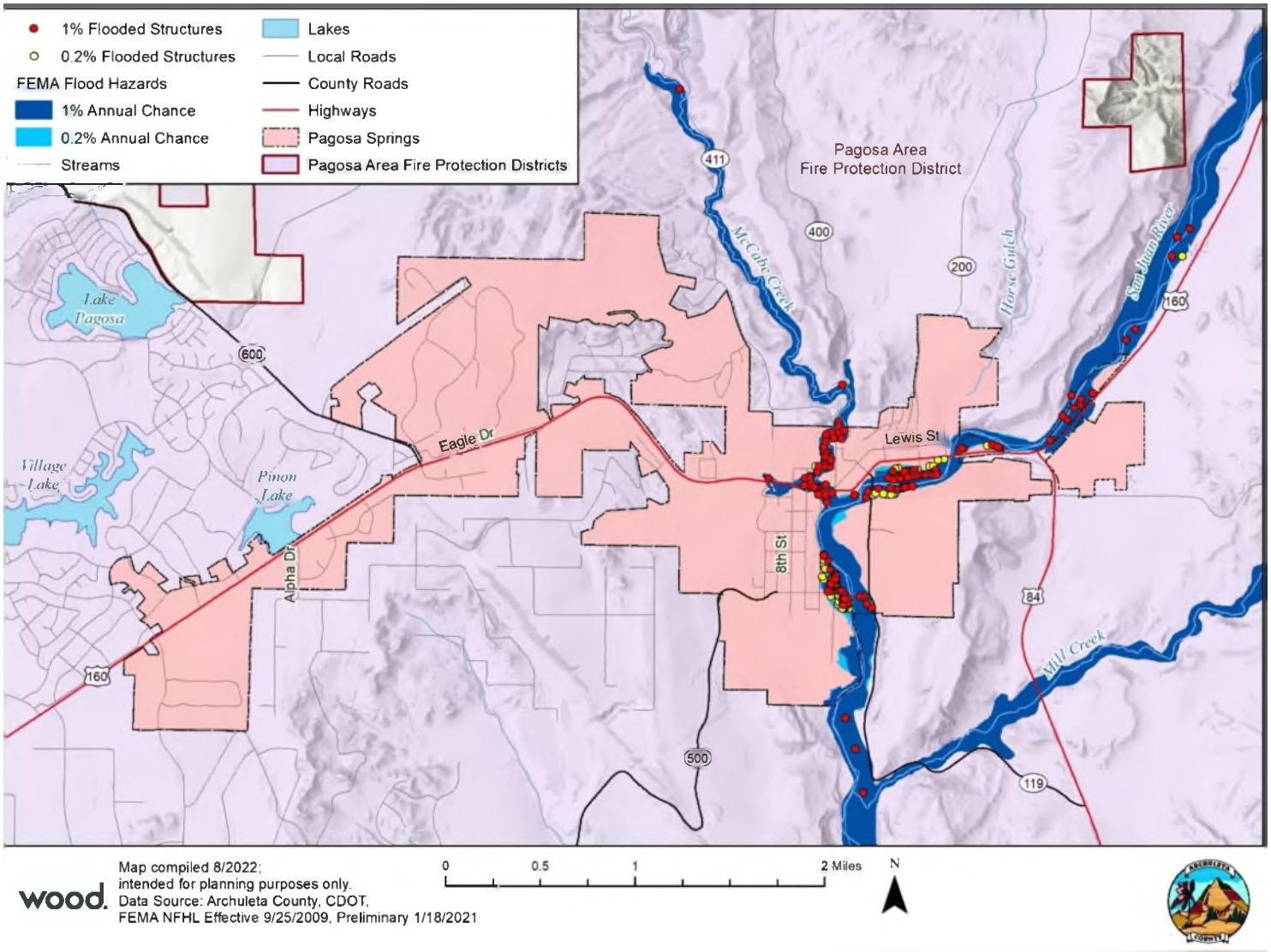
In regard to the 0.2% annual chance of flooding or the "500-year floodplain" Archuleta County has a total of 117 people in these areas, with 67 being in Pagosa Springs and 50 being in the unincorporated parts of the county and is highlighted in Table 4-40. These areas are not regulated but subject to lower premiums

for flood insurance. An illustration of the structures located in the 1% Annual Chance of Flooding is shown in Figure 4-15 below for Pagosa Springs. These structures within the Special Flood Hazard Area directly reflect the structures at risk due to flooding hazards.

Property

Figure 4-15 illustrates the 132 structures that are located within the Special Flood Hazard Areas. Also noted in Table 4-39 and Table 4-40 below, there is a substantial amount of property value within Archuleta County's flood hazard areas. Pagosa Springs has $47,462,723 total property value exposed in the Special Flood Hazard Area, with the largest amount being in the residential and commercial sectors within the 1% floodplain. Archuleta's unincorporated areas possesses the highest amounts of total values with $62,031,275, again with the highest amount being in the residential sectors within the 1% floodplain.

Figure 4-15 Pagosa Springs Structures in the 1% Annual Floodplain



Similar to the 100-year floodplain Archuleta's 0.2% Annual Chance floodplain, Pagosa Springs has $12,180,060 total property value with the largest amount in the residential and commercial sectors. Archuleta's unincorporated areas possesses the highest amounts of total values with $13,722,115, again with the highest amount being in the residential sectors within the 0.2% floodplain.

Table 4-39 Archuleta County 1% Annual Chance FEMA Flood Hazard by Jurisdiction and Property Type

Jurisdiction	Occupancy Type	Parcel Count	Building Count	Improvement Value	Content Value	Total Value	Loss Estimate	Population
Pagosa Springs	Commercial	11	13	$3,647,620	$3,647,620	$7,295,240	$1,823,810	
	Exempt	7	7	$0	$0	$0	$0	
	Residential	108	108	$26,676,535	$13,338,268	$40,014,803	$10,003,701	260
	Vacant	6	7	$76,340	$76,340	$152,680	$38,170	
	Total	**132**	**135**	**$30,400,495**	**$17,062,228**	**$47,462,723**	**$11,865,681**	**260**
Unincorporated	Agricultural	12	12	$1,689,710	$1,689,710	$3,379,420	$844,855	
	Commercial	3	3	$1,276,660	$1,276,660	$2,553,320	$638,330	
	Exempt	3	3	$0	$0	$0	$0	
	Residential	110	112	$37,373,490	$18,686,745	$56,060,235	$14,015,059	255
	Vacant	3	3	$19,150	$19,150	$38,300	$9,575	
	Total	**131**	**133**	**$40,359,010**	**$21,672,265**	**$62,031,275**	**$15,507,819**	**255**
	Grand Total	**263**	**268**	**$70,759,505**	**$38,734,493**	**$109,493,998**	**$27,373,499**	**515**

Source: Archuleta County Assessor Data 2022, FEMA NFHL Effective 9/25/2009 Preliminary 1/18/2021, Wood GIS Analysis

Table 4-40 Archuleta County 0.2% Annual Chance FEMA Flood Hazard by Jurisdiction and Property Type

Jurisdiction	Occupancy Type	Parcel Count	Building Count	Improvement Value	Content Value	Total Value	Loss Estimate	Population
Pagosa Springs	Commercial	4	5	$825,730	$825,730	$1,651,460	$412,865	
	Residential	27	28	$7,013,760	$3,506,880	$10,520,640	$2,630,160	67
	Vacant	1	1	$3,980	$3,980	$7,960	$1,990	
	Total	**32**	**34**	**$7,843,470**	**$4,336,590**	**$12,180,060**	**$3,045,015**	**67**
Unincorporated	Agricultural	4	4	$2,573,370	$2,573,370	$5,146,740	$1,286,685	
	Industrial	1	1	$36,350	$54,525	$90,875	$22,719	
	Residential	22	22	$5,654,880	$2,827,440	$8,482,320	$2,120,580	50
	Vacant	1	1	$1,090	$1,090	$2,180	$545	
	Total	**28**	**28**	**$8,265,690**	**$5,456,425**	**$13,722,115**	**$3,430,529**	**50**
	Grand Total	**60**	**62**	**$16,109,160**	**$9,793,015**	**$25,902,175**	**$6,475,544**	**117**

Source: Archuleta County Assessor Data 2022, FEMA NFHL Effective 9/25/2009 Preliminary 1/18/2021, Wood GIS Analysis

National Flood Insurance Program

Table 4-41 lists flood insurance statistics that help identify vulnerability in the planning area. Archuleta County, and the Town of Pagosa Springs participate in the NFIP. Pagosa Springs has had 5 paid losses since they joined the NFIP. It should be noted that since the 2017 plan, three NFIP claims have been paid out to property owners in Archuleta County. As of June 2022, have been no repetitive loss properties and structures, as defined by the NFIP, in Archuleta County.

Table 4-41 Archuleta County National Flood Insurance Program Statistics

Jurisdiction	Initial FIRM Effective Date	# of Current NFIP Policies	Total # of NFIP Coverage	# of Paid Losses, 11/1978 to 6/2022	Total Losses Paid, 11/1978 to 6/2022
Pagosa Springs	4/01/1977	47	$0	0	$0
Archuleta County	09/25/2009	67	$85,868	5	$3,589
Total	--	**114**	**$85,868**	**5**	**$3,589**

Source: FEMA NFIP Policy and Claims Report CO, 06/2022

Critical Facilities and Lifelines

Key support facilities and structures most necessary to withstand the impacts of, and respond to, natural disasters are referred to as critical facilities. Figure 4-16 showcases the critical facilities located in the SFHA within Archuleta County. Examples of these critical facility types include utilities, transportation infrastructure, and emergency response and services facilities. Failures of components along major lifelines or even closures or inaccessibility to key emergency facilities could limit if not completely cut off transmission of commodities, essential services, and lead to other potentially catastrophic repercussions. Shown in Table 4-42 and Table 4-43 below are the critical facilities within Archuleta County. Based on feedback from the HMPC the Town of Pagosa Springs has a lift station south of town that is located in to the 0.2% annual flood area. The PAWSD noted having a lift station located in the 1% annual flood area. The County has relocated the Sheriff's office out of the 0.2% annual flood area since the last plan update.

The road and bridge infrastructure are vital to Archuleta County. There are a limited number of highways and local roads in the County. When these roads are rendered impassable by an event such as a flood, ingress or egress can be severely limited. These bridges have been impacted by floods in the past.

Figure 4-16 Archuleta County 1% FEMA and Hazus Annual Chance of Flooding Critical Facilities

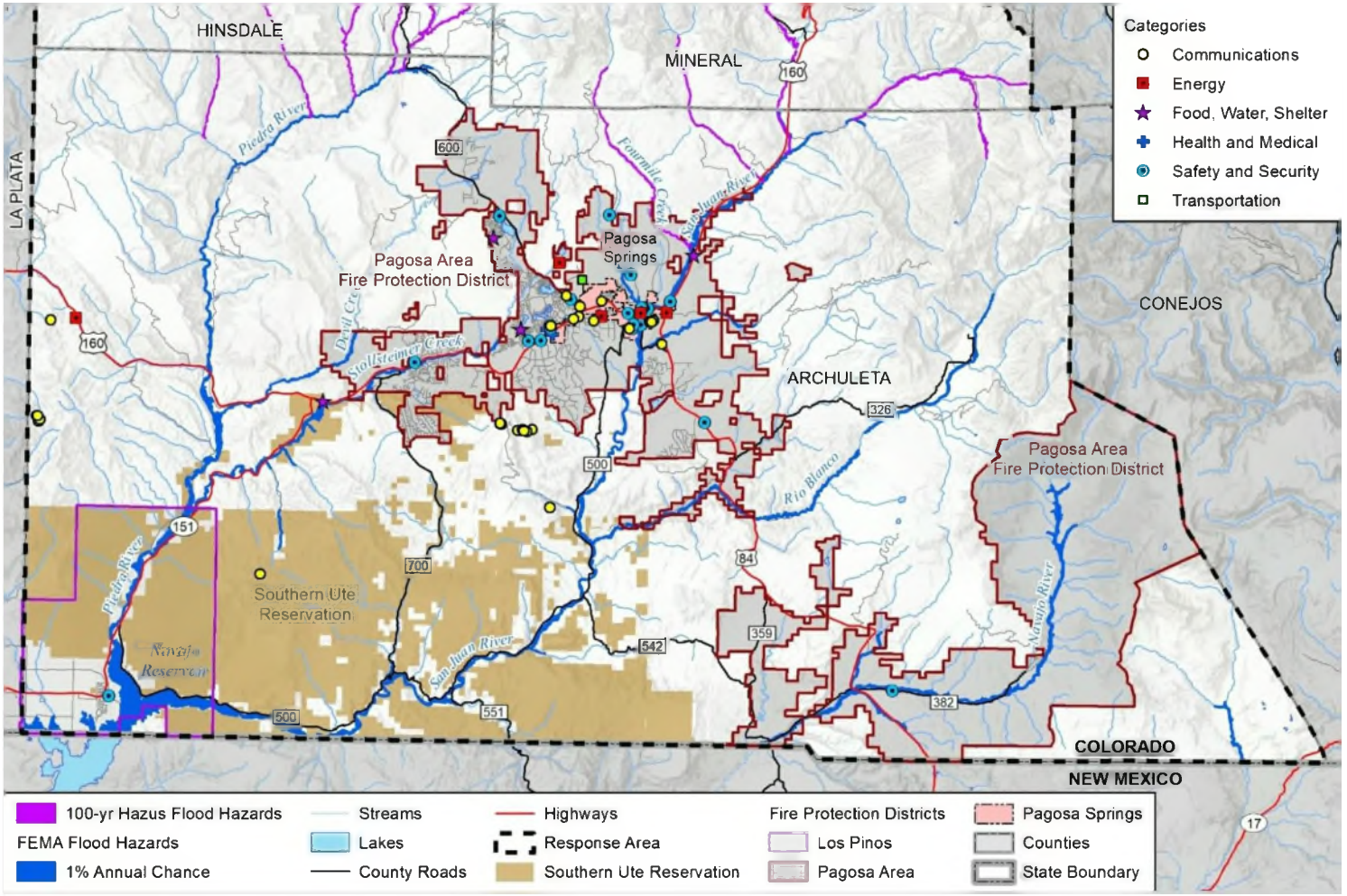


Table 4-42 and Table 4-43 identifies the critical facilities in the 100- and 500-year floodplains. There are 52 total facilities that would be affected by a 100-year flood, the majority of which (27) are located in Unincorporated Archuleta County. There are also three critical facilities located in the 500-year floodplain in Archuleta County. Two of which are safety and security facilities within Pagosa Springs and Pagosa Area's Fire Protection District and one in the transportation sector within Unincorporated Archuleta County.

Table 4-42 Archuleta County Critical Facilities in the 100-Year Floodplain by Jurisdiction

Category	Pagosa Springs	Unincorporated	Pagosa Area FPD
Communications	-	-	-
Energy	3	-	3
Food, Water, Shelter	-	1	1
Hazardous Material	-	-	-
Health and Medical	-	-	-
Safety and Security	-	-	-
Transportation	3	26	15
Total	6	27	19

Source: Source: Archuleta County Assessor Data 2022, FEMA NFHL Effective 9/25/2009 Preliminary 1/18/2021, Wood GIS Analysis

Table 4-43 Archuleta County Critical Facilities in the 500-Year Floodplain by Jurisdiction

Category	Pagosa Springs	Unincorporated	Pagosa Area FPD
Communications	-	-	-
Energy	-	-	-
Food, Water, Shelter	-	-	-
Hazardous Material	-	-	-
Health and Medical	-	-	-
Safety and Security	1	-	1
Transportation	-	1	-
Total	1	1	1

Source: Source: Archuleta County Assessor Data 2022, FEMA NFHL Effective 9/25/2009 Preliminary 1/18/2021, Wood GIS Analysis

Economy

Flooding can have a major economic impact on the economy, including indirect losses such as business interruption, lost wages, and other downtime costs. Flooding often coincides with the busy summer tourism months in Archuleta County. Even the threat of flooding can have an impact. This was observed during the flooding event in 2017 when local business was down more than normal due to anticipated flooding.

Historical, Environmental, and Cultural Resources

Next to people and property, natural resources impact from flooding could be severe. Flooding events are common and naturally occurring phenomenon in forested areas and can benefit forest health in many respects. Yet the trend for more flooding can make it more difficult for the environment to recover, and lead to even more increased flood hazards. This can severely impact water quality and watershed health for years following.

Development Trends

There is high pressure from the development community to develop residential housing along the San Juan River up to the floodway boundary. Most development that has occurred has been residential and built to the local floodplain management regulations (lowest floor 1 foot above the base flood elevation). Vulnerability to floods greater than the 1% annual chance flood (base flood), such as the 0.2% flood, has increased due to this development.

Risk Summary

Table 4-44 Flooding Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Significant	Likely	Critical	High
Pagosa Springs	Significant	Likely	Critical	High
Pagosa Fire Protection District	Significant	Likely	Limited	Low
Pagosa Area Water and Sanitation District (PAWSD)	Significant	Likely	Limited	Medium

In summary, flooding is considered **high** significance overall for the County. Variations in risk by jurisdiction are summarized in the table above, followed by key issues noted in the vulnerability assessment.

- Archuleta County has recorded two Federally Declared Flooding events from the 1950 to present.
- Archuleta County has no current deaths due to flooding and $336,000 in property damages due to flooding.
- There is a total of 515 people located within the Special Flood Hazard Area in Archuleta County. There is also a total of 117 people located in the 0.2% annual chance or 500-year floodplain.
- There is a total of $109,493,998 in total value for the properties located in Archuleta County exposed to the 1% annual chance of flooding, with $27,373,499 in estimated losses.
- There is a total of $25,902,175 in total value for the properties located in Archuleta County exposed to the 0.2% annual chance of flooding, with $6,475,544 in estimated losses.
- There is a total of 52 critical facilities in Archuleta County's floodplains, with the highest number in the transportation sector.

4.3.8 Hailstorm

Hazard/Problem Description

Hail forms when updrafts carry raindrops into extremely cold areas of the atmosphere where the drops freeze into ice. Hail falls when it becomes heavy enough to overcome the strength of the updraft and is pulled by gravity towards the earth. The process of falling, thawing, moving up into the updraft and refreezing before falling again may repeat many times, increasing the size of the hailstone. Hailstones are usually less than two inches in diameter but have been reported much larger and may fall at speeds of up to 120 mph. Hailstorms occur throughout the spring, summer, and fall in the region, but are more frequent in late spring and early summer. These events are often associated with thunderstorms that may also cause high winds and tornadoes.

According to the 2018-2023 Colorado State Hazard Mitigation Plan, Colorado is one of the most hail-prone states in the country. The Northeast Plains and Front Range experience a higher frequency of large-diameter hail than any part of the state, but all regions of the state, including Archuleta County, are vulnerable to storms that can produce severe (>1 inch) hail. The Colorado hail season is April 15 to September 15. Colorado hailstorms occur most frequently in June and are most likely to be destructive in mid-June

The National Weather Service classifies hail by diameter size in comparison to everyday objects to help relay scope and severity to the population. The table below indicates the hailstone measurements utilized by the National Weather Service.

Table 4-45 National Weather Service Hail Severity

Severity	Description	Hail Diameter Size (in inches)
Non-Severe Hail Does not typically cause damage and does not warrant severe thunderstorm warning from NWS.	Pea	1/4"
	Marble/mothball	1/2"
	Penny	3/4"
	Nickel	7/8"
Severe Hail Research has shown that damage occurs after hail reaches around 1" in diameter and larger. Hail of this size will trigger a severe thunderstorm warning from NWS.	Quarter	1" (severe)
	Half Dollar	1 1/4"
	Walnut/Ping Pong Ball	1 1/2"
	Golf Ball	1 3/4"
	Hen Egg	2"
	Tennis Ball	2 1/2"
	Baseball	2 3/4"
	Teacup	3"
	Grapefruit	4"
	Softball	4 1/2"

Source: National Weather Service, Severe Weather 101 Hail Basics

Past Occurrences

The NCEI database was used to gather information on historic hail events in Archuleta County from 1955 to March of 2022. In total, there has been six recorded hail events in Archuleta, four of which have been considered a severe hail event (hailstones of one inch or more in diameter). Table 4-46 presents a historical overview of damaging hailstorms in Archuleta County. It is important to note that actual property and crop losses are likely to be greater than the estimates provided in the dataset due to damages from hail often going unreported.

Table 4-46 Significant Hailstorms in Archuleta County: 1955-2022

Date	Location	Hailstone Size (inches)	Injuries	Fatalities	Estimated Property Damage	Estimated Crop Damage
4/25/1999	Pagosa Springs	0.75	0	0	$0	$0
8/10/2004	Pagosa Springs	0.88	0	0	$0	$0
4/15/2012	Pagosa Springs	1.00	0	0	$0	$0

Date	Location	Hailstone Size (inches)	Injuries	Fatalities	Estimated Property Damage	Estimated Crop Damage
9/22/2013	Arboles	1.25	0	0	$0	$0
9/29/2014	Pagosa Springs	1.75	0	0	$12,000	$0
8/20/2016	Stevens Airport	1.00	0	0	$0	$0
		Total	**0**	**0**	**$12,000**	**$0**

Source: NCEI

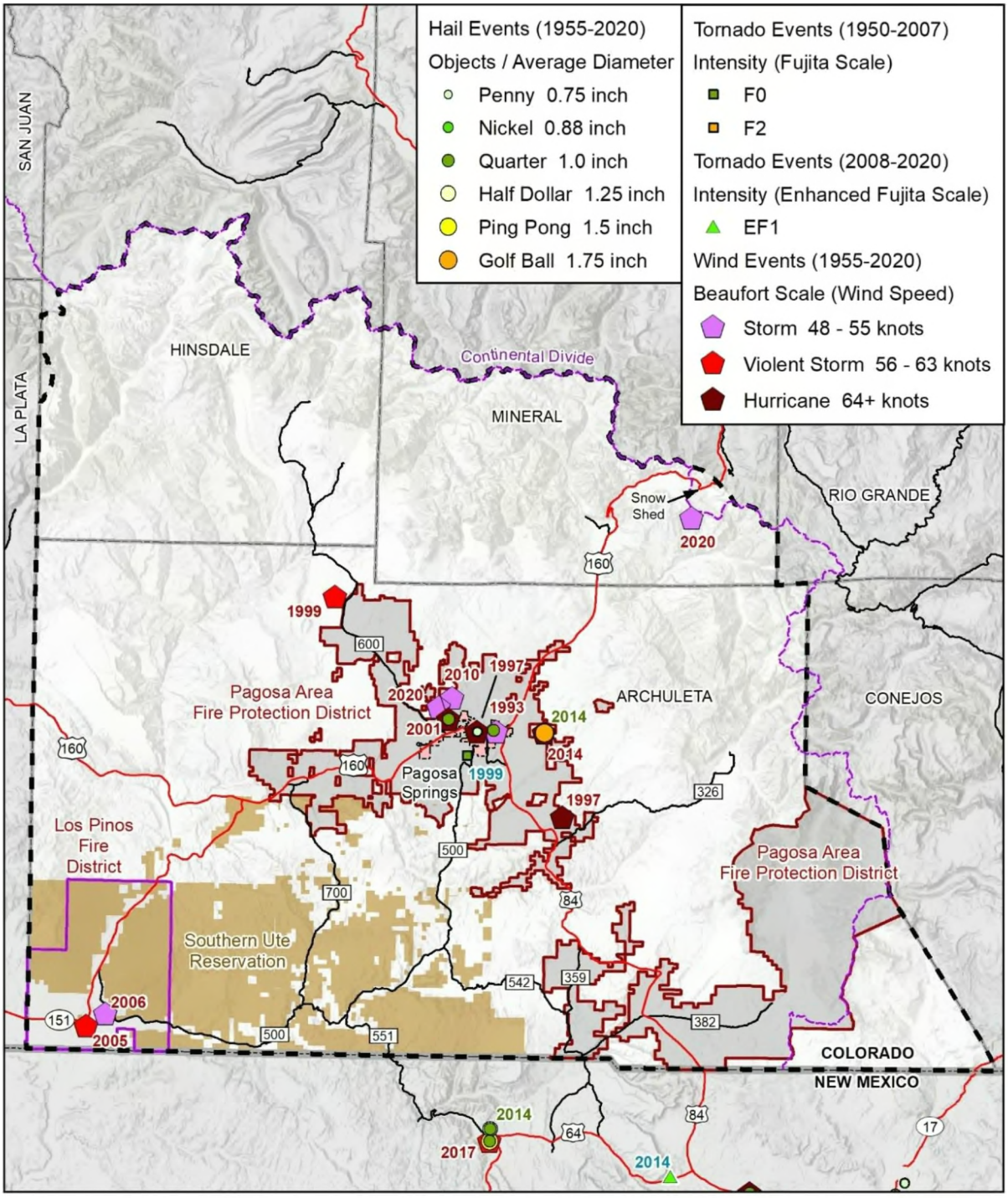
Details on several events were provided by the NCEI dataset:

- **April 15, 2012:** Thunderstorms produced one-inch hail in the Pagosa Springs area.
- **September 22, 2013:** Strong thunderstorms with large hail (reaching 1.25 inches in diameter) and heavy rainfall across southwest Colorado. The runoff from this rainfall caused flash flooding in many areas. Hail damage to personal property in La Plata County was estimated to be at least two million dollars.
- **September 29, 2014:** Strong to severe thunderstorms moved through the foothills of the San Juan mountains near Pagosa Springs. The strongest storm moved through eastern Archuleta County which produced damaging outflow winds and large hail up to 1.75 inches in diameter. Some damage to vehicles was reported, totaling $12,000 in damages.
- **August 20, 2016:** A strong thunderstorm produced one-inch hail at a location in southwest Colorado.

Geographical Area Affected

Hailstorms occur during severe storms, which are regional in nature. However, just as the amount of precipitation in the form of snow or rain may vary significantly within a single storm, so may the amount, size, and duration of hail within a severe storm. This can have a wide range of impacts. In general, hail can fall anywhere in Colorado. As described in the hazard/problem description section, the area where Wyoming, Nebraska, and Colorado meet are known as "Hail Alley." This region is battered by more hailstorms than any other part of the United States. While Archuleta County is not in "Hail Alley", damaging hailstorms can still occur anywhere in the planning area. Figure 4-17 below illustrates the location and magnitude of hail events within and adjacent to the planning area from 1955-2022. Based on this information, the geographic extent rating for hailstorms is **extensive**.

Figure 4-17 Significant Hailstorms and Weather Events in Archuleta County: 1955-2020



Magnitude/Severity

Colorado's severe hail season is between mid-April to mid-September and an average of 119 days per year (NICB 2020). Severe hailstorms can be quite destructive to property and crops. Vehicles, roofs of buildings and homes, and landscaping are the other things most damaged by hail. Hail has been known to cause injury to humans and occasionally has been fatal.

According to the NCEI database, there have been six recorded hail events in Archuleta County. There was no reported injury or fatality in the county, and only one of the hailstorm events resulted in property damage, which totaled $12,000. It is possible that many losses went unreported, however, Archuleta County still experiences significantly less hail events than the rest of the State.

The HMPC considers that hailstorms are more likely to have a **negligible** potential magnitude.

Frequency/Likelihood of Occurrence

Understanding the historical frequency, duration, and spatial extent of severe winter weather assists in determining the likelihood and potential severity of future occurrences. The characteristics of past severe hail events provide benchmarks for projecting similar conditions into the future. According to NCEI data, there were 6 notable hailstorms in Archuleta County over a 67-year period between 1955 and 2022. Using the methodology described in Section 4.3.1, we can calculate the probability of a severe hailstorm occurring in the County in any given year:

$$(6 \div 67) \times 100\% = 8.95\%$$

Therefore, there is roughly a 9% chance that a damaging, severe hailstorm will hit Archuleta County in any given year, or approximately one hail event every decade. This corresponds to a probability of future occurrences rating of **likely**.

Climate Change Considerations

According to the 2018 Colorado State Hazard Mitigation Plan, the future impacts of climate change are expected to influence future hail events. Ongoing efforts to reduce Colorado's greenhouse gas emissions and adapt to a changing climate, such as the Colorado Climate Plan and the Climate Change in Colorado Report, will help to reduce the impacts of climate induced hazards such as hail.

Vulnerability

People

Exposure is the greatest danger to people from hail for those caught outside in the open without shelter. Large hail has the potential to cause significant bruising, concussions, the potential for broken bones, and even death. The impacts of hail on vulnerable populations can be more severe. Low-income families are more likely to live in poorly constructed homes that are more likely to be damaged, and are more likely to be uninsured or underinsured, making it more difficult for them to recover from hail events. Individuals with disabilities may need more assistance after a major event, especially if transportation or utility services are disrupted. Severe weather warnings must use methods that reach vision or hearing-impaired people and those with limited English proficiency. People without shelter can also be injured by exposure to hailstorms, though there is very little historical reference for this occurring in the Region. Most injuries caused by hail are minor and go unreported. In Archuleta County, there are no reported events that caused injury or death to people.

Property

Hail can strike anywhere in the region and all structures are vulnerable. Hail can damage roofs, shingles, windows, siding, unsheltered vehicles, and any other property unprotected from the storm. Hail causes

more than a billion dollars of property damage nationally each year. Most of this damage is to crops, but hail can also decimate structural sidings, shatter windows, peel paint, and severely damage automobiles and equipment not protected or stored inside. NCEI reported that on September 29th, 2014, when a hailstorm with golf ball sized hail was reported by several members of the public just east of Pagosa Springs in a sparsely populated location. Damage totalling $12,000 occurred to vehicles.

Critical Facilities and Lifelines

Hail can lead to the temporary incapacitation of roads when small hail stones build up so deep, they block roads. Hail has also been observed to block storm drains and prevent proper runoff, potentially resulting in localized flooding as a secondary hazard. Most structures, including the County's critical facilities, should be able to provide adequate protection from hail to individuals but the structures themselves could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out. The HMPC noted that hail events have contributed to traffic accidents in the County due to slick roads.

Economy

The economic impact from hail can be substantial on impacted areas, and potentially long lasting. Archuleta County has only experienced one hail event with reported damages. Reported direct damages to crops and property have totalled to $12,000 in Archuleta County since the first reported event in 1999. Severe indirect economic impacts can also be felt through businesses forced to close for repairs. While the USDA did not report crop losses due to hail in the county, it is possible for hail to damage crops in the future.

Historical, Environmental, and Cultural Resources

While hail is a natural environmental process, it can cause significant environmental damage, breaking tree limbs, damaging trees, and other plants in bloom, and destroying crops. Some cultural and historic properties may also potentially be at risk of damage from hail.

Development Trends

Consideration for future development's ability to avoid excessive hail damages may include the use of hail resistant roofing/shingles, resilient landscaping, construction of covered parking, or semi-sheltered structures to minimize extensive losses. The availability of shelters in the many open spaces and parks throughout Archuleta County may afford some protection to recreation populations. The enforcement of existing land use and zoning ordinances requiring durability of building materials may improve the resilience of future buildings. In some cases, the costs of future mitigation efforts, even in new future development, may outweigh the potential insurance losses

Risk Summary

In summary, hail is considered low significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, by key issues noted in the vulnerability assessment.

Table 4-47 Hail Hazard Risk Summary by Jurisdiction

	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Likely	Negligible	Low
Pagosa Springs	Extensive	Likely	Negligible	Low
Pagosa Fire Protection District	Extensive	Likely	Negligible	Low
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Likely	Negligible	Low

- The overall significance of this hazard to the planning area is **low**
- Hail is not as high profile as hazards such as tornadoes, blizzards, or floods, because losses are typically covered by insurance, but hail events consistently inflict one of the highest rates of damage on the planning area
- The entire County could be impacted by a hail event; therefore, the geographic extent is rated as extensive
- The NCEI reported six hail events over a 67-year period in Archuleta County, indicating that the County is likely to experience one hail event every decade; therefore, the probability of future occurrence is rated as likely
- Severe hail events can cause significant damage to buildings, vehicles, and above ground utility lines, as well as catastrophic damage to vegetation and crops. The NCEI reported $12,000 in losses from hail since 1955
- For people caught outdoors in the open, large hail has the potential to cause significant bruising, concussions, broken bones, and even death. No deaths or injuries were reported in Archuleta County due to hail
- Older structures and those made of less durable materials could be highly vulnerable to severe hail events
- Related hazards: high winds and tornadoes, lightning

4.3.9 High Winds and Tornadoes

For planning purposes, tornadoes, high winds, and thunderstorm winds are combined into one profile. Although the hazard rankings among the three weather events vary, the impacts and mitigation actions for addressing those hazards are similar.

Hazard/Problem Description

High Winds and Thunderstorm Winds

Severe winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Windstorms in Archuleta County are typically straight-line winds. Straight-line winds are any wind that is not associated with rotation (i.e., is not a tornado). Since severe winds do not have narrow tracks like tornadoes, the associated wind damage can be extensive and affect multiple counties. Objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase. One type of straight-line wind is the downburst, which can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.

The most significance distinction between high winds and thunderstorm winds in the NCEI dataset is that high winds are most frequently reported in the winter months (December, January, and February) and are recorded on a zonal scale, whereas thunderstorm winds are most reported in the summer months (June, July, and August) and recorded on a local county or city scale. Despite these differences, the wind speeds and associated impacts from these winds are comparable.

Tornadoes

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most violent of all atmospheric storms. They can have the same pressure differential that fuels 300-mile-wide hurricanes across a path less than 300 yards wide. Closely associated with tornadoes are funnel

clouds, which are rotating columns of air and condensed water droplets that, unlike tornadoes, do not contact the ground.

The U.S. experiences more tornadoes than any other country. In a typical year, approximately 1,000 tornadoes affect the U.S. The peak of the tornado season is April through June, with the highest concentration of tornadoes in the central U.S. Tornadoes form when cool, dry air sits on top of warm, moist air. In Colorado, this most often happens in the spring and early summer (i.e., May, June, and July) when cool, dry mountain air rolls east over the warm, moist air of the plains during the late afternoon and early evening hours. However, tornadoes are possible anywhere in the state, at any time of year and at any point during the day.

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, most injuries and deaths result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis, better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. Table 4-48 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at various levels of intensity. Table 4-49 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4-48 Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damages
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/f-scale.html

Table 4-49 Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF-0	65-85
EF-1	86-110
EF-2	111-135
EF-3	136-165
EF-4	166-200
EF-5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

Past Occurrences

The NCEI database reported 33 wind events and one tornado between 1950 and March of 2022. These events are captured in Table 4-50 and Table 4-51. In total, $1,693,300 in property damages were reported from high winds, thunderstorm winds, and tornadoes in Archuleta County. One fatality and two injuries were also reported in the County. The Town of Pagosa Springs experienced the greatest number of documented events in the dataset.

The official definitions for high wind and thunderstorm defined by the Storm Events Database are described as follows:

- **High Winds:** Sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration. These events were first recorded in 1996.
- **Thunderstorm Winds:** Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage. These events were first recorded in 1955.

Table 4-50 Summary of Wind Weather Events and Impacts (1955-2022)

Type of Hazard	Total Number Wind Events	Total Property Damage	Total Crop Damage	Total Fatalities	Total Injuries	Average Recorded Wind Speed (mph)	Max Recorded Wind Speed (mph)
Thunderstorm Wind (1955-2022)	15	$108,300	$0	1	2	62.8	86.3
High Wind (1996-2022)	18	$1,521,000	$0	0	0	84.9	118.5
Total	**33**	**$1,692,300**	**$0**	**1**	**2**	**73.8**	**118.5**

Source: NCEI

Table 4-51 Summary of Tornado Events and Impacts (1955-2022)

Total Number Wind Events	Total Property Damage	Total Crop Damage	Total Fatalities	Total Injuries	Fujita Scale
1	$1,000	$0	0	0	F0

Source: NCEI

The NCEI database described several notable events in the dataset:

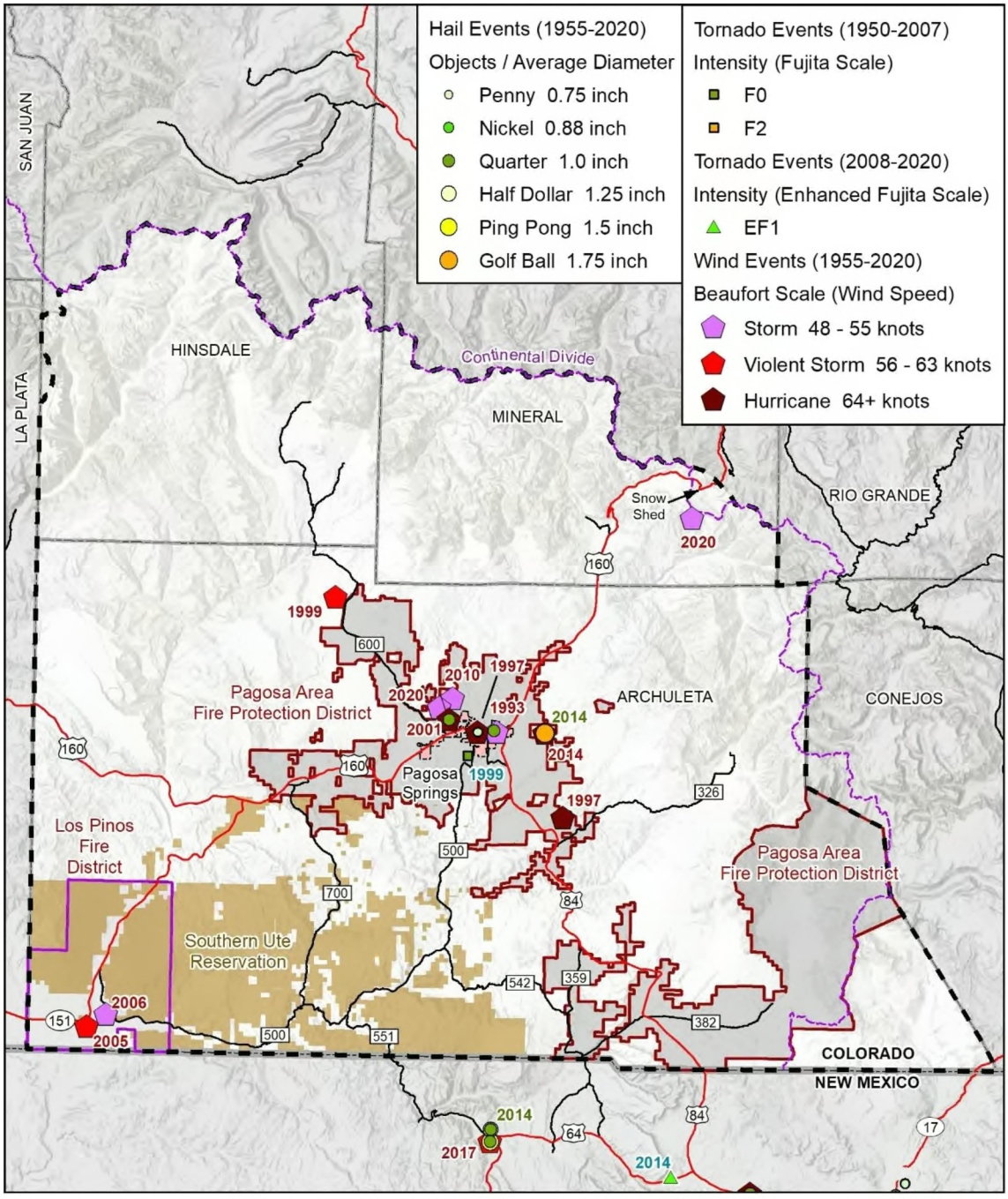
- **April 28, 1997** - Strong thunderstorm outflow winds toppled construction scaffolding near downtown Pagosa Springs was toppled, fatally crushing one worker, and injuring another. The same outflow winds continued at least 25 miles southeast to a recent airplane crash site near the continental divide where rescue workers had to take shelter from wind-blown tree branches and pebbles. The event totaled $5,000 in damages.
- **May 5, 1997** - A microburst wind struck while students were leaving their elementary school. The children and adults were blown to the ground. One adult required stitches at a hospital. A child grabbed hold of a railing and was extended sideways like a flag. Many adults and children were pelted by windblown debris. Minor property damage was reported. $300 in reported damages.
- **April 25, 1999 -** The first documented tornado in Archuleta County ripped up several large pine trees and tossed them into power lines in Pagosa Springs. Many Archuleta County residents were without power for about an hour and a half as a result. Reported damages totaled $1,000.
- **April 18, 2000** - Several vehicles were smashed or damaged by fallen trees due to a strong wind. Several mobile homes were destroyed when they were blown from their moorings. Many houses and businesses sustained damage, mostly because of being struck by fallen trees or by having the roofs blown off. Electrical power and telephone service was disrupted in many areas for up to several hours. Many controlled burns became out-of-control fires. Damages to property totaled $1,500,000.
- **July 31, 2001** - Strong thunderstorm winds pushed an airplane away from its mooring anchors, breaking off the nose gear of the plane and throwing it nearly 50 feet to the northeast of where it had been anchored. No one was injured. Damages totaled $15,000.
- **February 15, 2006** - Locally strong gusts of wind included 84 mph at the top of Snowmass Ski Area, 96 mph at the top of Telluride Ski Area, and 108 mph on Eagle Mountain in the southwest San Juan Mountains. Numerous trees were blown down and some ski areas had to remove downed trees from the slopes. A few power outages were reported across the area. Damages totaled $6,000.
- **June 14, 2006** - A strong gust of wind blew over a mobile home in transit on Highway 151 north of Arboles. Damages totaled $15,000.
- **June 6, 2007** - Thousands of electrical customers were without power after widespread wind gusts downed some trees and large branches that were batted against and fell into power lines. Damages totaled $10,000.
- **September 29, 2014 -** Hundreds of trees were blown down by thunderstorm outflow winds in the San Juan National Forest, including a large area near County Road 302 in eastern Archuleta County. Live trees up to 3 feet in diameter were snapped off like toothpicks. Damage totaled $45,000.
- **April 25, 2016** - Wind gusts estimated more than 50 mph downed a power line in Archuleta County, which left about 780 customers without power across Archuleta and La Plata Counties. Estimated damages totaled $1,000.
- **April 12, 2018** – A strong wind in the San Juan River Basin zone in Archuleta County caused property damages estimated to total $3,000.

According to the HMPC, a tornado not included in the NCEI dataset occurred near Chromo in 2008. The HMPC also noted in 2017 that wind-related blowdown hazards were also noted as increasing due to beetle-killed trees, particularly along USFS roads in the Spring of 2022. Two incidents, including a fatality and injury, were also noted as occurring in 2016-2017.

Geographical Area Affected

The spatial extent rating for both tornadoes and other high wind hazards is **extensive**. Windstorms could occur anywhere in Archuleta County. The rural, unpopulated areas of the County will experience the highest frequency of wind events due to flat, open land. However, greatest monetary losses due to property damages are likely to occur in cities with concentrated infrastructure, such as Pagosa Springs. Tornadoes could also potentially occur anywhere in the planning area. Figure 4-18 displays the past wind and tornado events recorded in the County since 1950.

Figure 4-18 Significant Weather Events in Archuleta County: 1955-2020



Magnitude/Severity

To calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it reflects common occurrence. Based on NCEI records, $1,692,300 in property damage resulted from severe winds in Archuleta County and an additional $1,000 in property damages from a single tornado event. Of this total property loss, $1,500,000, occurred from a single high wind event that took place on April 18, 2000.

Overall, windstorm or tornado impacts in Archuleta County would likely be **critical**. While wind occurs rather frequently in the area, most events cause little to no damage. However, in the event of a severe storm, such as the one in April of 2000, significant economic losses, injury, and death can occur.

Probability/Likelihood of Occurrence

According to the NCEI dataset, there have been 33 total recorded severe windstorm events over the past 67 years in Archuleta County. Using the formula described in Section 4.3.1, the likelihood that a damaging severe wind event will occur in any given year is 49%. This corresponds to a **likely** probability of occurrence. In terms of frequency, damaging thunderstorm wind events seem to occur roughly every four years and high wind events occur roughly once every 18 months. Tornadoes occasionally occur in Archuleta County but are less common than wind. Two events over a 67-year span of time yield a 3% chance that a tornado will occur in the planning area in any given year.

Climate Change Considerations

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times higher than in the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events such as tornadoes increases in a warmer climate.

More research is needed to determine what impacts climate change may have on severe wind events. The 2018-2023 Colorado Enhanced State Hazard Mitigation Plan reports that the area at risk, extent, intensity, and frequency of severe wind events are not projected to change. However, it is unknown if the duration of severe wind events may be affected by climate change.

Vulnerability

People

It can be assumed that the entire planning area is exposed to some extent to thunderstorm winds, high wind, and tornadoes. Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out. While tornadoes typically occur on flat plains, where conditions are most favorable for these events, tornadoes have been known to cross rivers and travel up mountains.

Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages due to severe wind or tornadoes can be life threatening to those dependent on electricity for life support. These populations face isolation and exposure during thunderstorm wind, high wind, and tornado events and could suffer more secondary effects of the hazard.

Individuals caught in the path of a tornado who are unable to seek appropriate shelter are especially vulnerable. This may include individuals such who are out in the open, in cars, or who do not have access to basements, cellars, or safe rooms. Hikers and climbers in the area may also be more vulnerable to severe

weather events. Visitors to the area may not be aware of how quickly a thunderstorm can build in the mountains. The NCEI reported several instances in Archuleta County where wind caused two injuries and one death to people who were outside and hit with flying debris.

Property

All property is vulnerable during thunderstorm wind and high wind events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Generally, damage is minimal and goes unreported from wind. Property located at higher elevations and on ridges may be more prone to wind damage. Property located under or near overhead lines or near large trees may be damaged in the event of a collapse. Mobile homes are disproportionately at risk due to the design of homes. In Archuleta County, 10.6% of total housing is mobile homes. Tornadoes also often create flying debris which can cause damages to homes, vehicles, and landscape. In Archuleta County, property damages due to wind and tornadoes totaled $1,693,300. Reported impacts from high wind in the planning area include damage to trees, mobile homes, roofs, power lines, and vehicles. One incident resulted in extensive damage to an aircraft.

Critical Facilities and Lifelines

Like severe wind, all critical facilities and infrastructure are likely exposed to tornadoes. Incapacity and loss of roads are the primary transportation failures resulting from thunderstorm winds, high winds, and tornadoes. These hazards can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Of particular concern are roads providing access to isolated areas and to the elderly. Loss of utilities during these events is also a major concern. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance. The HMPC noted significant blowdown of trees and debris along United Stated Forest Services (USFS) roads in the County.

Economy

Loss of power and minimal damage following a tornado or severe wind event could cause disruptions to the local economy through forced temporary closures of businesses and preventing people from traveling to work. More severe events could result in significant economic disruption and hinder recovery through the forced extended or permanent closure of businesses damaged in the event. Additionally, events which cause significant property damage could negatively impact the local economy. Most financial losses due to wind and tornadoes are related to direct property damages as well as subsequent debris removal, response, and repair activities.

Historical, Environmental, and Cultural Resources

The environment is highly exposed to severe winds and tornadoes. Large swaths of tree blowdowns can occur, particularly in the beetle-killed forests prevalent in the county. Severe winds can trigger or spread wildfires under some conditions. As mentioned previously, historic infrastructure is less likely to be built to code and can be more vulnerable to damage during wind and tornado events. These events may also lead to hazardous materials (HAZMAT) releases if facilities that store or transport HAZMAT are impacted.

Development Trends

All future development will be exposed to severe winds and tornadoes. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. Development regulations that require safe rooms, basements, or other structures that reduce risk to people would decrease vulnerability but may not be cost-effective given the relative infrequency of damaging tornadoes in Archuleta County.

Risk Summary

In summary, severe winds and tornadoes are considered medium significance overall for the County. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-52 High Wind and Tornado Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Likely	Critical	Medium
Pagosa Springs	Extensive	Likely	Critical	Medium
Pagosa Fire Protection District	Extensive	Likely	Critical	Medium
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Likely	Critical	Medium

- Severe wind and tornadoes can impact all of Archuleta County and are therefore rated as extensive, but greatest damages are likely to occur to areas of concentrated infrastructure
- Severe wind events are likely to continue occurring in Archuleta County. The NCEI data reported that severe wind events are likely to impact Archuleta every other year, but tornadoes are far less frequent
- According to the NCEI dataset, severe winds have caused 1 death, 2 injuries, and nearly $1.7 million in property damage in Archuleta County since 1950, therefore, magnitude is rated as critical
- Mobile homes are disproportionately at risk to severe wind and tornadoes due to the design of homes. In Archuleta County, 10.6% of total housing is mobile homes
- Individuals who work outdoors or who cannot find shelter during an event are most likely to experience injury or death, but it is possible for those indoors to sustain injury from flying debris as well
- Related Hazards: Wildland fire, Lightning, Hail

4.3.10 Landslide/Rockfall/Debris Flow

Hazard/Problem Description

Landslide

Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to $2 billion in damages and from 25 to 50 deaths annually. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide include saturation by water, erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

A landslide is a general term for a variety of mass-movement processes that generate a down slope movement of soil, rock, and vegetation under gravitational influence. Some of the natural causes of ground instability are stream and lakeshore erosion, heavy rainfall, and poor-quality natural materials. In addition, many human activities tend to make the earth materials less stable and, thus, increase the chance of ground failure. Human activities contribute to soil instability through grading of steep slopes or overloading them with artificial fill, by extensive irrigation, construction of impermeable surfaces, excessive groundwater withdrawal, and removal of stabilizing vegetation. Landslides typically have a slower onset and can be predicted to some extent by monitoring soil moisture levels and ground cracking or slumping in areas of previous landslide activity.

Landslides are caused by one or a combination of the following factors: change in slope of the terrain, increased load on the land, shocks and vibrations, change in water content, groundwater movement, frost action, weathering of rocks, and removing or changing the type of vegetation covering slopes. In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- A slope greater than 30%.
- A history of landslide activity or movement during the last 10,000 years.
- Stream or wave activity, which has caused erosion, undercut a bank, or cut into a bank to cause the surrounding land to be unstable.
- The presence or potential for snow avalanches.
- The presence of an alluvial fan, indicating vulnerability to the flow of debris or sediments.
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel.

In this chapter, the discussion of landslides is more extensive than that of rockfall or debris flow. The primary reason is availability of information. Landslides in the planning area have a more detailed history of record than rockfall or debris flow. Additionally, landslides potentially present a very serious threat to the planning area. Debris flow and rockfall, though still dangerous, are not as significant to the Archuleta County response area.

Rockfall

A rockfall is the falling of a detached mass of rock from a cliff or down a very steep slope. Weathering and decomposition of geological materials produce conditions favorable to rockfalls. Rockfalls are caused by the loss of support from underneath through erosion or triggered by ice wedging, root growth, or ground shaking. Changes to an area or slope, such as cutting and filling activities, can also increase the risk of a rockfall. Rocks in a rockfall can be of any dimension, from the size of baseballs to houses. Rockfall occurs most frequently in mountains or other steep areas during the early spring when there is abundant moisture and repeated freezing and thawing. Rockfalls are a serious geological hazard that can threaten human life, impact transportation corridors, and communication systems, and result in other property damage.

Spring is typically the landslide/rockfall season in Colorado as snow melts and saturates soils and temperatures enter freeze/thaw cycles. Rockfall and landslides are influenced by seasonal patterns, precipitation, and temperature patterns. Earthquakes could trigger rockfalls and landslides too.

Debris Flows

Debris flows are among the most destructive geologic processes that occur in mountainous areas. A debris flow is a mass of water and earth materials that flows down a stream, ravine, canyon, arroyo, or gulch. According to the Colorado Geological Survey (CGS), if more than half of the solids in the mass are larger than sand grains (e.g., rocks, stones, boulders) the event is called a debris flow, otherwise it is called a mudslide or mudflow. For the purposes of this plan the term debris flow is meant to be a global term to include mudslides/mudflows. Many of Colorado's older mountain communities built in major mountain valleys are located on or near debris fans. A debris fan is a conical landform produced by successive mud and debris flow deposits, and the likely spot for a future event.

Debris flows can occur rapidly with little warning during torrential rains. Debris and mudflows generally occur with floods and downpours associated with the late summer monsoon season.

The debris flow problem can be exacerbated by wildland fires that remove vegetation that serves to stabilize soil from erosion. Heavy rains on the denuded landscape can lead to rapid development of destructive

mudflows. Neighboring La Plata County experienced damaging mudflows in the area burned by the Missionary Ridge Fire in 2002.

CGS classified the debris flow hazards into the following three zones:

- **Very High Hazard Zone**— This is the zone of greatest hazard. It is estimated that in this area the greatest impact from, and most frequent exposure to, debris flows and floods occurs. The zone is characterized by steep slopes, deposits of large boulders (greater than two feet in diameter), tree scars and burial, channels, levees, and lobes. Damage in this zone could include structural damage, such as buildings being moved off their foundations, walls, and windows being broken, large accumulations of debris being piled in and around buildings, trees being toppled or severely damaged, and severe mud and water damage. Plugs of debris should be expected in this zone, and loss of life is possible.
- **High Hazard Zone**— This is the zone of high hazard. This zone is subject to debris flows and floods, but does not experience the maximum impact of the events. However, events may be just as frequent as in the Very High Hazard Zone. The zone is generally characterized by moderate to steep slopes, boulders, levees, lobes, tree scars and burial, and channels. Damage in this zone could include moderate damage to structures resulting from the pounding of boulders and logs, broken windows, basements filled with mud and debris, piles of debris in and around structures and in yards and streets, and severe mud and water damage.
- **Moderate to Low Hazard Zone**— This hazard zone is usually subjected primarily to mud and water flooding because of debris-flow events. This zone is characterized by low to moderate slopes, and deposits of abundant mud, and minor debris (small boulders, one foot or less and logs). Damage is usually comparatively minor, consisting of mud and water damage to outer walls of buildings, basements, and yards.

Past Occurrences

Two major active landslides exist in Archuleta County: the East Fork Landslide, which is located roughly three miles upstream from the confluence of the West Fork and East Fork of the San Juan River, and the Jackson Mountain Landslide located along Highway 160 a few miles northeast of Pagosa Springs.

The East Fork landslide has had periodic movement in the past, but on May 2, 2008 the slide area had its largest single movement to date. The movement severed an 8-inch natural gas pipeline owned by Xcel Energy, which is what first tipped off the company that the slide had occurred. Archuleta County emergency services personnel, Forest Service staff, and Xcel Energy assessed the damage. Xcel staff installed a new temporary natural gas pipeline that was easier to access, relocate, and repair in the event of continued movement. At the time, the slide area was moving at roughly four feet per day. It is estimated that the slide moved a total of 50 feet down the slope of the mountain toward the river. In February 2006, the same slide had another movement that also severed the natural gas pipeline.

As the slide area descended toward the East Fork, concerns arose over the slide creating a natural dam. If this were to happen, water would build up behind the dam until it eventually breached. Studies on the issue revealed that much of Pagosa Springs would be inundated. Given the size of the slide area, it is highly unlikely that man-made solutions would be able to stop the slide from damming the river. However, for this scenario to occur, the slide rate would have to either increase significantly or the amount of sediment moved by the river day to day would have to fall below the rate at which sediment from the slide is falling into the river. A hydrologist with the Pagosa Ranger District said that, although possible, this scenario is unlikely. Figure 4-19 shows the eastern edge of the May 2008 slide. The toe of the landslide as it approaches the San Juan River is visible in Figure 4-20. Figure 4-21 clearly shows the sediment from the landslide muddying the waters of the East Fork of the San Juan River.

In 2010 the Federal Highway Administration did a construction project on the East Fork Slide to reduce the chances of future movement. Extensive subsurface drains were installed within the slide and a rock buttress was installed at the toe of the slide. Since 2010, the East Fork landslide has not seen recent movement and is being closely monitored by Xcel Energy due to the gas line that feeds the San Luis Valley.

The Jackson Mountain Landslide is roughly five miles east of Pagosa Springs. The slide area measures roughly 2,000 feet wide by one-half mile long. It is caused by erosion from the San Juan River, which lies at the toe of the slide area. This slide has been active since at least the 1970s. Periodically, the slide severed Highway 160 near mile marker 150 to 151, resulting in road closures and utility disruptions from ruptured water and gas pipelines. An underground pipeline was replaced with an above-ground pipeline that is easier to access, relocate, and repair in the event of another slide movement. Mitigation has helped Jackson Mountain at the crossing with Highway 160. However, HMPC members have noted that a problem spot has recently occurred in a new location, affecting the water and gas line corridor. Figure 4-22 shows the toe of the Jackson Mountain Landslide as it is eroded by the San Juan River. The above-ground pipeline is also visible in this image. Figure 4-23 illustrates the slope instability of the slide area. Note that several trees in the slide area have been nearly uprooted and now stand at sharp angles. Figure 4-24 provides an aerial view of the Jackson Mountain slide. The pipeline is visible in the middle of the photograph. The Snowball pipeline (PAWSD owned) had to be relocated because of the Jackson Mountain slide according to the HMPC.

Figure 4-19 East Fork Landslide: May 2008 Movement

Source: Colorado Geological Survey, East Fork Landslide Report May 18, 2008

Figure 4-20 Toe of the East Fork Landslide

Source: Archuleta Sheriff's Office – Division of Emergency Management (taken May 16, 2008)

Figure 4-21 Sediment from the East Fork Landslide at the confluence of the East and West Fork of the San Juan River

Source: Archuleta Sheriff's Office – Division of Emergency Management (taken May 16, 2008)

Figure 4-22 Toe of the Jackson Mountain Landslide and Above-Ground Pipeline

Source: MWH Americas, Inc., Final Report for the Snowball Pipeline Replacement Evaluation in the Vicinity of U.S. Highway 160 Jackson Mountain Landslide

Figure 4-23 Jackson Mountain Landslide Slope Instability

Source: MWH Americas, Inc., Final Report for the Snowball Pipeline Replacement Evaluation near U.S. Highway 160 Jackson Mountain Landslide

Figure 4-24 Jackson Mountain Landslide Aerial View

Source: Archuleta Sheriff's Office – Division of Emergency Management (taken May 16, 2008)

During the 2022 update the HMPC noted a landslide on south side of river opposite of San Juan River Village that has been checked by County OEM and USFS Geologist. There is a concern with altering the flow of the river and impacting the Village, and it was noted that it impacted a PAWSD diversion ditch. Changes to the slide have not been witnessed in the last year (2021-2022).

In addition to landslides, rockfall occurs on an annual basis in and around Archuleta County. Highway 160 over Wolf Creek Pass, which is a heavily trafficked route in and out of Archuleta County, is a common location for rockfall. In the hard stone rock that makes up the areas around Wolf Creek Pass a common cause for rockfall is a process called ice-jacking, where fractures in the rock face fill with water or runoff which then goes through the freeze-thaw cycle. This causes the fracture to expand and contract repeatedly until the rock separates and falls. This leads to an annual occurrence of rockfalls on Highway 160 in the spring, resulting in frequent vehicle collisions and temporary closures of the roadway.

According to the NCEI database, there were also two debris flow events which occurred in Archuleta County since the last plan update. One occurred on July 17, 2018, when a mudslide occurred along Colorado Highway 160 at mile marker 124 as a result of heavy rain. Vehicles were stuck in deep mud with traffic backed up on either side of the highway. The highway was closed in both directions for almost 4 hours with

about 100 vehicles backed up on either side of the mudslide area. Another debris flow occurred July 24, 2021, when heavy rains led to a debris flow across sections of First Fork Road on the Pagosa Ranger District. Portions of the road were washed out.

Geographical Area Affected

Figure 4-25 shows the location of the potential landslide hazards in the response area, which is **extensive**. The two major landslide hazards in the planning area are marked on the map by yellow circles. The East Fork slide area is roughly twelve miles northeast of Pagosa Springs in the San Juan National Forest. It lies two miles east of Highway 160 along the East Fork Road (NFSR 667). The slide is about 35 acres in size. The toe of the landslide has been reinforced to keep it from sliding into the East Fork of the San Juan River, and the slide has been monitored with sensors since the 2008 event. The East Fork Landslide belongs to an older system of landslides in that same area.

The Jackson Mountain Landslide is roughly five miles east of Pagosa Springs. The slide area measures approximately 2,000 feet wide by one-half mile long. The Jackson Mountain Slide is nearer to Pagosa Springs while the East Fork Landslide lies near the Archuleta-Mineral County border. There are other landslide areas in the response area that could be problematic as well, including a slide on the Sheep Creek trail.

Additional problem areas include:

- Highway 160: MM 146 and MM 147
- Highway 160: Wolf Creek Pass, MM 158-165
- Highway 160: Yellow Jacket Pass
- CR 151 MM 114 and MM117
- CR 335- Lower Blanco culverts plugged with mud, rock, and shale
- CR 500
- Area behind high school affected from landslide in Spring 2017

CDOT identified 756 sites throughout the State that have ongoing issues with rockfall. There are 15 such sites in the planning area: 7 in Archuleta County along Highway 160 and 8 in Mineral County on Wolf Creek Pass. CDOT identifies these areas using the Colorado Rockfall Hazard Rating System (CRHRS) which combines traffic data, geology information, and slope measurements to determine a hazard ranking score. Table 4-53 below details the 15 rockfall hazards in the planning area by mile marker and lists each site's overall hazard ranking out of the 756 rockfall hazard areas in the State.

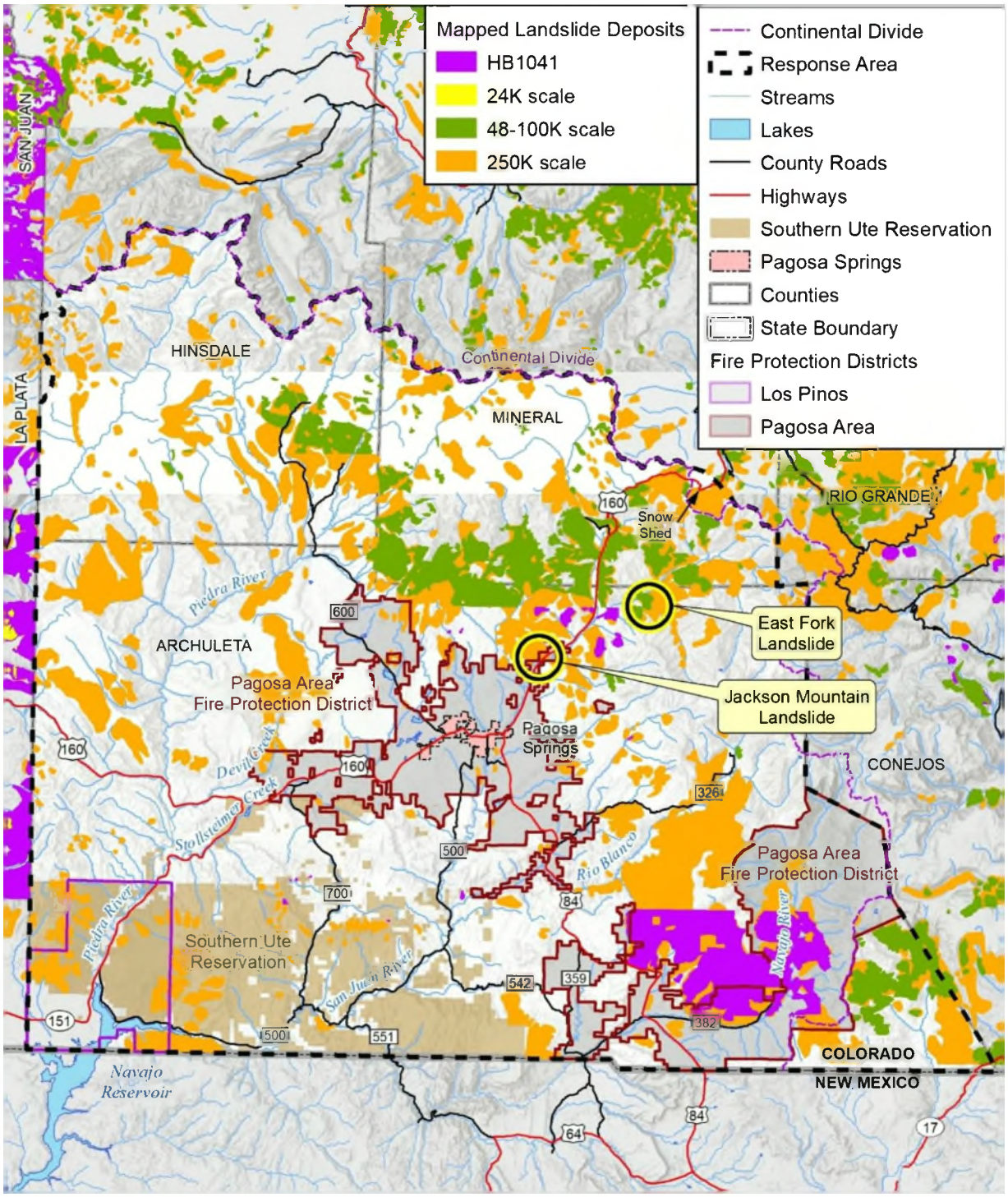
Table 4-53 Rockfall Hazard Areas and Rankings in Archuleta County Response Area

County	Route	Beginning Mile Marker	Ending Mile Marker	Hazard Rank
Archuleta	Highway 160	115.603	115.663	46
Archuleta	Highway 160	116.757	116.819	116
Archuleta	Highway 160	115.982	116.079	131
Archuleta	Highway 160	114.719	114.787	389
Archuleta	Highway 160	115.505	115.586	479
Archuleta	Highway 160	116.462	116.500	649
Archuleta	Highway 160	116.359	116.423	666
Mineral	Highway 160	161.289	161.360	31
Mineral	Highway 160	159.193	159.771	45
Mineral	Highway 160	159.116	159.193	281

County	Route	Beginning Mile Marker	Ending Mile Marker	Hazard Rank
Mineral	Highway 160	161.000	161.119	320
Mineral	Highway 160	160.759	160.917	358
Mineral	Highway 160	161.193	161.266	397
Mineral	Highway 160	161.676	161.728	714
Mineral	Highway 160	161.557	161.600	714

Source: Colorado Department of Transportation

Figure 4-25 Landslide Deposits in the Archuleta County Planning Area



Map compiled 8/2022; intended for planning purposes only. Data Source: Archuleta County, CDOT, Colorado Geological Survey

0 5 10 Miles

N

Magnitude/Severity

The potential magnitude of landslide impacts in Archuleta County could be **critical**. The East Fork landslide specifically is prone to disrupting utility lines in the area, including the interstate natural gas pipeline. The interstate pipeline supplies all of central Colorado with natural gas. If the East Fork landslide broke this pipeline, municipalities such as Gunnison and Salida would not have enough natural gas for heating. This would be particularly serious in the winter months when many Coloradoans use natural gas to heat their homes. Impacts on this gas transmission line would be minimal to the Archuleta County response area itself. The most severe impacts to the Pagosa Springs area would result from the damming of the East Fork of the San Juan if the East Fork landslide mass fell into the river. If this were to happen, water would build up behind the dam until it eventually breached. Studies on the issue revealed that much of Pagosa Springs would be inundated. Figure 4-26 shows where the San Juan River is constricted by boulders from the landslide, causing the river to widen upstream of the constriction. The difference in the width of the channel above and below the point of constriction and the damage to trees on the slide area is apparent in this image.

The Jackson Mountain Slide ruptured the Snowball water pipeline several times in the past 10-20 years. The Snowball pipeline supplies a portion of Pagosa Springs' municipal water and is the only source of water for the Snowball Water Treatment Plant and District 2 of the Pagosa Area Water and Sanitation District. Disruption of this water supply line could also be critical for the Pagosa Springs area. The financial impact of the Jackson Mountain Slide has been substantial. According to the HMPC, roughly $6 million has been spent on stabilizing the slide area and repairing the stretch of Highway 160 affected by the slide. This part of the Highway has been repaved repeatedly to the point that the asphalt is 27 vertical feet thick, the accumulation of one repaving after another.

Overall, rockfall impacts would likely be **negligible** in Archuleta County, with less than 10 percent of the planning area affected. However, rockfalls elsewhere have caused severe injury or even death. In the Archuleta County response area, this risk is higher for motorists traveling along Highway 160 in the rockfall hazard areas identified previously.

The HMPC estimates that the potential magnitude of debris flow would be **limited**.

Figure 4-26 Constriction of the San Juan River by the Toe of the East Fork Landslide

Source: Colorado Geological Survey, East Fork Landslide Report May 18, 2008

Frequency/Likelihood of Occurrence

Landslides are **likely** to occur in the planning area, meaning these hazards have between a 10 and 100 percent chance of occurrence in next year, or have a recurrence interval of 10 years or less. The Jackson Mountain slide area shows activity approximately every ten years according to the 2002 Colorado Landslide Hazard Mitigation Plan. It has been monitored with sensors since 2008 and has not shown movement since (as of 2017). The potential for landslide movement typically increases during a wet year.

Rockfall also has a **likely** occurrence rating. Three sites in the planning area on Highway 160 are ranked in the top 50 in the State for frequent rockfall issues.

The HMPC estimates that debris flows could occur **occasionally**, but this likelihood can increase following wildfires.

Climate Change Considerations

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. Climate change projections for more intense precipitation events has the potential to increase landslide incidence, particularly debris flows. With increases in heavy precipitation events, Archuleta County could

have an elevated risk of landslide and debris flow occurrence in the future. All these factors would increase the probability for landslide and debris flow occurrences.

Vulnerability

Research in the hazard profile for landslide, debris flow, and rockfall events revealed sporadic impacts, particularly along the county's major roadways and mountain passes. Future property losses to existing developments would likely be minor, based on patterns of previous events, and impact mostly infrastructure. However, as mentioned throughout this chapter there are two active landslides in the county which could have larger impacts to infrastructure and critical facilities.

The two active landslides in the planning area, the East Fork landslide and the Jackson Mountain landslide, pose a serious risk to public safety and have already resulted in substantial financial loss. Both landslides are prone to disrupting utility lines in the area.

People

Past events in Archuleta County have not caused loss of life or major injuries to date, although the potential for both in the future does exist. People could be susceptible if they are caught in a landslide or debris flow, potentially leading to injury or death. There is also a danger to drivers operating vehicles, as rocks and debris can strike vehicles passing through the hazard area or cause dangerous shifts in roadways. However, rockfall and debris flow occurrences do tend to occur more suddenly, making advance warning difficult. Based on the past notable landslides in the county which are slow-moving, well known and well documented, it is not likely that landslides will occur without warning and direct impacts to people are suspected to be minimal.

Property

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

During the 2022 update of this plan, a GIS analysis of exposure to landslide hazard areas was performed. GIS analysis indicates approximately $189 million of total property value exposed, which takes into account total improved values of structures based on data from Archuleta County Assessor and estimated content values from FEMA. Based on this analysis there is a total of 323 structures potentially within landslide hazard areas throughout the unincorporated areas of Archuleta County. There is a high level of uncertainty as to the actual risk to these exposed structures, thus a more specific loss estimation is not provided. A more detailed, site-specific analysis would be needed to assess actual risk within the identified structures.

Table 4-54 Archuleta County Structures at Risk to Landslide Property Types

Occupancy Type	Parcel Count	Building Count	Improvement Value	Content Value	Total Value	Population
Agricultural	22	23	$3,962,640	$3,962,640	$7,925,280	
Commercial	3	3	$2,583,460	$2,583,460	$5,166,920	
Industrial	1	1	$19,640	$29,460	$49,100	
Residential	298	311	$125,490,650	$62,745,325	$188,235,975	708
Vacant	12	12	$263,080	$263,080	$526,160	
Total	**310**	**323**	**$125,753,730**	**$63,008,405**	**$188,762,135**	**708**

Source: Archuleta County Assessor Data 2022, Colorado Geologic Survey, WSP GIS Analysis

Landslides have also been known to create temporary dams in some locations, partially or fully blocking rivers at the toe of the slide. These dams can subsequently burst as the pressure of the impounded water builds, leading to flood damage for structures and communities downstream as well.

Specific to Archuleta County, there is potential for this to occur with the damming of the East Fork of the San Juan if the East Fork landslide mass fell into the river. If this were to happen, water would build up behind the dam until it eventually breached. Figure 4-26 shows where the San Juan River is constricted by boulders from the landslide, causing the river to widen upstream of the constriction. The difference in the width of the channel above and below the point of constriction and the damage to trees on the slide area is apparent in the photograph shown in this figure. These dams can subsequently burst as the pressure of the impounded water builds, leading to flood damage for structures and communities downstream as well. To gain some idea of the damage this dam breach could potentially cause, dam safety engineers modeled flood approximations off the 1% annual chance flood in Pagosa Springs. The results of this study are repeated below in Table 4-55. It is important to note that the data in this table are approximations; there is no way to determine for certain what dam height the landslide could potentially create.

Table 4-55 Flood Level Approximations Based on Potential Landslide Dam Height

Peak Breach Discharge (cfs)	Dam Height Associated with Peak Discharge (feet)	Storage Volume Associated with Peak Discharge (AF)	Expected Attenuation at Pagosa Springs
15,000	50	695	25%
30,000	65	1,500	10%
50,000	85	3,000	5%
100,000	125	8,500	0%
150,000	150	15,000	0%

Source: Gavin, Matt and Brown, Chris, 2008. East Fork Landslide prompted Flood Hazard Study by Dam Safety Engineers. Streamlines, Vol. 22 (2), p. 1-3.

Based on this data, a breach of a landslide dam of 50 feet in height could result in a flood the same size as the 1% annual chance flood. In such an event, the Town of Pagosa Springs and parts of the unincorporated County could expect the same risks and damages from the 100-year flood as discussed in the flood vulnerability section.

Critical Facilities and Lifelines

In addition to buildings, utilities and transportation structures are vulnerable to the impact and ground deformation caused by slope failures. They present a particular vulnerability because of their geographic extent and susceptibility to physical distress. These lifeline types are generally linear structures that, because of their geographic extent, have a greater chance of being affected by ground failure due to greater hazard exposure.

As described in the Past Occurrences section, transportation networks are the most exposed lifeline type in the county to rockfall, landslide and debris flow incidents. Residents and visitors alike are impacted when roads are damaged by rockfall and landslides. This includes Highway 160 which is not only the primary transportation and access route for the county and Pagosa Springs, but significantly vulnerable to landslides and rockfalls. The loss of transportation networks could potentially cause secondary damage to the overall county's infrastructure, including revenue, transportation availability, emergency response mechanisms, evacuation operations, and other essential capabilities by preventing the means of these resources from activating or moving between locations.

Extension, bending, and compression caused by ground deformation can break lifelines. Failure of any component along the lifeline can result in failure to deliver service over a large region. Once broken, transmission of the commodity through the lifeline ceases, which can have catastrophic repercussions down the line: loss of power to critical facilities such as hospitals, impaired disposal of sewage, contamination of water supplies, disruption of all forms of transportation, release of flammable fuels, and so on. Therefore, the overall impact of lifeline failures, including secondary failure of systems that depend on lifelines, can be much greater than the impact of individual building failures. As mentioned in the Past Occurrences section, this has occurred in Archuleta County multiple times before in both the East Fork and Jackson Mountain landslides. The gas line that traverses the East Fork landslide has been a long-term concern and periodically monitored by Xcel Energy.

The Jackson Mountain Slide has ruptured the Snowball water pipeline several times in the past 10-20 years. The Snowball pipeline supplies a portion of Pagosa Springs' municipal water and is the only source of water for the Snowball Water Treatment Plant and District 2 of the Pagosa Area Water and Sanitation District. Disruption of this water supply line could also be critical for the Pagosa Springs area. The financial impact of the Jackson Mountain Slide has been substantial. According to the HMPC, roughly $6 million has been spent on stabilizing the slide area and repairing the stretch of Highway 160 affected by the slide. This part of the Highway has been repaved repeatedly to the point that the asphalt is 27 vertical feet thick, the accumulation of one repaving after another. If this landslide is active, it will continue to drain financial resources. This slide also poses a potential threat to motorists traveling along Highway 160.

No assets owned by PAWSD or Pagosa Area FPD were found to be vulnerable to landslide based on GIS analysis.

Economy

Economic impacts typically center around transportation routes temporarily closed by rockfall, debris flow, mudflow, or landslide activity. These roads may be used to transport goods across the county or provide access by visitors and tourists. Depending on the amount of damage, the road may simply need to be cleaned off, or may need some level of reconstruction and affect the local economy indirectly. Total economic losses due to geologic hazards reported by the NCEI dataset was $20,000 in damages from 2006-2022 in Archuleta County.

Historical, Environmental, and Cultural Resources

Landslides, rockfall, and debris flows are a natural environmental process. Environmental impacts can include the removal of vegetation, soil, and rock. Landslides that fall into streams, or block and reroute them completely, may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time. Additionally, rockfalls to rivers can cause blockages causing flooding, damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

Development Trends

The severity of landslides, rockfalls, and debris flow is directly related to the extent of human activity in hazard areas. Adverse effects can be mitigated by early identification of areas susceptible to these hazards and avoiding incompatible land uses in these areas or by corrective engineering. The mountainous topography of the County presents considerable constraints to development (in addition to large amounts of federal land), most commonly in the form of steeply sloped areas. These areas are vulnerable to disturbance and can become unstable.

Steep slope regulations limit problems from these hazards for future development, thus the exposure of infrastructure to these hazards is not anticipated to grow. As expansion of the tourism and recreational

activity grows in Archuleta and within nearby counties, the amount of traffic within the County will continue to increase, and thus the amount of people exposed to danger from rockfall hazards may increase. The Wolf Creek Pass area commonly has rockfall which affects vehicular traffic on Highway 160.

Continued adherence to the land development codes and regulations in the planning area will decrease the risk of future development to landslide hazard areas. Development of lands within identified hazard areas are limited to meet the requirements set forth by the Planning and Zoning Offices or the Building Departments of the jurisdiction at the time of construction. Most construction has been limited to areas that are not in these hazard areas.

Risk Summary

Table 4-56 Landslides, Debris Flows and Rockfall Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Archuleta County	Extensive	Likely	Critical	High
Pagosa Springs	Limited	Likely	Limited	Medium
Pagosa Fire Protection District	Limited	Likely	Limited	Low
Pagosa Area Water and Sanitation District (PAWSD)	Limited	Likely	Limited	Medium

- The overall significance of landslides, debris flows, and rockfall is **High**.
- Landslides, debris flow, and rockfall do occur with some regularity in Archuleta County. The direct effect on the populace is low, but there is potential for severe injury or death from rockfall.
- Impacts on linear critical infrastructure have been significant in the county, notably gas and water pipelines and Highway 160.
- As incidents of wildfires increase and hillsides are void of vegetation, rain-soaked hillsides are more likely to slide resulting in increased damage following fires.
- Mapping and assessment of landslide hazards are constantly evolving. As new data and science become available, assessments of landslide risk should be reevaluated.
- The risk associated with the landslide hazard overlaps the risk associated with other hazards such as earthquake, flood, and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.

4.3.11 Land Subsidence

Hazard/Problem Description

According to the 2018 Colorado Natural Hazards Mitigation Plan, "ground subsidence is the sinking of land over human caused or natural underground voids and the settlement of native low-density soils" (Colorado DHSEM 2018). Subsidence can occur gradually over time or virtually instantaneously. There are many different types of subsidence; however, in Colorado, there are three types of subsidence that warrant the most concern: settlement related to collapsing soils, sinkholes in karst areas, and the ground subsidence over abandoned mine workings. These man-driven or technology-exacerbated subsidence conditions are associated with the lowering of water tables, extraction of natural gas, or subsurface mining activities. As the underground voids caused by these activities settle or collapse, subsidence occurs on the surface.

According to CGS records, there are 24 known historic coal mines in Archuleta County. Past coal and other mining activities have created surface subsidence in some areas and created the potential for subsidence in other areas. Any area where past sub-surface mining was documented has some risk of subsidence; however, tracking these areas is difficult. CGS has historic mine maps for most of these 24 mines, yet it is unclear whether some of these maps refer to the same mines despite having different names. According to CGS records, there are no known historic coal mines or associated subsidence events in southern Hinsdale and Mineral Counties.

Past Occurrences

Records of previous subsidence occurrences are difficult to track, as there is no coordinating or monitoring agencies for this hazard. However, records from the Colorado Geological Survey indicate that 14 mine subsidence events occurred in Archuleta County between 1983 and 2003. The date of occurrence for all but five of these events is unknown. These events are profiled in Table 4-57. As of 2022 the HMPC did not have documentation of more recent events.

Table 4-57 Mine Subsidence Events

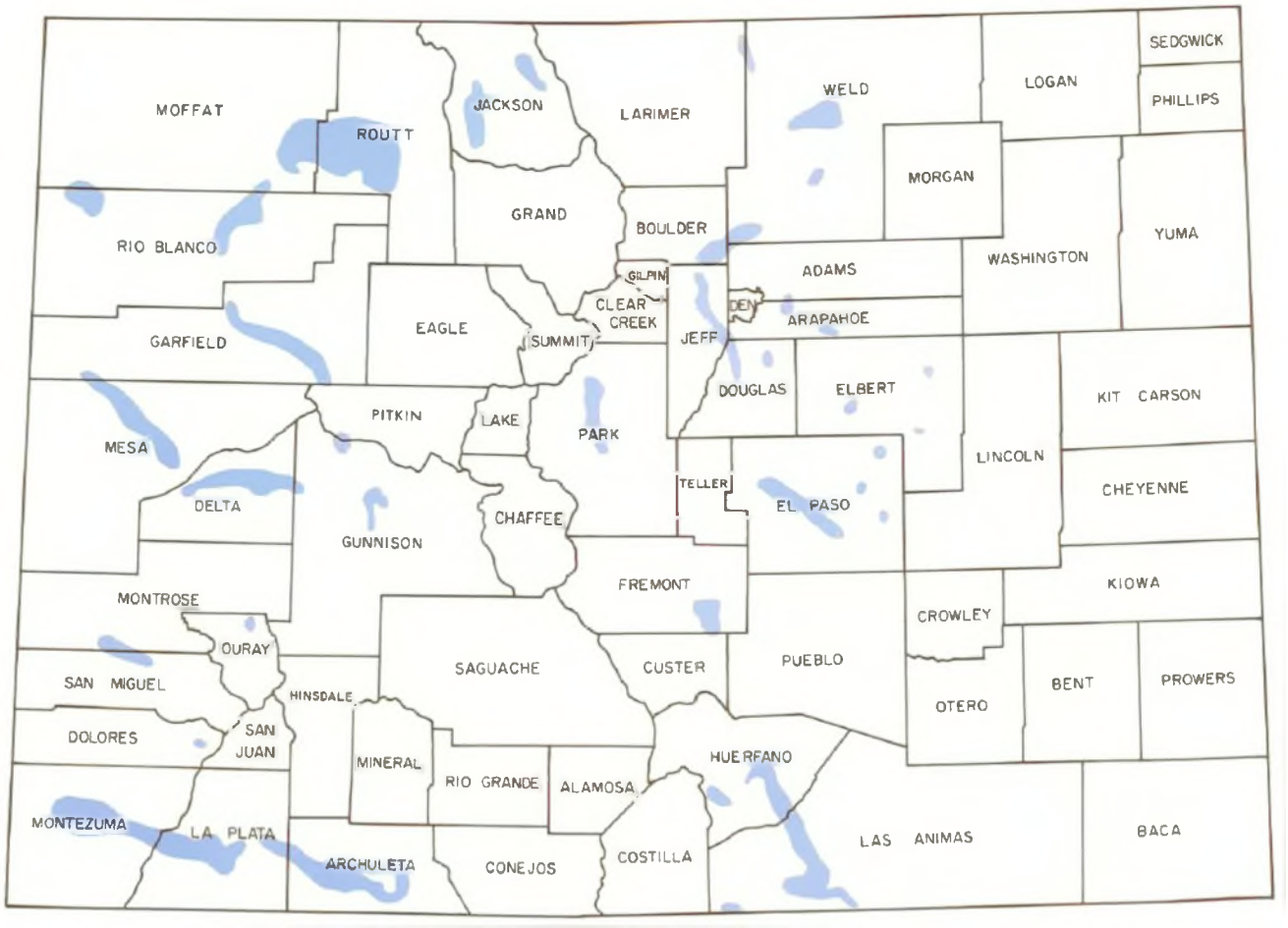
Date	Comments
8/11/1983	Open portal with falling roof and walls, gob pile, trash
1/12/1984	Moore #1 (Coalmount) Collapsed-Concrete soil, subsoil Backfill No survey report found for this site.
11/12/1986	Mine opening (room collapse)
6/24/2003	Stabilize undercuts prior to machine loading6 miles; 1st right on Beaver Meadows Rd. from US 160 oval
Unknown	Completed by Pioneer Construction 37° 18' 2.223" N, 107° 29' 8.242" W identified on USFS west of Shamrock
Unknown	Shamrock Mines: Subsidence Inventory - 9 pits between Shamrock Mines 1 & 2
Unknown	Shamrock Mines: Subsidence Inventory - 9 pits between Shamrock Mines 1 & 2
Unknown	Shamrock Mines: Subsidence Inventory - 9 pits between Shamrock Mines 1 & 2
Unknown	Several Subsidence pits located between the Triple S mine and Shamrock Mines 1 & 2
Unknown	(No comments)
Unknown	(No comments)
Unknown	(No comments)
Unknown	(No comments)

Source: Colorado Geological Survey

Geographical Area Affected

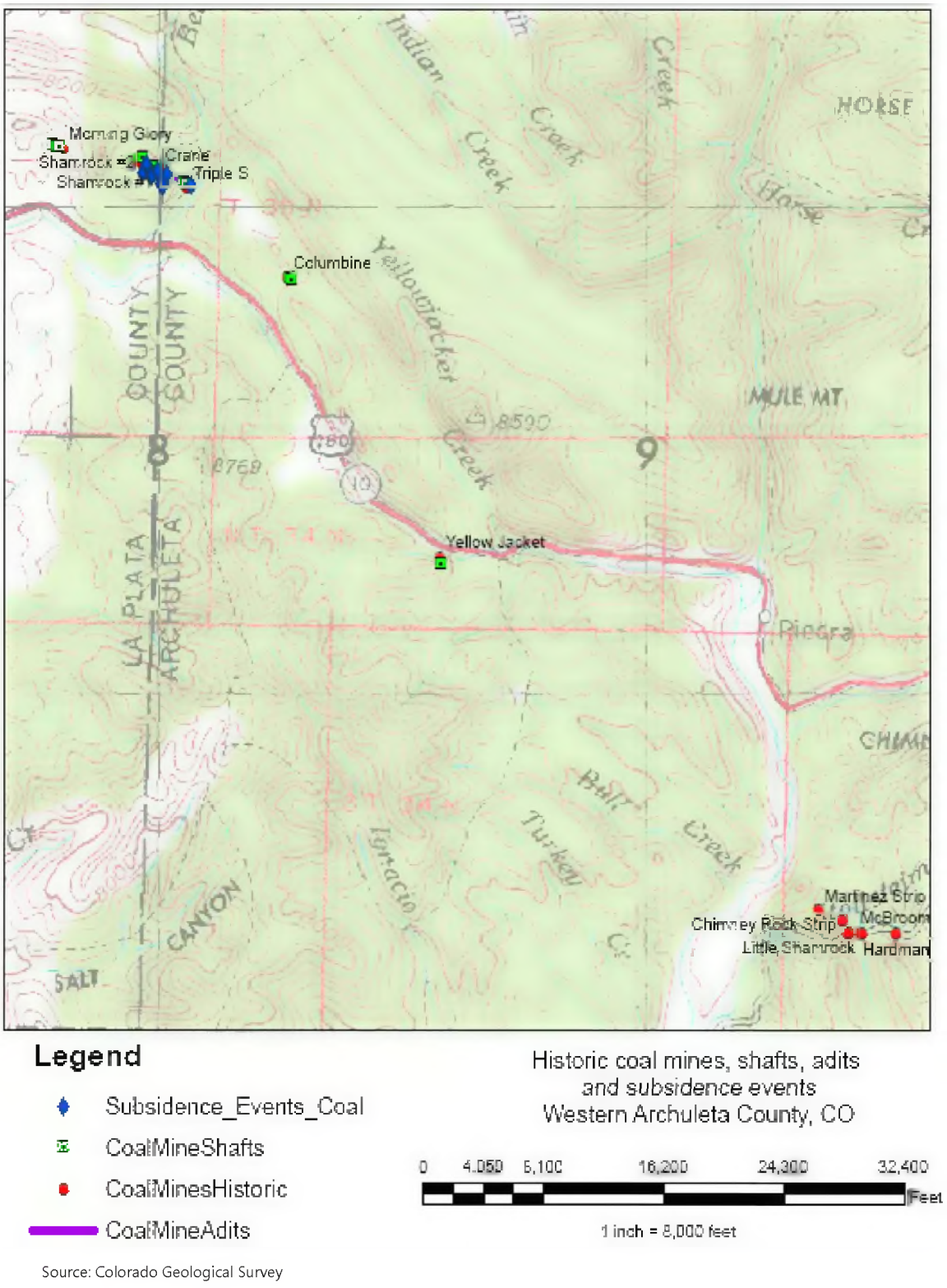
Areas of Archuleta County at higher risk for subsidence are shown in Figure 4-27 on the map of inactive coal mines in Colorado. These areas are primarily located in the southern half of the County, in the Southern Ute Reservation, along Highway 160 near the Archuleta-La Plata County border, and along Highway 84. Based on this map and oral communication with the Colorado Geological Survey there is little potential for coal mine subsidence in southern Mineral or Hinsdale counties. Figure 4-28 and Figure 4-29 show the mapped locations of subsidence events related to coal mining, coal mine shafts, historic coal mines, and coal mine adits. Based on this information, the geographic extent rating for subsidence is **significant**.

Figure 4-27 Locations of Inactive Coal Mines in Colorado



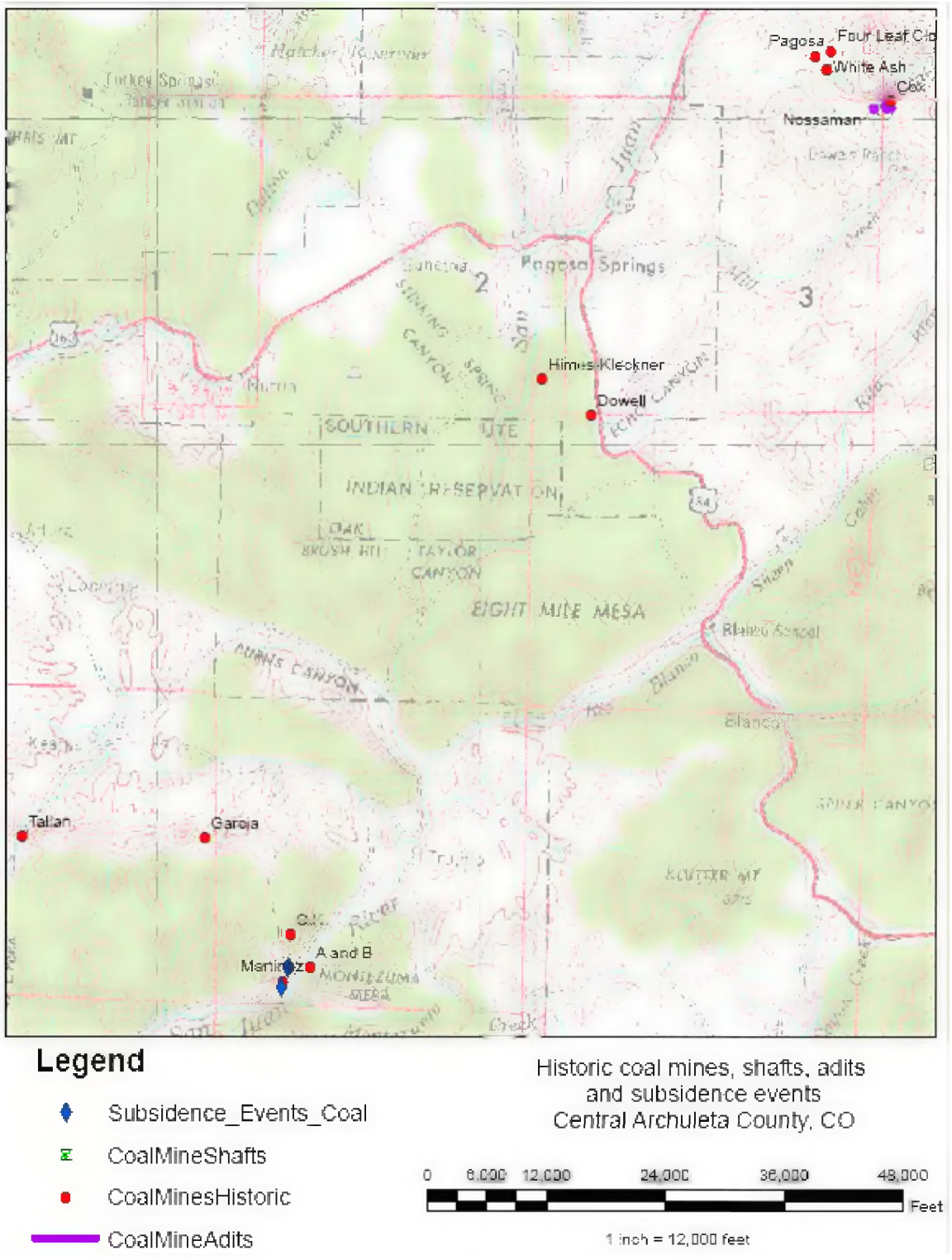
Source: J.E. Turney, Subsidence above Inactive Coal Mines: Information for the Homeowner, Special Publication No. 26, Colorado Geological Survey and Colorado Mined Land Reclamation, 1985.

Figure 4-28 Historic Coal Mines, Shafts, Adits and Subsidence Events in Western Archuleta County



Source: Colorado Geological Survey

Figure 4-29 Historic Coal Mines, Shafts, Adits and Subsidence Events in Central Archuleta County



Source: Colorado Geological Survey

Magnitude/Severity

The greatest dangers associated with subsidence are related to property damages incurred by the hazard. There are minimal risks to injury and death from unexpected subsidence or accidental exposure to it, but the risk is possible. No injuries or deaths related to subsidence have been reported in the planning area.

To calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area, information from the event of record is used. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it reflects common occurrence. In this case, there is no event of record for the County related to subsidence.

Using typical damages caused by subsidence as a point of reference, the planning area could potentially experience damage to houses, critical facilities, and other structures. Given the limited number of roads in the County, subsidence along Highway 160 could affect transportation and delivery of services to the planning area. Subsidence may also result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate natural processes of subsidence, or incur subsidence over manmade voids. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. The consequences of improper use of land subject to ground subsidence can be excessive economic losses, including the high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through increased taxes and decreased property values.

Based on these factors, the magnitude severity ratings for subsidence are considered **limited**, based on the dollar amount of property damage incurred. Land use planning does consider the subsidence hazard in development reviews to avoid building structures in hazard areas.

Frequency/Likelihood of Occurrence

Records from the Colorado Geological Survey indicate that 14 mine subsidence events occurred in Archuleta County. The date of occurrence for all but four of these events is unknown. This absence of data on dates of occurrence must be taken into consideration when evaluating the frequency or likelihood of future occurrences. For the purposes of this plan, the four events with known occurrence dates will be used to calculate a likelihood and frequency rating for the purposes of this plan. Four events occurred between 1983 and 2010, yielding an average annual occurrence of one subsidence event every six or seven years. The probability that a subsidence event will occur in any given year is 14.8%, which corresponds to a probability rating of **likely**.

Climate Change Considerations

Changes in precipitation events and the hydrological cycle may result in changes in the rate of subsidence. Additionally, the future impacts of climate change are expected to influence future erosion and deposition events through changes to the frequency and intensity of wildfires.

Vulnerability

People

There are minimal risks to injury and death from unexpected subsidence or accidental exposure to it, but the risk is possible. No injuries or deaths related to subsidence have been reported in the planning area.

Property

The greatest dangers associated with subsidence are related to property damages incurred by the hazard. Using typical damages caused by subsidence as a point of reference, the planning area could potentially experience damage to houses, critical facilities, and other structures. According to the Colorado Geological Survey, merely an inch of differential subsidence beneath a residential structure can cause several thousand dollars of damage.

Critical Facilities and Lifelines

Subsidence may also result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines. According to the Colorado Geological Survey, large ground displacements caused by collapsing soils can destroy roads and structures and alter surface drainage.

Economy

Given the limited number of roads in the County, subsidence along Highway 160 or Highway 84 could affect transportation and delivery of services to the planning area, resulting in economic losses. Ground subsidence can result in high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through increased taxes and decreased property values.

Historical, Environmental, and Cultural Resources

It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate natural processes of subsidence, or incur subsidence over manmade voids.

Development Trends

According to the 2018 Colorado State Hazard Mitigation Plan:

Future development will continue to intersect subsidence hazard areas based on past and projected population growth. Important identification and mitigation strategies are necessary in engineering geology and geotechnical investigations within the evaporite terrain mapped. Avoidance is generally the best mitigation solution where subsidence features are exposed at the surface and properly identified. Many older sinkholes may be hidden. Only subsurface inspections, either by investigative trenching, a series of investigative borings, geophysical means, and/or observations made during over lot grading or utility installation, can ascertain whether sinkholes exist within a development area. Ground-modification and structural solutions can help mitigate the threat of localized subsidence. Drainage issues and proper water management are also important. In Colorado's semi-arid climate, additional increases of fresh water may accelerate dissolution and further destabilize certain subsidence areas.

Jurisdictions in the planning area should ensure that known hazard areas are regulated under their planning and zoning programs, but a lack of detailed hazard mapping for collapsible soils and fluvial hazard zones is an issue. Understanding the potential hazards are key to addressing them through jurisdictional ordinances and regulations so that future impacts are mitigated or avoided prior to development.

Risk Summary

In summary, subsidence is considered low significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-58 Land Subsidence Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Significant	Likely	Limited	Low
Pagosa Springs	Significant	Likely	Limited	Low
Pagosa Fire Protection District	Significant	Likely	Limited	Low
Pagosa Area Water and Sanitation District	Significant	Likely	Limited	Low

- Effects on people: Minimal risk to injury or deaths. No deaths or injuries have been reported in County.
- Effects on property: The greatest dangers associated with subsidence are related to property damages. an inch of differential subsidence beneath a residential structure can cause several thousand dollars of damage.
- Effects on economy: Limited.
- Effects on critical facilities and infrastructure: Potential for limited structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines.
- Related Hazards: Drought, Dam Failure

4.3.12 Lightning

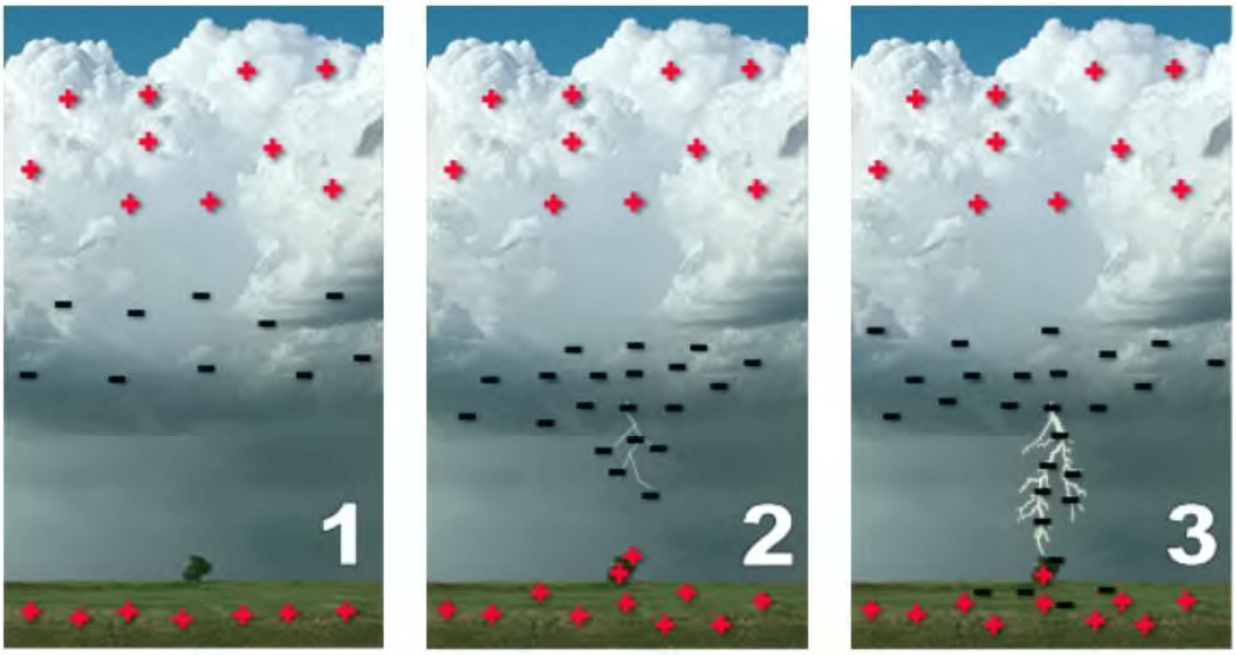
Hazard/Problem Description

Lightning is one of the more dangerous weather hazards in the United States and in Colorado. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning also causes wildland fires and deaths and injuries to livestock and other animals. According to the National Lightning Safety Institute, lightning causes more than 26,000 fires in the United States each year. The institute estimates property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects to be more than $6 billion per year. Impacts can be direct or indirect. People or objects can be directly struck, or damage can occur indirectly when the current passes through or near it.

Intracloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually, it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel can be visible for many miles.

Although it is not as common, cloud-to-ground lightning is the most damaging and dangerous form of lightning. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage. Figure 4-30 displays the formation of cloud-to-ground lightning.

Figure 4-30 Cloud to Ground Lightning Formation



Source: National Weather Service

Past Occurrences

NOAA's NCEI Storm Events Database only records lightning events that resulted in a fatality, injury, or reported property or crop damage. The NCEI dataset reported 12 lightning events in Archuleta County since 1996. In the county, NCEI reported that lightning has caused no deaths, but 5 injuries and $173,250 of property damage. Damaging lightning events are profiled in Table 4-59.

It should be recognized that NCEI data is not completely comprehensive and does not capture all the lightning events in the planning area. Additionally, dollar amounts from the data are not adjusted to 2022 dollars. In 2017, the HMPC members noted that three homes not mentioned in the dataset were struck by lightning.

Table 4-59 Damaging Lightning Events: 1996-2022

County	Location	Date	Fatalities	Injuries	Property Damage
ARCHULETA	PAGOSA SPRINGS	4/7/1998	0	1	$0
ARCHULETA	PAGOSA SPRINGS	4/7/1998	0	0	$40,000
ARCHULETA	PAGOSA SPRINGS	7/24/1998	0	0	$12,000
ARCHULETA	PAGOSA SPRINGS	7/28/1998	0	0	$500
ARCHULETA	PAGOSA SPRINGS	4/25/1999	0	0	$500
ARCHULETA	PAGOSA SPRINGS	6/26/2000	0	0	$40,000
ARCHULETA	CHROMO	7/7/2000	0	1	$0
ARCHULETA	PAGOSA SPRINGS	9/8/2000	0	0	$50,000

County	Location	Date	Fatalities	Injuries	Property Damage
ARCHULETA	PAGOSA SPRINGS	7/15/2001	0	1	$250
ARCHULETA	PAGOSA SPRINGS AIRPORT	6/30/2008	0	0	$10,000
ARCHULETA	LONETREE	9/30/2017	0	0	$20000
ARCHULETA	CHIMNEY ROCK	7/31/2021	0	2	$0
Totals			0	5	$173,250

Source: NCEI

Details from several events were included in the NCEI dataset:

- **April 7, 1998**: A lineman was struck by lightning and sustained minor burns while repairing a streetlight. That same day, lightning struck a tree and a nearby house caught on fire. Property damage was estimated at $40,000.
- **July 24, 1998**: Lightning activity caused several small wildland fires near Pagosa Springs in addition to causing minor damage to one house. A radio broadcasting station was also struck and received extensive damage to a broadcasting communications tower and the station's electronic equipment. Damages were estimated at $12,000.
- **July 28, 1998**: Lightning struck a nearby radio station, destroying a computer. $500 in property damages were sustained.
- **April 25, 1999**: Roughly 900 homes and businesses lost power for five hours when lightning struck a substation near Pagosa Springs. The event caused $500 in damages.
- **June 26, 2000**: A house and several trees caught on fire following several lightning strikes. Damages were estimated at $40,000.
- **July 7, 2000**: Near Chromo, a man fishing along the Navajo River was injured by lightning. He survived but suffered significant burns.
- **September 8, 2000**: Lightning caused $50,000 in damages after starting a fire in a garage/workshop in Pagosa Springs. The structure and its contents were destroyed.
- **July 15, 2001**: A man fishing on Lake Pagosa sustained burn injuries when lightning struck his fishing pole and traveled down through the man's body. Damages were estimated at $300.
- **June 30, 2008**: Lightning struck a power supply and left about 550 customers without power for several hours. Electrical crews had to use a backhoe to get at equipment damaged by the strike.
- **September 30, 2017:** Lightning struck the Oak Brush communications site in Lonetree and damaged law enforcement communications equipment, resulting in $20,000 in damages. The HMPC noted that this event resulted in communications interruptions for three days.
- **July 31, 2021:** A lightning strike near Chimney caused two injuries when a crew of firemen mopping up after a fire were caught in a thunderstorm. There were no serious injuries between the three firefighters, and all refused treatment.

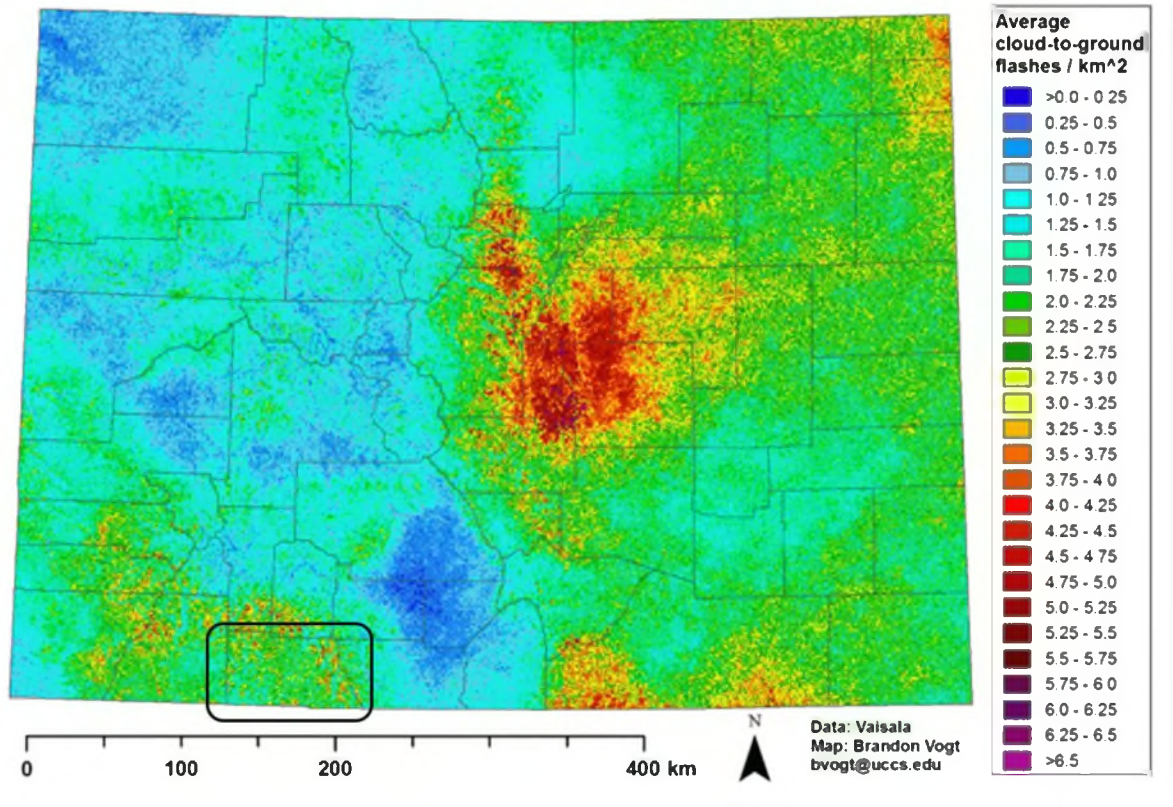
The HMPC also noted a lightning event in 2021 that struck a USFS employee.

Geographical Area Affected

Lightning can strike anywhere in the County of Archuleta. Nationwide lightning strikes are routinely monitored by Vaisala, Inc. with accuracies to within a 1-kilometer resolution. In 2021, there were 3,451,756 lighting counts in the state of Colorado. The figure below shows the average lightning flash density for Colorado from 1996 to 2016 with data collected by Vaisala. While most of the County experiences 1.5-2.5

cloud-to-ground flashes/km^2, high frequency areas of the County can experience up to 5.75 cloud-to-ground flashes/km^2.

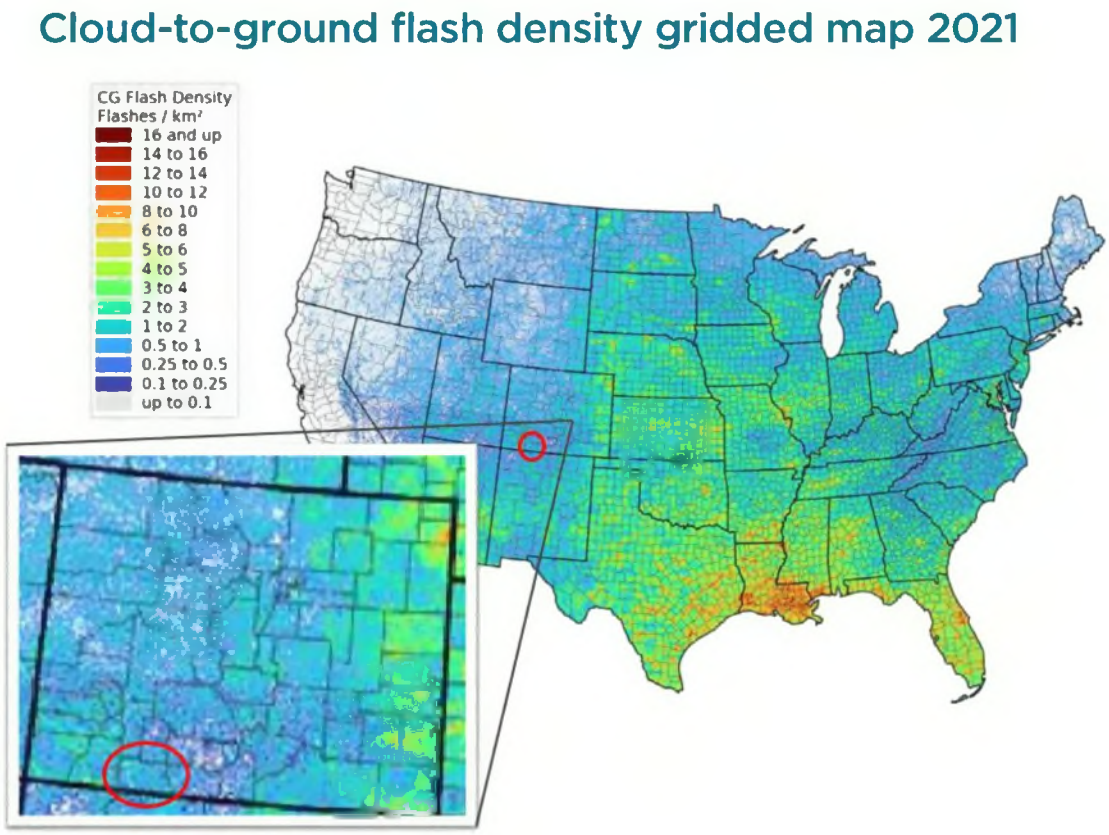
Figure 4-31 Colorado Lightning Density, 1996-2016



Source: National Weather Service

Figure 4-32 shows the total cloud-to-ground lightning flashes in the U.S. in 2021. These values can vary by 50 percent in a year depending on whether there is a drought or enhanced monsoonal flow. However, the locations of maximum and minimum strikes do not change much from year to year. Archuleta County is in the mid-lower range for cloud-to-ground lightning flash density in comparison to the rest of the U.S. in 2021. The HMPC has recommended the geographic extent rating to be **extensive** since it can occur anywhere in the planning area.

Figure 4-32 Cloud-to-ground Lightning Flashes in U.S. 2021



Source: Vaisala Annual Lightning Report, http://www.vaisala.com

Magnitude/Severity

Lightning can cause deaths, injuries, and property damage, including damage to buildings, communications systems, power lines, and electrical systems. It also causes wildland and structural fires. Damage from lightning occurs in four ways:

- Electrocution, severe electrical shock, and burns of humans and animals
- Vaporization of materials in the path of the strike
- Fire caused by the high temperatures associated with lightning
- Power surges that can damage electrical and electronic equipment

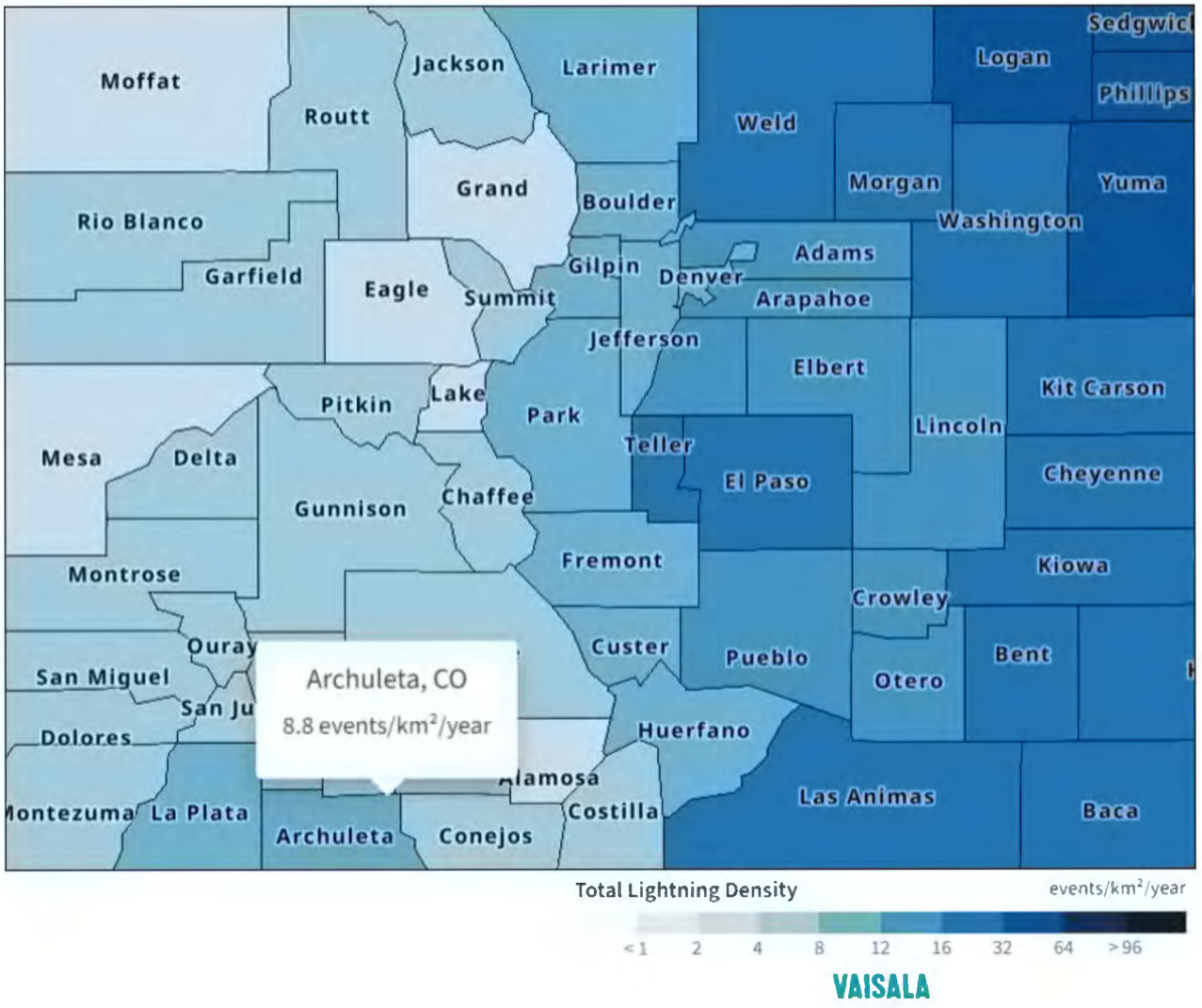
Past events in Archuleta County indicate that the potential magnitude of lightning events will likely be negligible. However, the HMPC feels that the significance of lightning is **critical** due to its potential for causing wildland fires, power outages, and injuries or deaths.

Frequency/Likelihood of Occurrence

It is certain that lightning will occur every year in Archuleta County, but not all strikes will be damaging or fatal. Vaisala reports that Archuleta County has an average of 8.8 lightning events per square kilometer annually. Figure 4-33 shows the total lightning density (cloud-to-ground and in-cloud) in Colorado by

county per year. As mentioned above, most of the County will experience 1.5-2.5 cloud-to-ground flashes/km^2, with high frequency areas of the County experiencing up to 5.75 cloud-to-ground flashes/km^2.

Figure 4-33 Lightning Density by County in Colorado (2016-2021)



Source: Vaisala Annual Lightning Report, 2021

The methodology described in Section 4.3.1 can be used to calculate the likelihood that damaging lightning events will occur in the future, or an event that will result in either property damage, crop damage, injury, or death. With 12 events reported over the course of 26 years, there is a 46% probability that a damaging lightning event will occur in any given year in Archuleta County, or one damaging lightning event once every two years. Despite limited records of damaging lightning events, lightning events will occur in the County every year; therefore, the likelihood of lightning events in Archuleta County is **highly likely**.

U.S. lightning statistics compiled by the National Oceanic and Atmospheric Administration indicate that most lightning incidents occur during the summer months of June, July, and August and during the afternoon hours from between 2 and 6 p.m.

Climate Change Considerations

Per the 2018-2023 Colorado Enhanced State Hazard Mitigation Plan, the future impacts of climate change on lightning are unclear. A 2014 report in *Science* suggested that lightning strikes over the contiguous United States may increase by 12% for every degree rise in global average air temperature due to potential increases in convective available potential energy. However, more research is needed to better understand this potential connection.

Vulnerability

People

Anyone that is caught in an exposed area during a thunderstorm could be at risk of getting struck by lightning. In Wyoming, outdoor enthusiasts venturing to high and exposed areas should be especially cautious because rapid thunderstorm development with associated lightning can place even the most experienced persons in jeopardy without warning. Nationwide, 85 percent of lightning victims are children and young men ages 10-35 engaged in outdoor recreation or work. People may often find themselves outside and need to be especially watchful of the weather during the summer months when afternoon thunderstorms are more common. When people are struck by lightning, the result is deep burns at the point of contact (usually on the head, neck, and shoulders). Approximately 70 percent of lightning survivors experience residual effects such as vision and hearing loss or neuropsychiatric issues. These effects may develop slowly and only become apparent much later. Death occurs in 20 percent of lightning strike victims.

Members of the population who rely on constant, uninterrupted electrical supplies may have a greater, indirect vulnerability to lightning. As a group, the elderly or disabled, especially those with home health care services, rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, Community Based Residential Facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged and there is no available back-up power source. For all these populations, there are also concerns regarding these individual's dependence on caretakers, which increases their vulnerability during disaster events such as a power outage. Rural residents and agricultural operations reliant on electricity for heating, cooling, and water supplies are also especially vulnerable to power outages.

In Archuleta County, the injuries to people due to lightning events were to those working outside or who were caught outdoors, generally at higher elevations, during a storm event. Outdoor workers and enthusiasts caught at high elevation during a storm is one reason that deaths due to lightning are so high in Colorado in comparison to the rest of the United States. Educating people on the dangers of lighting can reduce this occurrence in the future.

Property

Lightning strikes cause intense but localized damage. Most reported damages from lightning are fires to private structures, damage to chimneys or steeples, or small grass fires. Property is more vulnerable to lightning than population because of the exposure ratios; while people can take shelter indoors, buildings remain exposed. Structural fires, localized damage to buildings, damage to electronics and electrical appliances, and electrical power and communications outages are typical consequences of a lightning strike. Mitigation techniques such as choice of building materials or landscaping help reduce the vulnerability of these properties, but there is no data available to segment these properties out of the overall vulnerability assessment.

According to the event details collected in the NCEI database, lightning has resulted in $173,250 in property damages in Archuleta County since 1996. The dataset reported several homes and surrounding trees caught due to a lightning strike, as well as damaged police communications and radio tower equipment.

Critical Facilities and Lifelines

In contrast to other hazards, lightning does not generally cause widespread disruptions with the community. Some essential infrastructures and facilities can be impacted by lightning. Emergency responders, hospitals, government services, schools, and other important community assets are not more vulnerable to lightning than the general vulnerabilities established for property and population. Sometimes, communications and infrastructure are interrupted by lightning strikes, such as in Archuleta County when radio towers and police communications can be damaged by lightning. When emergency communication systems are impacted, the health and safety of the community is jeopardized. According to the HMPC in 2017 or 2018 lightning hit the public safety communications tower, which caused interruptions for three days. Similarly, the event in 2008 that left 550 customers without power for hours can jeopardize the lives of individuals who are dependent on electricity to survive. These events raise the vulnerability of the essential functions by delaying response times, hindering interagency communication efforts, or endangering or damaging communication networks.

Economy

Economic impact of a severe thunderstorm is typically short term. The indirect social and economic impacts of lightning damage are typically associated with the loss of electrical power. Since society relies heavily on electric power, any disruption in the supply, even for a short time, can have significant consequences. Generally, long-term economic impacts are caused by hazards that result from lightning, including wildfires.

Historical, Environmental, and Cultural Resources

There are no indications that cultural or historic resources are more vulnerable to lightning than as previously accounted for as general structures. Natural resources may be vulnerable to indirect impacts of lightning, such as wildfires caused by lightning strikes. Vaisala reported that lighting-triggered wildfires account for 58% of total acreage burned by wildfires each year. The presence of large areas of water, or of wide, open spaces in natural habitats may increase the danger of lightning strikes to trees, people, or structures, but these vulnerabilities are not directly related to natural resources. Campgrounds are areas where lightning strikes have more dangerous impacts, so populations utilizing the campgrounds may have a higher vulnerability.

Development Trends

Any development built above ground will be susceptible to lightning strikes. Buildings should be built with grounding, when possible, to prevent the ignition of structure fires. New critical facilities such as communications towers should be built with lightning protection measures. Construction of lightning shelters at outdoor venues and increased public awareness campaigns may help minimize increased effects of lightning on growing numbers of visitors recreating outdoors.

Risk Summary

In summary, lightning is considered high significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-60 Lightning Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Highly Likely	Critical	High
Pagosa Springs	Extensive	Highly Likely	Critical	High
Pagosa Fire Protection District	Extensive	Highly Likely	Critical	High

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Highly Likely	Critical	High

- The NCEI dataset reported 12 lightning events since 1996 that resulted in 5 injuries and $173,250 in property damages in Archuleta County. Despite limited past impacts, the HMPC believes that the magnitude should be ranked as critical due to potential for wildfires from lightning ignition.
- Lightning can strike anywhere in Archuleta County; therefore, geographic extent is rated as extensive
- Despite limited records of past damages, lightning is highly likely in the planning area, particularly during summer months, with a peak number of events occurring in July.
- Individuals caught outside during a storm, outdoor workers, outdoor enthusiasts, and individuals reliant on a constant electric supply to survive are among the most vulnerable population to lightning events
- Lightning has impacted critical communication infrastructure in the county, causing outages that have lasted days.
- Related Hazards: Wildfire, High Wind, Hail

4.3.13 Pandemic Disease

Hazard/Problem Description

A pandemic can be defined as a public health emergency that attacks a large population across great geographic distances. Pandemics are larger than epidemics in terms of geographic area and number of people affected. Epidemics tend to occur seasonally and affect much smaller areas. Pandemics, on the other hand, are most often caused by new subtypes of viruses or bacteria for which humans have little or no natural resistance. Consequently, pandemics typically result in more deaths, social disruption, and economic loss than epidemics.

There are three conditions that must be met before a pandemic begins:

1. A new virus subtype must emerge that has not previously circulated in humans (and therefore there is no pre-existing immunity),
2. This new subtype must be able to cause disease in humans, and
3. The virus must be easily transmissible from human to human.

As of March 2020, Archuleta County, the nation, and the world are dealing with the COVID-19 pandemic, confirming that pandemic is a key public health hazard in the county. This hazard risk assessment includes an analysis of pandemic risk in Archuleta County and an analysis of the impacts of the hazards profiled in this plan on public health.

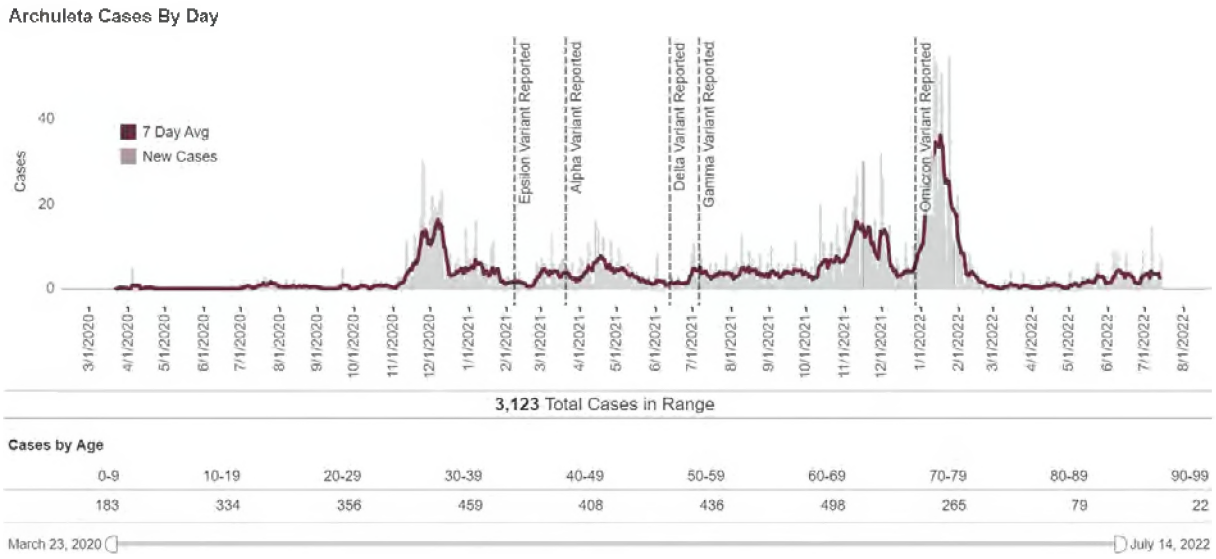
Unlike seasonal flu, an influenza pandemic has much greater potential for loss of life and significant social disruption due to higher rates of transmission and more severe health impacts. The COVID-19 virus has a much higher rate of transmission than the seasonal flu, primarily by airborne transmission of droplets/bodily fluid. Common symptoms include fever, cough, fatigue, shortness of breath or breathing difficulties, and loss of smell and taste. While most people have mild symptoms, some people develop acute respiratory distress syndrome. A key challenge in containing the spread has been the fact that it can be transmitted by people who are asymptomatic.

Past Occurrences

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

- **1918-19 Spanish flu (H1N1)**—This flu is estimated to have infected 20-40 percent of the world's population. An estimated 17 to 100 million people lost their lives. Between September 1918 and April 1919, 500,000 Americans died. The flu spread rapidly; many died within a few days of infection, others from secondary complications. The attack rate and mortality was highest among adults 20-50 years old; the reasons for this are uncertain. It is likely that the Spanish flu impacted Archuleta County given the nature of that particular strain, but exact impacts are unknown.
- **1957-58 Asian flu (H2N2)**—This virus was quickly identified due to advances in technology, and a vaccine was produced. Globally, more than 500 million people were infected and an estimated 1 to 4 million people lost their lives. Infection rates were highest among school children, young adults, and pregnant women. The elderly had the highest rates of death. A second wave developed in 1958. In total, there were about 70,000 deaths in the United States.
- **1968-69 Hong Kong flu (H3N2)**—This strain descended from the H2N2 virus which caused the Asian flu pandemic. Globally, more than 500 million people were infected, resulting in 1 to 4 million deaths. It was first detected in Hong Kong in early 1968 and spread to the United States later that year. Those over age 65 were the most vulnerable and severely affected. This virus returned in 1970 and 1972 and still circulates today.
- **2009 H1N1 Swine flu**—The 2009 H1N1 virus was first detected in the United States in April 2009. It is now believed that the outbreak began in either Mexico or somewhere in Asia. The World Health Organization officially declared a pandemic on June 11, 2009. Testing of the strain indicated that it did not contain markers associated with high deaths rates or increased risk of severe disease. About 70 percent of people who have been hospitalized with this 2009 H1N1 virus have had one or more medical conditions previously recognized as placing people at "high risk" of serious seasonal flu-related complications. This included pregnancy, diabetes, heart disease, asthma, and kidney disease. Young children were also at high risk of serious complications from 2009 H1N1, just as they are from seasonal flu. The elderly were not disproportionately affected by this strain, which is rare for most flu viruses. And while people 65 and older were the least likely to be infected with 2009 H1N1 flu, if they got sick, they were also at high risk of developing serious complications from their illness. The World Health Organization (WHO) declared the pandemic to be officially over in June 2010. The WHO estimated that over 18,000 people died of the H1N1 strain world-wide. This number could potentially be much higher. Deaths related to this particular strain of the virus could have gone unconfirmed or unreported. Nevertheless, this number is lower than the 250,000 to 500,000 people around the world who die of seasonal flu strains each year. In 2009, one person in Archuleta County was hospitalized for H1N1.
- **2020-Ongoing COVID-19:** —The COVID-19 or novel coronavirus pandemic began in December 2019 and was declared a pandemic in March of 2020. As of July 8, 2022, 554 million cases have been reported around the world with over 6.3 million deaths, including over 88 million cases and over 1 million deaths in the United States. As of July 15, 2022, Archuleta County has seen 3,123 cases and several variants (shown in the figure below), resulting in 16 deaths. According to the County's cases by age, elderly people (ages 60-69) had the highest number of cases. The pandemic is expected to persist into the foreseeable future, as the virus continues to mutate into different variants.

Figure 4-34 Archuleta County COVID-19 Cases (March 2020-July 2022)



Geographical Area Affected

Extensive - Archuleta County and the neighboring region all have potential for a pandemic outbreak.

Magnitude/Severity

Overall, the impacts from a pandemic disease outbreak in Archuleta County could be critical, with a significant percentage of the planning area's population affected. Local medical facilities could be rapidly overwhelmed. The medical facilities of neighboring jurisdictions would most likely be overwhelmed as well and unable to aid Archuleta County.

Archuleta County is a popular destination for tourists who come to the area seasonally. Depending on the time of year, the number of people in the planning area who could be affected by a pandemic disease could increase or decrease.

Frequency/Likelihood of Occurrence

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

Based on four worldwide outbreaks that affected the United States between 1918 and 2010, a 92-year period, a pandemic outbreak occurs on average about every 23-25 years.

Climate Change Considerations

Additional research is needed to determine the effects of climate change on the frequency and duration of epidemics and pandemics. Climate change may influence vector-borne disease transmission, although the direction of the effects (increased or decreased incidence) will be location- and disease-specific. The intensity and extent of certain diseases is projected to increase.

Ongoing efforts to reduce greenhouse gas emissions, building climate resiliency, and creating robust public health campaigns to prevent or prepare for possible increased vector-borne diseases may help to reduce the impacts of climate change on pandemics.

Vulnerability

People

Pandemics can affect large segments of the population for long periods of time. According to the 2018 Colorado State Hazard Mitigation Plan, a pandemic disease outbreak could affect approximately 30% of the state's overall population, with as much as 10% possibly needing hospitalization. The number of hospitalizations and deaths will depend on the virulence of the virus. Risk groups cannot be predicted with certainty; the elderly, people with underlying medical conditions, and young children are usually at higher risk, but as discussed above this is not always true for all influenza strains. People without health coverage or access to good medical care are also likely to be more adversely affected. Mental health of the public could also be impacted depending on the length of the event and public health guidance on prevention.

Property

For the most part, property itself would not be impacted by a human disease epidemic or pandemic. However, as concerns about contamination increase, property may be quarantined or destroyed as a precaution against spreading illness. Additionally, traditional sheltering facilities including homeless shelters or facilities stood up to support displaced persons due to an evacuation or other reason due to a simultaneous disaster occurring cannot be done in a congregate setting. This requires additional planning considerations or use of facilities that allow for non-congregate shelter settings which may require an approval of a request to FEMA for non-congregate sheltering and may have an increased cost (such as the use of individual hotel rooms) as opposed to traditional congregate sheltering facilities.

Critical Facilities and Lifelines

Hospitals and morgues will be heavily affected and may be overwhelmed. Other critical facilities and infrastructure are not directly affected by a pandemic but may have difficulty maintaining operations and maintenance activities due to a significantly decreased workforce. Schools may be forced to close. Government facilities may have difficulty continuing to provide services due to staffing shortages.

Economy

In a normal year, lost productivity due to illness costs U.S. employers an estimated $530 billion. During a pandemic, that figure would likely be considerably higher and could trigger a recession or even a depression. Mandatory shutdowns of businesses and services in the early weeks of the COVID-19 pandemic, for example, resulted in over 22 million people without jobs.

FluWorkLoss 1.0 is a tool developed by the CDC to estimate the potential economic impact of pandemic influenza on a community in terms of the number of workdays lost. Days missed from work cost both employees in lost wages, and employers in work not completed. Table 4-61 shows the total estimated number of days lost from work in Archuleta County due to a hypothetical four-week long influenza pandemic with a 25% clinical attack rate. The available workdays are calculated as a product of the total population in the working age group (Census 2021), the employment rate of Archuleta County (Census 2016-2020), and five workdays in a week. Results are estimated based on three scenarios: a mild, best-case scenario; a most likely scenario, and a more severe worst-case scenario.

Table 4-61 Total Workdays Lost (Pandemic Influenza)

Scenario	Workdays Lost
Minimum Loss Scenario	4,949
Most Likely Scenario	5,810
Maximum Loss Scenario	7,215

Source: FluWorkLoss 1.0, CDC

The number of workdays lost includes days lost for both self-care and care of sick family members and shows the County could lose hundreds of thousands of workdays in a month. Moreover, these estimates do not include workdays lost due to secondary impacts such as social distancing and the closure of schools and businesses.

The HMPC noted that during the COVID-19 pandemic the County and Town experienced an influx of out of state residents in 2020-2022, causing an increase in sales tax revenue, as people went to more rural areas. This may have been caused by delays in testing and testing results that lead to a misrepresentation of low Covid positivity rates in the County compared to other areas.

Historical, Environmental, and Cultural Resources

Impacts to these resources are typically minimal. However, reduced tourism could lead to additional economic impacts.

Development Trends

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

Risk Summary

In summary, pandemic disease is considered medium significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-62 Pandemic Disease Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Occasional	Critical	Medium
Pagosa Springs	Extensive	Occasional	Critical	Medium
Pagosa Fire Protection District	Extensive	Occasional	Critical	Medium
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Occasional	Critical	Medium

- Pandemics affecting the U.S. occur roughly once every 20 years but cannot be reliably predicted, therefore, the hazard is rated as occasional.
- The entire region is vulnerable to pandemic disease, particular members of the population who are elderly, have underlying medical conditions, or young children. People without medical insurance will also be adversely impacted.
- Significant economic impacts can result from a pandemic disease due to loss of revenue from sick employees and from disruptions in the supply chain, as seen in the COVID-19 pandemic.

- Ongoing mitigation activities should focus on preventing infection during flu season such as pre-season community outreach campaigns to educate the public about risks and available support; establishing convenient vaccination centers; reaching out to vulnerable populations and care givers; and issuing advisories and warnings.

4.3.14 Severe Winter Storm

Hazard/Problem Description

Winter storms and severe winter weather events, including blizzards and heavy snow, are a common occurrence in Colorado and can affect Archuleta County throughout the fall, winter, and spring seasons. The following definitions detail the types of winter weather events that can occur in Archuleta County:

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

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

The National Weather Service also tracks data on:

Winter Storms, defined as winter weather events that have more than one significant hazard (including falling or blowing snow, ice, and/or sleet) and meet or exceed regional 12- and/or 24-hour warning criteria for at least one of the included elements; and

Winter Weather, defined as events that do not meet regional warning criteria but that cause death, injury, or a significant impact to commerce or transportation.

Past Occurrences

Data from NOAA's NCEI Storm Events Database was used to compile past winter storm events, as defined above, in the Archuleta County planning area. The NCEI dataset listed a total of 767 events on 662 days occurring in the County from 1996 to March of 2022. Profiles of some of the more severe storms were obtained from articles from the Pagosa Springs Sun, HMPC records, and interviews with residents of Archuleta County. Table 4-63 is a summary table of these hazard events in Archuleta County and their associated losses. Events that are primarily related to extreme cold are profiled in Section 4.3.6 Extreme Cold.

Table 4-63 Archuleta County Severe Winter Weather Hazards Summary (1996-2022)

Hazard	Total Number of Days with Wind Events	Total Number of Events	Total Property Damage	Total Fatalities	Total Injuries
Blizzard	9	9	$10,000	0	0
Heavy Snow	119	139	$0	0	0

Hazard	Total Number of Days with Wind Events	Total Number of Events	Total Property Damage	Total Fatalities	Total Injuries
Winter Storm	219	269	$35,000	0	0
Winter Weather	315	350	$0	0	0
Total	662	767	$45,000	0	0

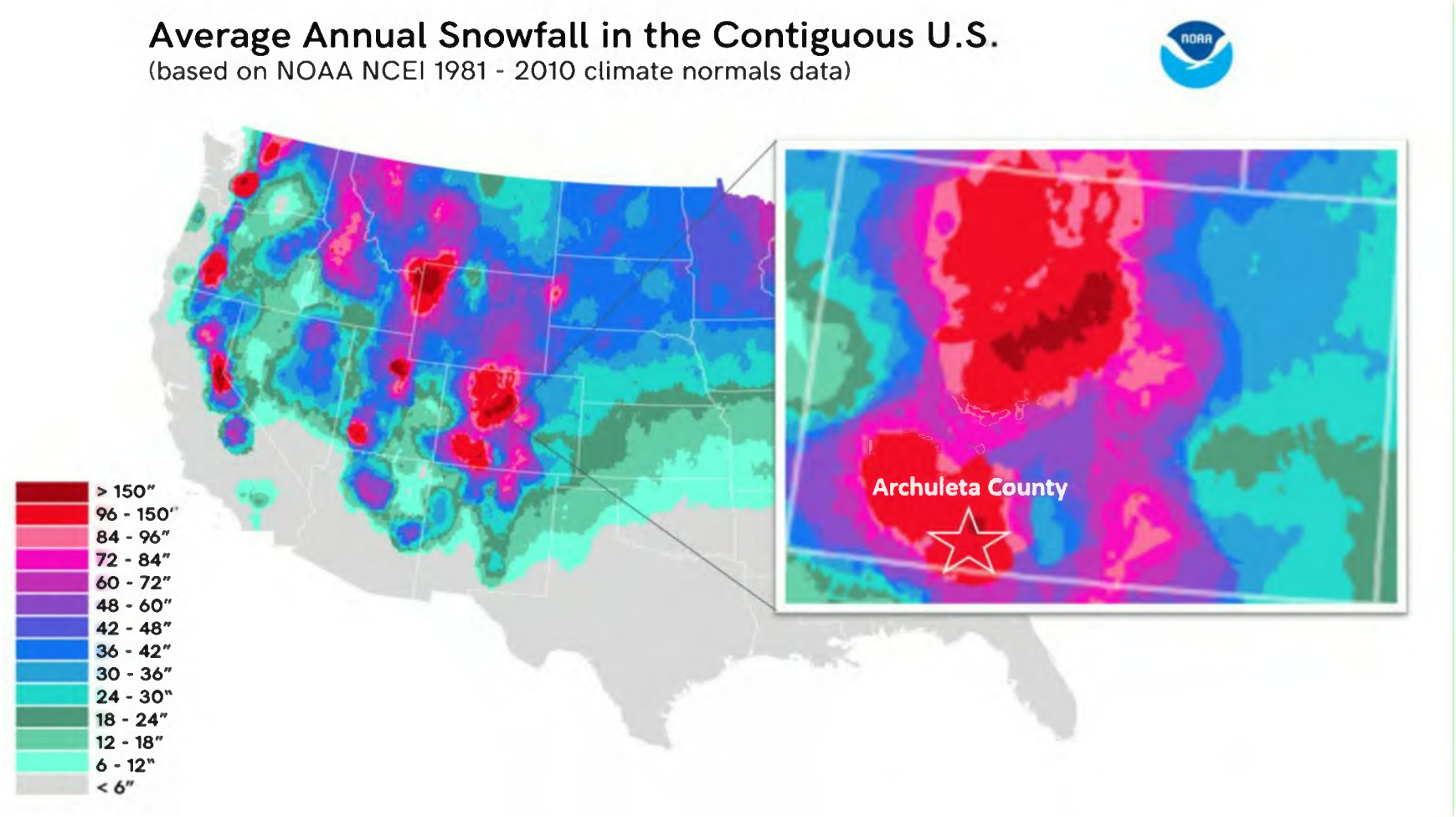
Source: NCEI

Details from the NCEI dataset are discussed below:

- **February 2004** – Thousands of people were left without electricity for several hours, resulting in an estimated $20,000 in property damages.
- **January 2008** – Widespread snowfall of 6 to 12 inches occurred while wind gusts of 20 to 45 mph. The combination of wind and snow caused power outages in some areas. Resulted in an estimated $15,000 in property damages.
- **December 2007**—A winter storm brought extremely wet and heavy snow to the County in December 2007. Power poles and electrical lines became overloaded with snow, and many people across the planning area lost power as a result. Outages in specific areas lasted several hours due to the remote locations of certain transmission lines that are only accessible by foot. Highway 550 was closed, downed trees occurred. Losses totaled an estimated $10,000 in damages.
- **November 2016**—A strong and moist upper-level trough brought a series of heavy snowfall that affected most mountain areas and higher elevation valleys. Generally, 8 to 16 inches were measured across the study area, but some areas recorded over 25 inches.
- **January 2017**—An atmospheric river event followed by cold fronts produced snowfall throughout western Colorado. Pagosa Springs measured 5 to 7 inches, however, locally higher amounts included 53 inches at the Spud Mountain SNOTEL site.

Archuleta receives an average annual snowfall of 75.9 inches, which is significantly higher than the U.S. average of 38.1 inches per year. The snowfall season typically occurs between October and April in the County, with peak snowfall in January. Figure 4-35 displays the average annual snowfall across the United States created by the NOAA. Colorado is one of the snowiest states in the United States, and Archuleta County is in an area of the state with highest amounts of snowfall. Not all winter weather is considered hazardous. Snowfall and storms that build snowpack annually is vital to the water resources and winter tourism economy of Archuleta County and the surrounding region.

Figure 4-35 Average Annual Snowfall in U.S.



Source: NOAA

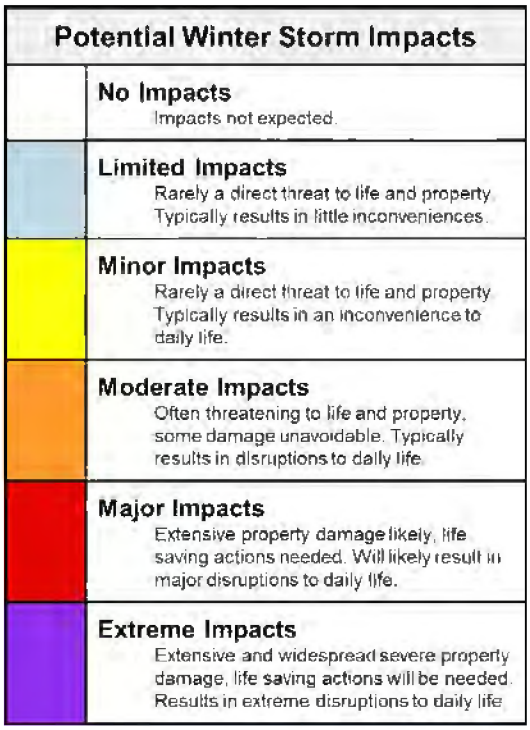
Geographic Area Affected

All of Archuleta County is subject to blizzard, heavy snowfall, ice storm, and other winter weather conditions; therefore, geographic extent of severe winter weather is rated as **extensive**. Most severe winter storms are widespread events, impacting multiple counties simultaneously and for extended time periods. Additionally, more severe winter weather tends to be at higher elevations in the County.

Magnitude/Severity

Figure 4-36 shows the Winter Storm Severity Index (WSSI), which provides NWS partners and the public with an indication of the level of winter precipitation severity and its potential related societal impacts.

Figure 4-36 Winter Storm Severity Index (WWSI) Scale



Source: https://www.weather.gov/ict/WSSI_Overview

It is difficult to calculate a reasonable average annual loss estimate, as the damage noted in NCEI may reflect only a fraction of the total event damage and may be not specific to Archuleta County. However, based on the information in the table above, the total recorded losses in the county totaled $45,000 in property damages over the past 26 years.

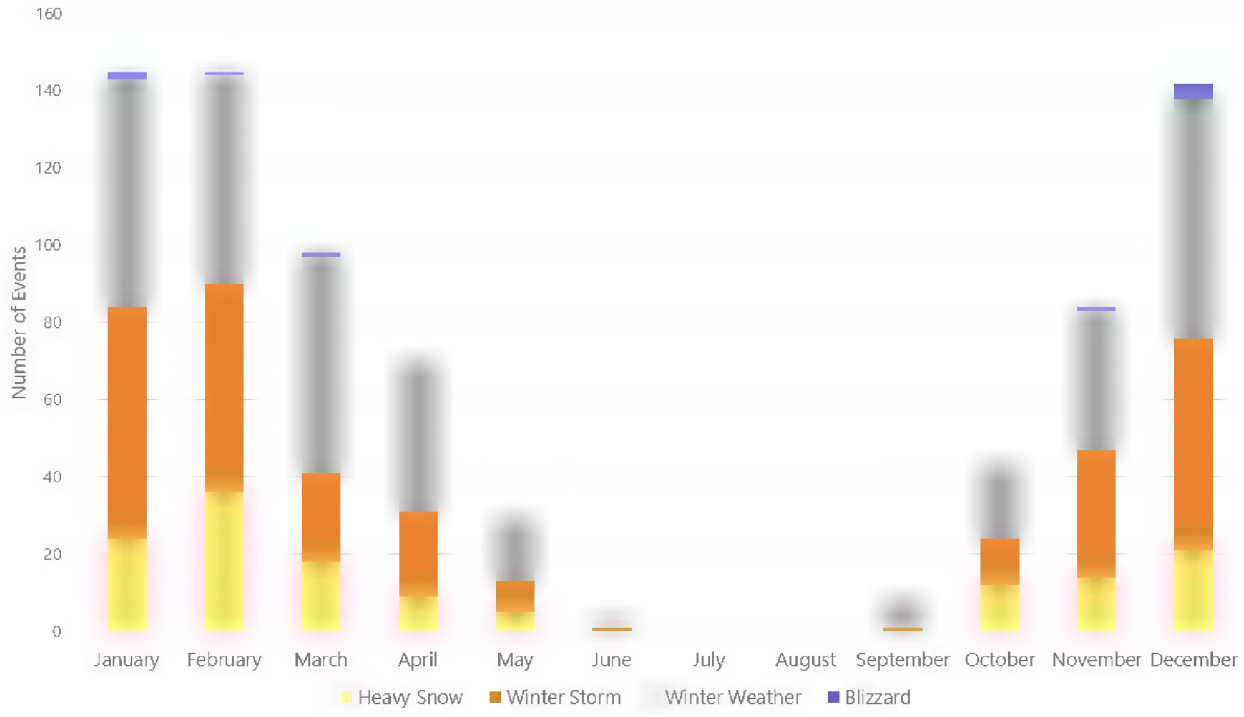
Overall, severe winter storm impacts could be **limited**. The residents in Archuleta County appear to take the weather in stride as part of mountain living. Most problems with winter storms are related to vehicle accidents and power outages. The highest risk will be to travelers that attempt to drive during adverse conditions. Economic impacts occur because of power outages and closing Highway 160 for snow removal and avalanche control.

Frequency/Likelihood of Occurrence

The HMPC estimates that severe winter storms or blizzards are highly likely to occur in any given year. More damaging severe storms may have a slightly lower frequency of occurrence. Based on the data presented

above, it is likely that a damaging winter storm will occur. According to the NCEI data, there has been 662 days with events since 1996, 26 years ago. The greatest number of severe winter weather events occurred in January and February in Archuleta County, with a total of 145 events in each month. Severe winter weather events have been recorded nearly yearlong, except for July and August. Figure 4-37 displays the distribution of events by month. This indicates that on average, there are 25.5 severe winter weather events in the county annually, or a 100% chance of an event occurring somewhere in the County every year. Therefore, the likelihood of severe winter storm events in Archuleta County is **highly likely.**

Figure 4-37 Severe Winter Weather Events by Month (1996-2022)



Source: NCEI data, figure by WSP

Climate Change Considerations

According to the 2018-2023 State Hazard Mitigation Plan, winter storm events are projected to become more severe, and winter precipitation events are expected to increase in frequency. However, the Fourth National Climate Assessment reports that portions of the Southwest are experiencing an increase in the proportion of rain to snow in precipitation patterns and projections indicate continuations of this trend as well as a shorter snowfall season. A warming climate may also result in warmer winters, the benefits of which may include lower winter heating demand, less cold stress on humans and animals, and a longer growing season. However, these benefits are expected to be offset by the negative consequences of warmer summer temperatures and impact to water resources.

Vulnerability

People

Vulnerable populations include the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life-threatening to those dependent on electricity for life support. Isolation of these populations is a

significant concern. These populations face isolation and exposure during severe winter weather events and could suffer more secondary effects of the hazard. Commuters who are caught in storms may be particularly vulnerable. Stranded commuters may be vulnerable to carbon monoxide poisoning or hypothermia. Additionally, individuals engaged in outdoor recreation during a severe winter event may be difficult to locate and rescue. The HMPC noted that out of state visitors are less likely to be prepared for the poor road conditions due to winter weather; due to the proximity of the County to other more temperate States (New Mexico, Texas, Arizona) the area is frequently visited by travelers from warmer climates. No injuries or fatalities were reported in Archuleta County due to severe winter weather.

Property

All property is vulnerable during severe winter weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse.

Based on the 767 total winter weather events that have occurred in the County between 1996 and 2022, only three of the events had reported property damage. These events include the blizzard in December of 2007, and two winter storms in February of 2003 and January of 2008. These reported damages were due to power outages, blown trees, and high winds that caused white-out conditions on Highway 550, causing road closures for several hours.

Critical Facilities and Lifelines

Incapacity and loss of roads are the primary transportation failures resulting from severe winter weather, mostly associated with secondary hazards. Major roadways such as U.S. Route 151, 160, and 84 run through Archuleta County. The NCEI dataset reported road closures due to severe winter weather events, including frequent closures of Highway 160 on Wolf Creek Pass, in part due to avalanche control by CDOT. Hazardous conditions to motorists if blizzard or severe winter weather conditions occur, especially to portions of highways and other major roads that are narrow and curved. Major accidents could lead to delays for emergency vehicles.

Snowstorms can significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and to the elderly. Prolonged obstruction of major routes can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

Economy

Roads may become impassable due to ice or snow. Ice accumulation on roadways can create dangerous driving conditions. There are limited county roads that are available to move people and supplies throughout the region. Many of the small side roads are narrow and curved. As noted above, there are several major highways that runs through the County. These roads are vital to transportation within and through Archuleta County. Accidents on the highway can cause a major disruption in the flow of goods and services in and out of the County. It should be noted that periodic road closures during winter storms on Highway 160 are necessary for avalanche mitigation and in the interest of public safety.

Historical, Environmental, and Cultural Resources

While winter storms are part of the natural environment, trees can still sustain damage particularly during unseasonable snowstorms. Flooding events caused by rapid snowmelt can produce river channel migration or damage riparian habitat. Livestock and crops are also vulnerable to winter weather conditions.

Development Trends

All future development will be exposed to severe winter storms, but if built with modern construction practices and to local codes and standards the vulnerability of community assets should not increase. Greater populations are exposed to severe winter storms is increasing over time as more people enter the and live in the planning area. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction.

Risk Summary

In summary, severe winter storm is considered high significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-64 Severe Winter Storm Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Highly Likely	Limited	High
Pagosa Springs	Extensive	Highly Likely	Limited	High
Pagosa Fire Protection District	Extensive	Highly Likely	Negligible	Medium
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Highly Likely	Negligible	Medium

- Severe winter storms can produce strong winds and significant accumulations of snow and ice. These events are likely to continue occurring in the future. These storms can impact the entire county and are therefore ranked as extensive.
- The NCEI recorded 662 events over 767 days from 1996-2022, therefore severe winter storms are likely to occur multiple times a year and are rated as highly likely.
- The NCEI reported $45,000 in property damages and no crop damages – the magnitude and severity of winter storms is ranked as limited.
- Power outages and poor road conditions are likely impacts of severe winter storms.
- Elderly populations, individuals with pre-existing conditions, out of state visitors, and populations without appropriate shelter are vulnerable to winter weather.
- Related hazards: Extreme Temperatures, Severe Wind, Avalanche, Flooding

4.3.15 Volcano

Hazard Problem/Description

A volcano is a vent in the earth's crust or mountain formed by the eruption of subsurface material including lava, rock fragments, ash, and gases, onto the earth's surface. Volcanoes produce a wide variety of hazards that can damage and destroy property and cause injury and death to people caught in its path. Hazards include those related to volcanic activities such as: eruption columns and clouds, volcanic gases, lava/pyroclastic flows, volcanic landslides, and mudflows or debris flows (called lahars). Large explosive eruptions can cause damage several hundred miles away from the volcano, primarily from ashfall. The

distribution of ash from a violent eruption is a function of the weather, particularly wind direction and speed and atmospheric stability, and the duration of the eruption. As the prevailing wind in the mid-latitudes of the northern hemisphere is generally from the west, volcanic ash is usually spread eastward from the volcano. Exceptions to this rule do, however, occur. Ash fall, because of its potential widespread distribution, offers some significant volcanic hazards.

Based on the evidence of past activity, volcanoes can be considered "active", "dormant", or "extinct." "Active" volcanoes usually have evidence of eruption during historic times. Volcanoes have a wide degree of variability in their eruptions, from mild lava flows to large explosions that eject tons of material and ash into the air. The degree of volcano hazard depends largely on if the volcano has a reasonable probability of erupting, the nature of the eruption, and the associated hazards that may be triggered.

Past Occurrences

The USGS monitor over 160 active and potentially active volcanoes in the U.S. The most volcanically active regions in the U.S. are in Alaska, Hawaii, California, Oregon, and Washington. The closest areas of potentially active volcanoes and volcanic hazards are in New Mexico (Figure 4-38 and Figure 4-39). Northern New Mexico volcanic centers that have potential volcanic hazards include, from north to south: the Raton-Clayton, Taos, the Jemez, and Zuni-Bandera volcanic fields. The only volcano in Colorado that has erupted during the Holocene (during the last 11,000 years) is Dotsero Volcano, which last erupted approximately 2,200 years ago and consists of a maar volcano, basaltic lava flows, and scoria cones (Smithsonian Global Volcanism Program, 2010). According to the USGS, Dotsero Crater formed when magma encountered water and explosively blasted a crater through the rock, showering tephra, which is ash and rock fragments ejected from a volcano, across the landscape. Today Interstate 70 cuts through the lava flow that originated from the Dotsero eruptions. Dotsero is considered a moderate-threat volcano (Ewert et al., 2005) because explosive eruptions could eject enough ash into the air to pose a threat to aviation. However, given the type of volcanism and its location in north-central Colorado, Dotsero is too distant to pose a hazard to the county of Archuleta.

Although hot springs are often associated with young volcanic activity, the hot spring activity at Pagosa Springs is not considered to be associated with a volcanic heat source. Rather there is evidence that thermal waters are heated during circulation into sedimentary horizons of the Colorado Plateau and deeper circulation into Precambrian basement rocks (Pearl et al., 1978; Galloway, 1980; Goff, 1994).

The only potential volcanic hazard to Archuleta County would be from ashfall from a distant, large explosive eruption. Hazards from volcanic ashfall include:

- Short-circuits and failure of electronic components, especially high-voltage circuits and transformers (wet ash conducts electricity).
- Eruption clouds and ashfall commonly interrupt or prevent telephone and radio communications.
- Volcanic ash can cause internal-combustion engines to stall by clogging air filters and damage the moving parts. Engines of jet aircraft have suddenly failed after flying through clouds of even thinly dispersed ash.
- Roads, highways, and airport runways can be made treacherous or impassable because ash is slippery and may reduce visibility to near zero.
- Ash also clogs filters used in air-ventilation systems to the point that airflow often stops completely, causing equipment to overheat.
- Crop damage can range from negligible to severe, depending on the thickness of ash, type and maturity of plants, and timing of subsequent rainfall.

- Like airborne particles from dust storms, forest fires, and air pollution, volcanic ash poses a health risk, especially to children, the elderly, and people with cardiac or respiratory conditions, such as asthma, chronic bronchitis, and emphysema (USGS, 2004).

Many geologically recent large explosive eruptions (e.g., Mt. St. Helens, WA; Yellowstone, WY; Long Valley Caldera, CA; Valles Caldera, NM) have distributed ash over a large area of the U.S., including the area of Archuleta, Colorado (Figure 4-38). The amount of ashfall deposits from a distant eruption in Archuleta County would likely be less than 5 cm thick (Figure 4-40). The most likely source of a nearby explosive eruption is the Jemez Mountains, located approximately 70 miles south of Archuleta County in northern New Mexico. Voluminous explosive eruptions at 1.6 and 1.2 million years ago formed the Valles Caldera and erupted over 90 cubic miles of ash and rock, forming the Bandelier tuff. Ash from this eruption traveled hundreds of miles. The most recent volcanic eruptions in the Jemez Mountains were approximately 50,000 years ago (Reneau et al., 1996), and deposited significant ashfall in eastern New Mexico and several decimeters of ashfall in Santa Fe (Wolff et al., 2010). Based on temporal and petrologic patterns of volcanism and seismologic data indicating a low-velocity zone at depth, Wolff and Gardner (1995) suggest that the most recent eruption in the Jemez Mountains may be the beginning of a new cycle of volcanic activity rather than the end of the last cycle of activity. The San Juan volcanic field, located in the San Juan Mountains of southwestern Colorado, is an area of Oligocene to Pliocene volcanic activity, and is not considered to be a volcanic hazard. Older large explosive eruptions formed numerous calderas in the San Juan volcanic field.

Figure 4-38 Volcanic Hazards in the United States based on activity during the last 15,000 years (U.S. Geological Survey)

Red and orange areas show higher and lower risk of local volcanic activity including lava flows, ashfall, lahars, and debris avalanches; whereas gray shaded areas show regions at risk of receiving 5 cm or more of ashfall from large explosive eruptions (as compiled by Mullineaux, 1976).

Figure 4-39 Locations of Potentially Active and Active Volcanoes with Respect to Major Population Centers in the Western United States (Modified from Wright and Pierson, 1992)

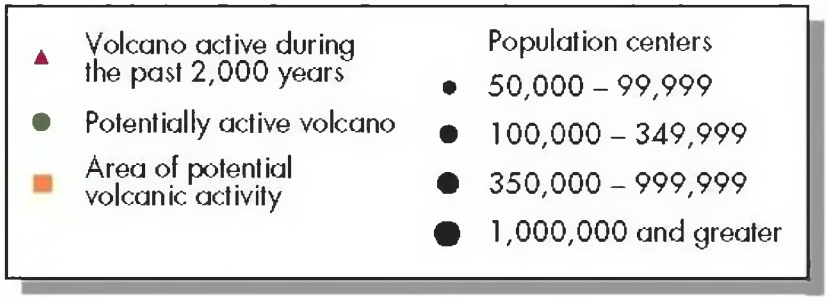
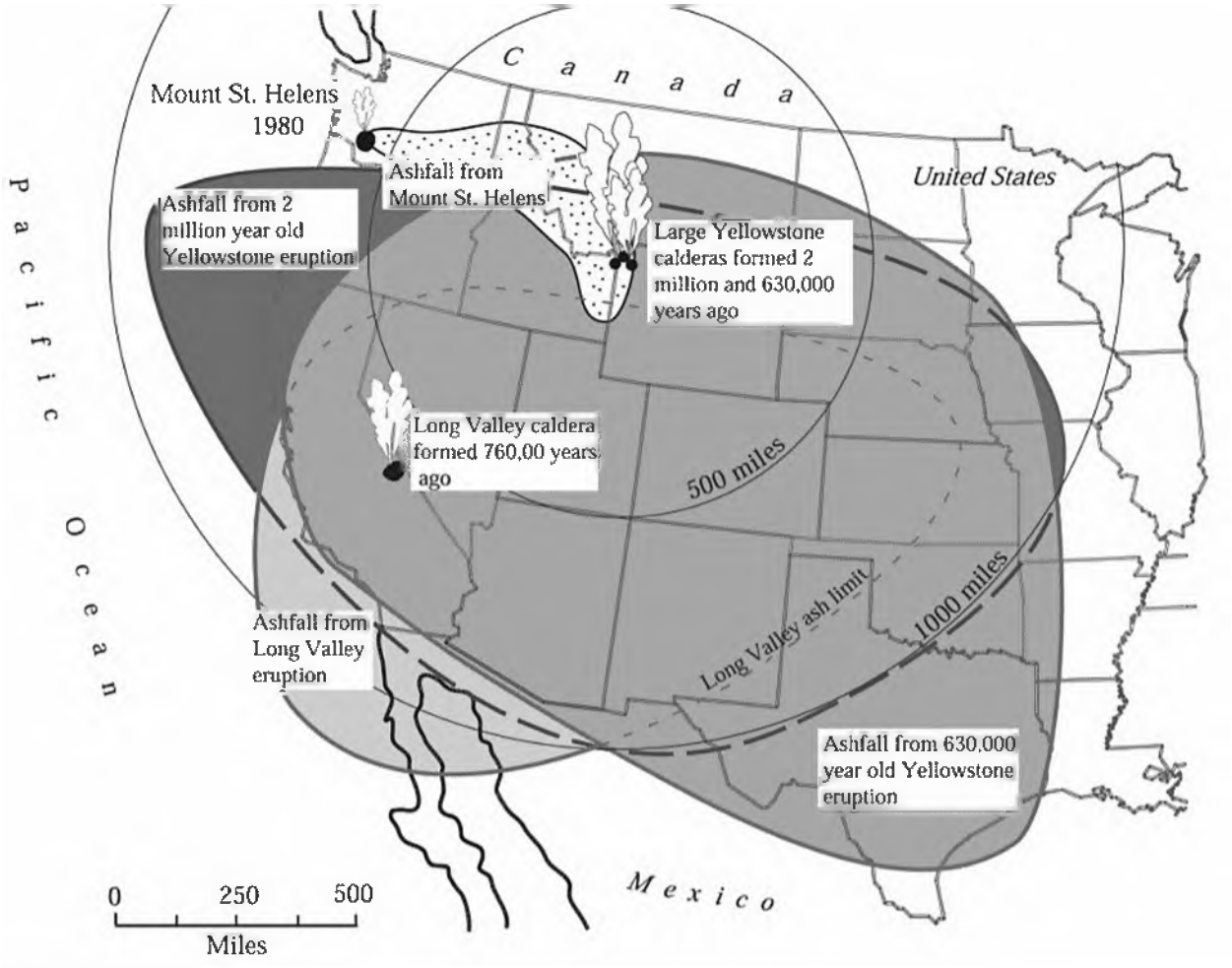


Figure 4-40 Areas of the United Stated That Once Were Covered by Volcanic Ash from Major Eruptions



Source: U.S. Geological Survey

Ashfall distribution from Yellowstone's giant eruptions 2 million and 630,000 years ago, compared with ashfall from the 760,000-year-old Long Valley caldera eruptions at Mammoth Lakes, California, and the 1980 eruption of Mount St. Helens, Washington (adapted from Sarna-Wojcicki, 1991).

Geographical Area Affected

Limited: There are no sources of volcanic hazards in Archuleta County, Colorado, as noted in the previous section. However, Archuleta County could be affected by ashfall from explosive eruptions at distant active and potentially active volcanoes in the western U.S., especially nearby northern New Mexico.

Magnitude/Severity

Based on the information provided in this profile, the potential magnitude of the volcanic hazard is considered **negligible**.

Frequency/Likelihood of Future Occurrence

Unlikely: The closest source of ashfall from an explosive eruption is the Jemez Mountains in northern New Mexico, 70 miles south of Archuleta. Based on historic data (most recent volcanic activity in the Jemez ended

approximately 50,000 years ago), it is highly unlikely that volcanic activity will resume any time soon. An explosive eruption from the Cascade Range or the Long Valley Caldera is more likely but would likely result in less than 5 cm of ashfall deposits and would pose a minimal hazard to Archuleta.

Climate Change Considerations

While most climate change considerations associated with hazards identified in this risk assessment pertain to how climate change might impact specific hazards, the considerations involved between climate change and volcanoes work the opposite way. While climate change is not expected to impact the size or frequency of eruptions, eruptions themselves can have a huge impact on climate. Eruptions can inject millions of tons of gases and debris into the atmosphere, which can circulate far away from the incident site and disrupt normal climate patterns. Large-scale volcanic activity may only last a few days, but the massive outpouring of gases and ash can influence climate patterns for years, influencing both heating and cooling.

Vulnerability

People

Volcanic ash poses a public health risk, especially to children, the elderly, and individuals with cardiac and respiratory considerations. The U.S Department of Health and Human Services tracks Medicare beneficiaries who rely on electricity-depending medical equipment, such as ventilators, oxygen concentrator equipment, and implanted cardiac devices. According to HHS, there are 436 electricity dependent Medicare beneficiaries in the County who rely on electricity to live independently in their homes. Many of these same individuals will be vulnerable to effects of volcanic ash. The abrasiveness of the volcanic ash particles can scratch the surface of skin and eyes and in general cause discomfort and inflammation, in addition to difficulties breathing or death if too much ash is inhaled.

Property

It is unlikely that Archuleta County would be affected by the explosive impacts of a volcanic eruption, which are often catastrophic. However, ashfall can impact both the interior and exterior of buildings. The interior of buildings can be contaminated with ash that builds up in air vents and filters. The exterior of buildings can have abrasive damage to roofs and gutters can be blocked with ash which could lead to secondary flooding issues. If a rain event were to occur post eruption, it can turn ash into heavy, cement-like sludge that can lead to the collapse of roofs and difficulty when cleaning up.

Critical Facilities and Lifelines

Critical facilities and lifelines are most vulnerable to the effects of ashfall. Volcanic eruption with ashfall can cause electricity outages and issues with power supply. The air intakes for generators will also be vulnerable to airborne ash post eruption. Telephone and radio communications can also be interrupted and electronic components and short-circuits especially high-voltage circuits and transformers can fail due to ashfall.

Wastewater collection systems are also vulnerable to damage from ashfall. Buildup of ash in drainage systems can result in stormwater flooding. Ash-laden sewage that makes its way to wastewater treatment plants can cause mechanical damage and if it makes it further through the system it will settle and reduce the capacity of biological reactors increasing the volume of sludge and changing its composition.

Transportation infrastructure is also vulnerable to the impacts of ashfall. Roads, highways, and airport runways can be made impassable due to the slippery ash and reduction of visibility. The abrasive volcanic ash can have damaging effects on aircraft including melting the inside of engines and solidifying the turbine blades ultimately causing the engine to stall. Ash can also lead to the failure of critical navigational and operational instruments.

Economy

In general, volcanic eruptions pose a risk to the tourism economy. Ashfall can disrupt travel into and out of all areas of the county and create perilous conditions for residents, tourists, and nature alike. Ashfall can also lead to widespread power loss which could have lasting impacts on local businesses. The perception of risk after a volcanic event could also lead to a downturn in visitors to the County leading the local communities to advertise that they are safe to visit.

Historical, Environmental, and Cultural Resources

Volcanic ash can collect carbon dioxide and fluorine gases that can be toxic to humans and have significant impacts on the natural environment. Windblown ash can spread and pollute areas that had previously been unaffected. Vegetation is also vulnerable to the impacts of ashfall that can result in decreased plant photosynthesis and poor pollination if flowers were damaged. Visual inspection of vegetation in a large area of the State of Washington impacted by the Mount Saint Helens eruption showed three broad categories of plant damages: (1) Breakage due to the weight of ash (2) physiological changes such as decreased plant growth and (3) chemical damages to the leaves (Ayris, Delmelle, 2012). Water bodies are also vulnerable to the effects of ashfall and can cause chemical changes that can affect water quality.

Development Trends

Due to the extremely low likelihood of measurable impacts of a volcanic eruption to the planning area, it is not likely that Archuleta County would see any negative change in vulnerability to volcanoes with increased development and continued growth. These development trends are unlikely to have an impact on the significance of this hazard.

Risk Summary

Table 4-65 Volcano Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Archuleta County	Limited	Unlikely	Negligible	Low
Pagosa Springs	Limited	Unlikely	Negligible	Low
Pagosa Fire Protection District	Limited	Unlikely	Negligible	Low
Pagosa Area Water and Sanitation District (PAWSD)	Limited	Unlikely	Negligible	Low

- In general, volcano is a **low** significance event in the county.
- Effects on people: Serious adverse health impacts can occur, such as scratches and abrasion to the skin and eyes from direct contact with ash, and ultimately death potentially if ash is inhaled and cements in the lungs.
- Effects on property: exterior of buildings can have abrasive damage to roofs and gutters can be blocked, and the collapse of roofs if too much ash accumulates.
- Effects on the economy: ashfall can lead to disruptions in the tourism industries, through the prevention of travel and access to affected areas, as well as massive losses to agriculture if heavy ashfall were to occur during the growing season.
- Effects on critical facilities and infrastructure: ash can seriously damage electrical and mechanical components of infrastructure, disrupt air travel and EMS/first responder operations, and lead to backups and damage of wastewater systems.

- Related hazards: earthquake

4.3.16 Wildland Fire

Hazard/Problem Description

Wildland fires are an ongoing concern for Archuleta County. The predominant values at risk are the population, residences, and businesses of the wildland-urban interface (WUI) communities. Habitat, watersheds, travel corridors, infrastructure systems, and cultural and natural resources are among the extensive list of additional significant values at risk within the county.

Fire conditions arise from a combination of hot weather, an accumulation of vegetation, and low moisture content in the air. These conditions, when combined with high winds and the impacts of seasonal or prolonged drought and frost killed brush increase the potential for a wildland fire to occur. A fire along the urban/rural interface can result in major losses of property and structures. Limited access in some parts of the County complicates evacuation and control options and constitutes serious life risk to residents and firefighters alike.

In wildland fire vernacular, hazard is described in terms of fuel characteristics, i.e., the vegetation available to combustion. Risk is considered in terms of probability and analyzed through historic fire records, while values at risk are determined by potential loss in a wildland fire. Fire danger refers to a combination of fuel moisture and weather conditions that combine with topography and other fuel characteristics to determine fire behavior as manifested in fire intensity and rate of spread.

- **Fuel**: Vegetative fuels are characterized by size, vertical arrangement, continuity, and quantity and are often classified in terms of fire behavior fuel models (FBFM). These fuel characteristics determine responsiveness to weather conditions and ignition. Fuel sources are diverse and include ground fuels (roots, duff), surface fuels (forest litter, dead and down twigs and branches, grass, shrubs), and aerial fuels (the canopies of forest and brush). Manmade structures and other associated combustibles are also considered fuel sources. Light surface and canopy fuels, such as cured grasses and drought stressed tree crowns, burn quickly and serve as a catalyst for rapid fire spread.
- **Topography**: An area's terrain and land slopes affect its susceptibility to wildland fire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- **Weather**: Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildland fire. High temperatures and low relative humidity dry out the fuels that feed the wildland fire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most influential weather factor for fire intensity and the direction and rate of fire spread. Winds can be significant at times in Archuleta County. In addition to high winds, wind shifts can occur suddenly due to frontal passage, temperature changes, or the interaction of wind with topographical features such as slopes or steep hillsides. Seasonal and episodic drought effects fuels' availability for combustion.
- **Ignitions**: Wildland fires are ignited by natural causes, predominately lightning, or human causes. Federal agencies categorize human caused in terms of equipment, smoking, campfires, debris burning, railroads, and arson. Human caused ignitions are associated with travel corridors, population centers, recreational use, and commercial activities. A concern in Archuleta County is that structure fires in rural areas may be sources of wildland fires, as response times can be significant in the more remote areas of the County. A member of the public in the Town of Pagosa Springs noted that lithium batteries,

which are found in most mobile phones, laptop computers, and other electronic devices have been known to cause fires in the trash vehicles and landfills.

An additional hazard associated with wildfire is debris flow. Wildfires could potentially result in the destabilization of pre-existing deep-seated landslides over long time periods. Post-fire geologic hazards can occur in the years immediately after wildfires catalyzed by high intensity rainfall events. Debris flows are particularly hazardous because they can occur with little warning, can exert great impulsive loads on objects in their paths, can strip vegetation, decrease soil strength, destroy root systems, block drainage ways, damage structures, and endanger human life. See 4.3.10 Landslide/Rockfall/Debris Flow for further description and analysis.

Past Occurrences

An analysis of historic fire records helps to define the area's fire season and patterns of fire occurrence over time and by jurisdiction. The most comprehensive fire data was available from the United States Department of Agriculture (USDA) Research Data Archive from 1992 to 2018. Data from the National Centers for Environmental Information (NCEI) from 1996 to March of 2022, as well as the Archuleta County Community Wildfire Protection Plan (CWPP) from October 2019, is used for wildfire data in Archuleta County. Some local fire data were available for the last decade. The only disaster declaration due to wildfire that impacted Archuleta County was DR-1421-CO. This disaster declaration was issued for 58 counties across Colorado due to wildfires from Apr 2,2002 – Aug 6, 2002.

The hazard mitigation planning committee (HMPC) also provided supplementary information on wildfire events in the County. The HMPC shared details on the Plumtaw fire, which began May 17th of 2022 just north of the Town of Pagosa Springs and burned 727 acres before it was declared out on August 10th of 2022. Evacuation notices were issued for residents living in the area. A statement from the Public Affairs Officer stated that 33 homes in the area were at risk of damage from the fire, but no homes were destroyed. There was significant emphasis placed on mitigating negative impacts from the fire along Fourmile Road and P;umtaw Road in the County. The cause of the fire is still under investigation.

Archuleta County is 1,364 square miles (861,129 acres) in size. The San Juan National Forest covers slightly less than half of the county, composing 418,565 acres of county land. There are an additional 5,837 acres of Bureau of Land Management (BLM) land in the county, managed in concert with the USFS lands through the San Juan Public Lands Center. A portion of the 130,456 total acres owned by the Southern Ute Indian Tribe is in Archuleta County. Fire occurrence since 2001 has been consistent in respect to jurisdiction, but not necessarily proportional to area. The land area of Hinsdale County within the Archuleta County Response Area covers 188,858 acres. Approximately 96% of this area is managed by the USFS. The Colorado Division of Wildlife (CDOW) manages 0.3% of the land, and the remaining 4% is privately owned. The total acreage in the portion of Mineral County that falls within the Archuleta County Response Area is 143,402. The USFS manages 95% of this area, while private ownership accounts for the remaining 5%.

The USDA Research Data Archive has kept a detailed database of wildfires occurring in Archuleta County from 1992 to 2018, documenting 1,735 events in total. Figure 4-41 displays these events by year in which they occurred. Wildland fire occurrence depends on the coincidence of an ignition source and a receptive fuel. As such, fire occurrence is typically associated with year-to-year fuel moisture and weather conditions and can appear rather stochastic. This can be seen when looking at fire occurrence for the last decade, where there seems to be no discernable pattern of fire occurrence over time. However, there is a general trend in increasing number of wildfire events over the past several decades.

Figure 4-41 Number of Wildland Fires in Archuleta County by Year: 1992-2018

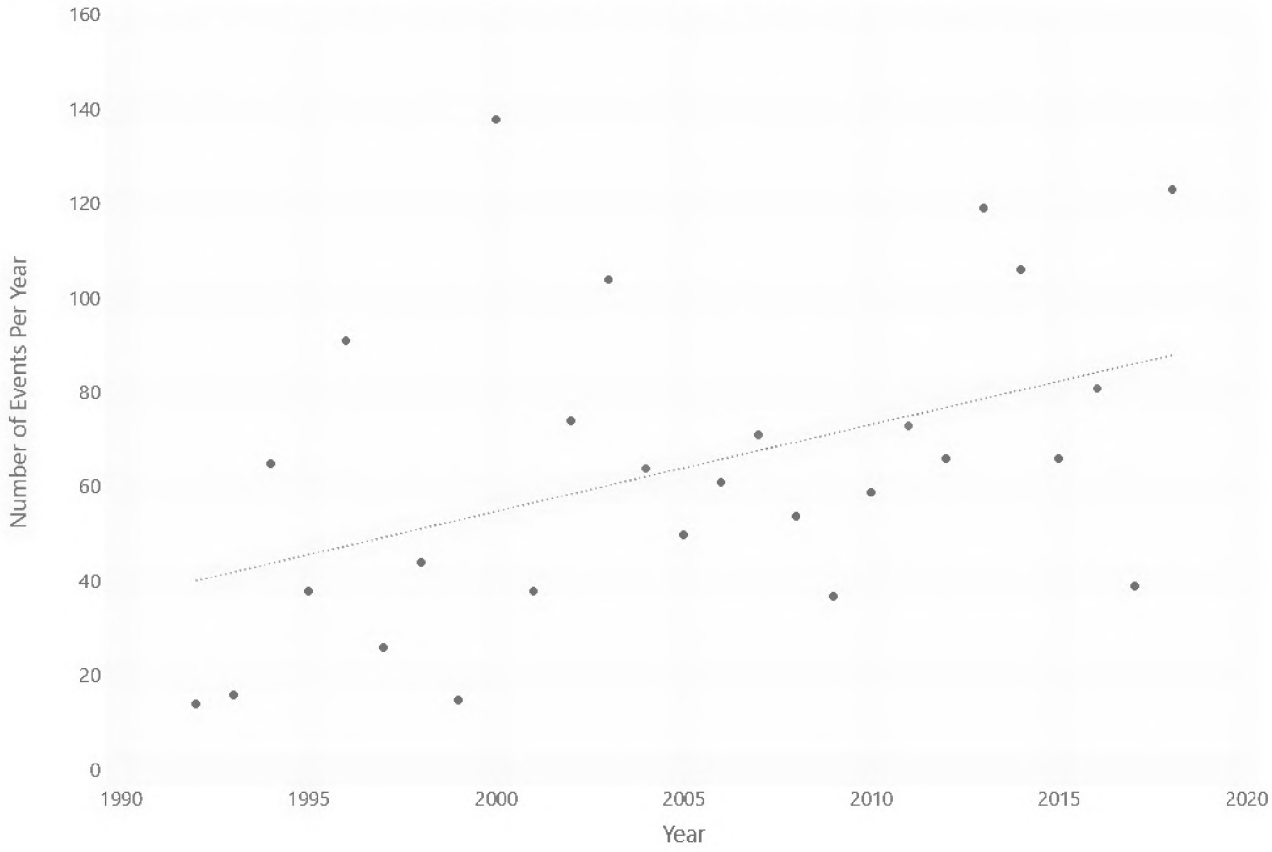


Illustration by Wood, Data Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

In addition to the total number of wildfires increasing over the past several decades in Archuleta County, the magnitude of these fires is also increasing. While total acres burned from wildfires varies from year-to-year, there is a general trend in the increase of total acres burned over the past several decades in Archuleta County. Figure 4-42 displays the total acres burned from fires each year in Archuleta County.

Figure 4-42 Total Acres Burned from Wildland Fires in Archuleta County by Year: 1992-2018

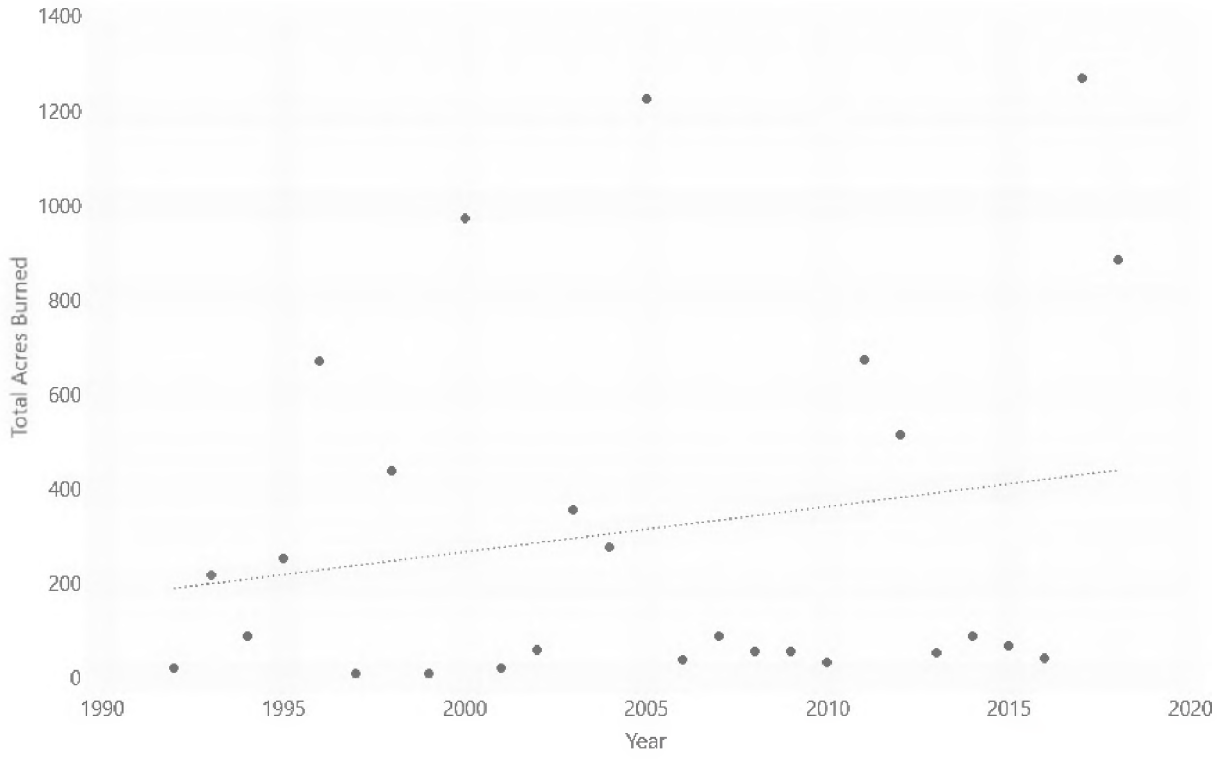


Illustration by Wood, Data Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

While wildland fire potential can persist throughout the year, a vast majority of wildland fires in Archuleta County occur from May through September, with a peak number of events occurring in July. Figure 4-43 displays the distribution of wildland fire events by month in Archuleta County. The number of wildland fire events peaks in July occurs for several reasons. Summers are hot and dry which makes fuel easier to catch on fire and burn. Additionally, summer months are associated with greater frequency of lightning which can cause wildland fires, as well as an increase in outdoor tourism such as camping, which can lead to human-caused wildland fires. This well-defined fire season is helpful for planning suppression resource availability. Identifying the fire season also helps define which weather and fuel moisture records should be used to model wildland fire behavior.

Figure 4-43 Number of Wildland Fires in Archuleta County by Month: 1992-2018

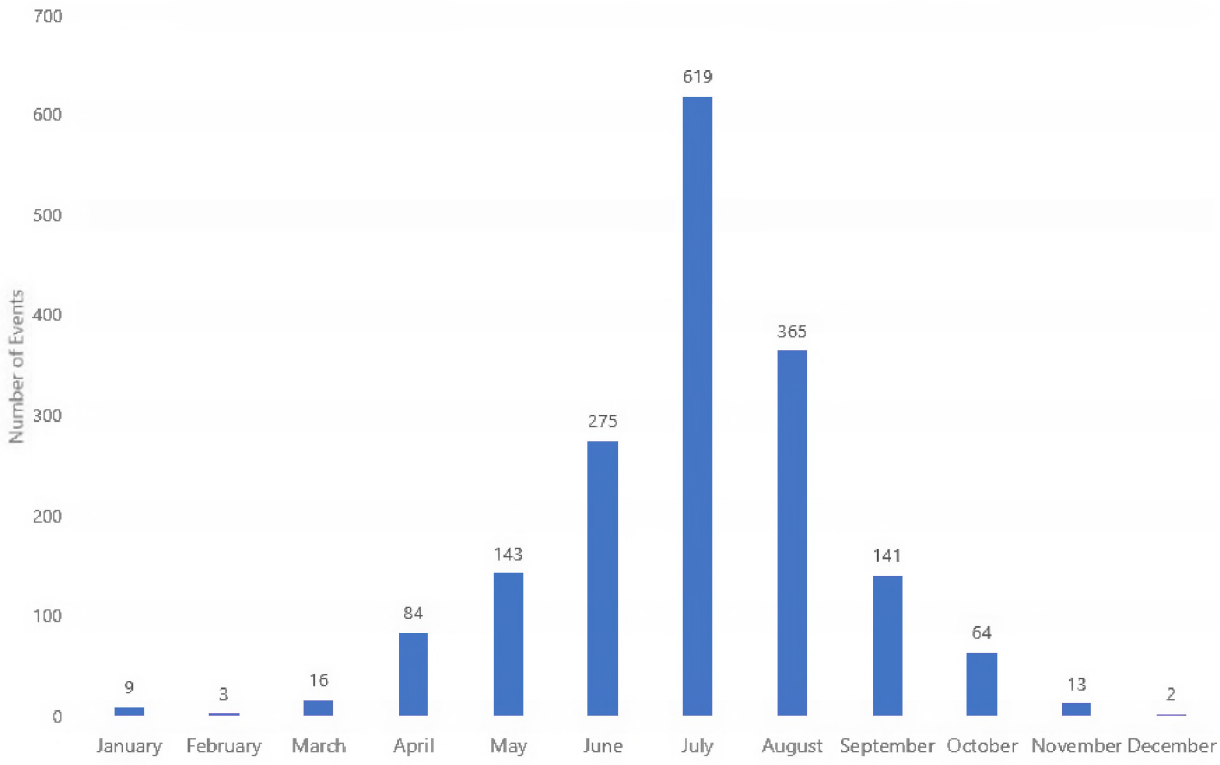


Illustration by Wood, Data Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

The cause of wildland fire ignition can help guide prevention activities. Figure 4-44 displays the cause of wildland fires in Archuleta County. According to the USDA Reach Data Archive, humans have been responsible for 25% of the wildland fires in Archuleta County from 1992 to 2018. Natural causes are the primary cause of wildland fires in Archuleta County, accounting for 73% of total recorded fires. Across the United States, there has been an increasing trend in human caused wildfires over the past several decades. The USDA wildfire data suggests a similar trend in Archuleta County.

Figure 4-44 Archuleta Fire Ignition Sources 1992-2018

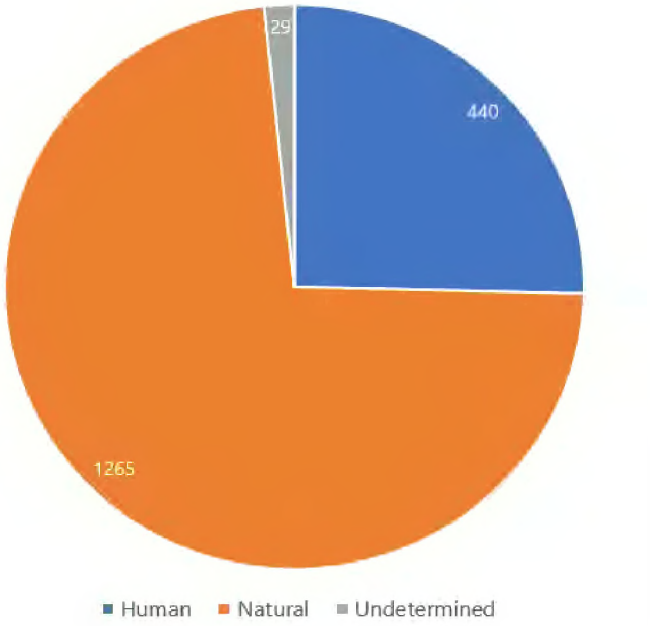


Illustration by Wood, Data Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

In addition to the USDA data, the Archuleta County CWPP and NCEI dataset reported several notable fires that have occurred in Archuleta County. The CWPP reported 9 significant wildland fire events, which have burned over 86,000 acres in total in Archuleta County. Additionally, the NCEI database contained information on 41 wildland fire events in Archuleta County from 1996 to March of 2022. While the NCEI dataset does not contain a comprehensive list of all wildland fires that have occurred in the county, it provides an understanding of some of the most impacting events in the County in recent years. In total, the NCEI dataset reported no deaths or injuries, but a total of $30,000 in property damages due to wildland fires. Table 4-66 summarizes these wildland fire reports.

Table 4-66 CWPP and NCEI Wildland Fire Summary

Fire Name	Acres Burned	Year
Ice Fire	596	2020
Sand Creek Fire	107	2020
East Canyon Fire	2,905	2020
Pine Tree	742	2019
441 Fire	325	2019
Horse Fire	700	2018
Eight Four Two Fire	1,000	2017
Windy Pass Fire	1,417	2013
West Fork Fire	58,576	2013
Weber Fire	10,000	2012
Little Sand Fire	24,931	2012

Fire Name	Acres Burned	Year
Sambrito 2 Fire	535 (Half in Archuleta)	2011
Devil Creek Fire	234	2003
Bolt Fire	2,160	2003
Missionary Ridge Fire	71,000 (330 in Archuleta)	2002
Cabezone Fire	796	2000
Cabezone South Fire	330	2000
Dipping Vat (Mt. Archuleta) Fire	16,456 (started in NM)	1996
Snow Springs #2 Fire	406	1996
Vigil Mesa Fire	200	1989

Source: Archuleta County CWPP 2019, NCEI

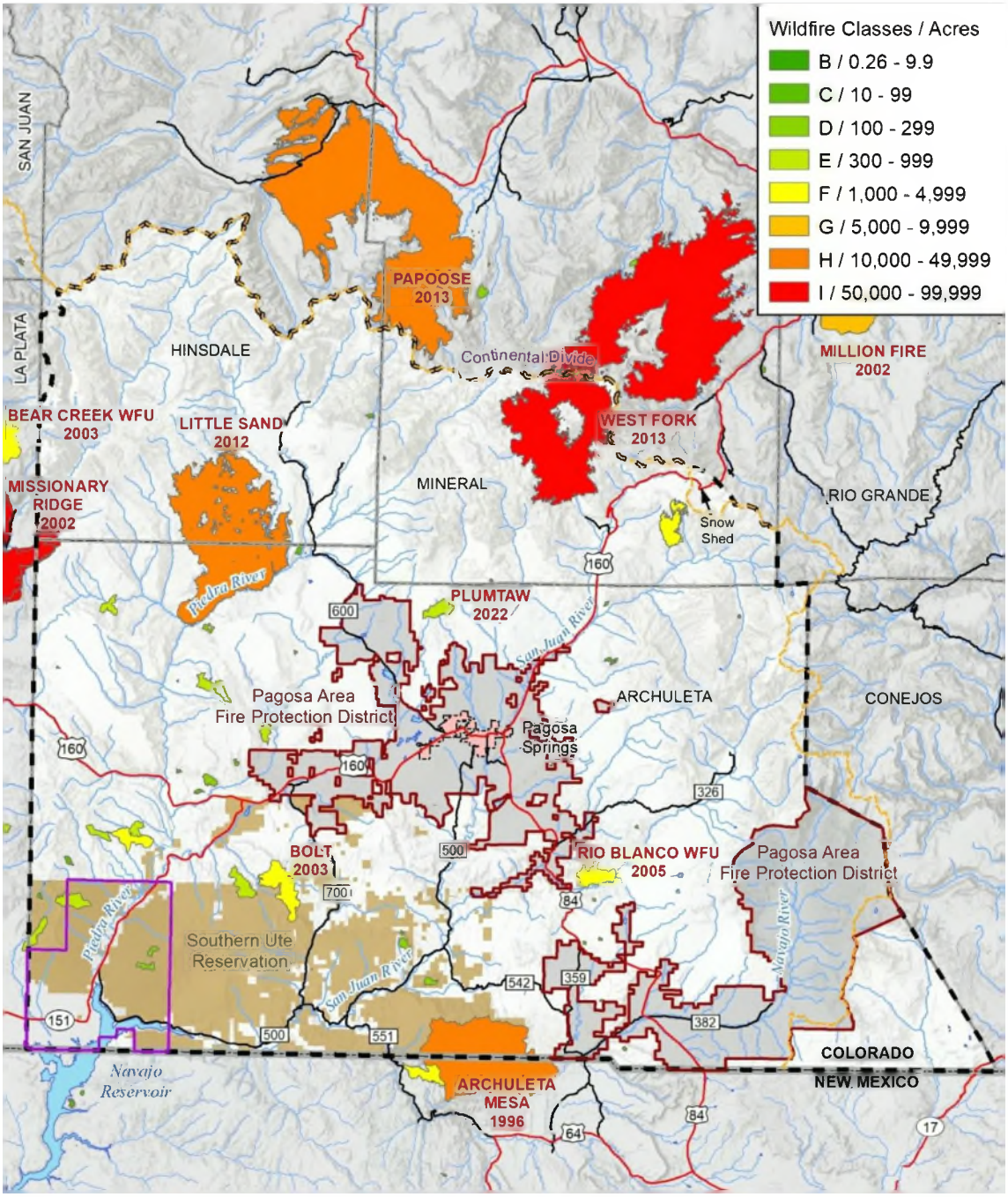
The Dipping Vat Complex, Little Sand, and the Bolt Fire are among the larger fires within Archuleta County in recent decades and illustrate the potential for large fires in the area. For example, though the Dipping Vat Complex burned no structures, its suppression still required the sustained efforts of over 1,000 fire personnel and multiple aircraft to contain it at a cost exceeding an estimated $3 million. This cost does not include recovery and rehabilitation. In contrast, the Rio Blanco fire of 2005 was managed for resource benefit and allowed to burn, eventually growing to more than 1200 acres.

The Missionary Ridge Fire that originated in neighboring La Plata County is especially instructive when considering values at risk in the WUI. This 71,000-acre blaze was the result of a human ignition. The fire burned 56 homes, 27 other buildings, and forced the evacuations of more than eighteen subdivisions over the course of three weeks. While the total cost of this fire exceeded $152 million, the heaviest toll was the loss of firefighter Alan Wyatt who was killed by a falling tree. The significance and potential impact of the wildland fire hazard in this area should not be underestimated.

The Weber Fire of 2012 started on June 22, six miles south of Mancos. This human caused event instigated the evacuation of several subdivisions and lead to numerous road closures. Additionally, a communications tower was temporarily offline as power to the facility was interrupted by the fire. The event lasted for over 2 weeks, resulted in $15,000 of property damage, and burned over 10,000 acres on both private and public land.

In June 2013, the West Fork Fire burned over 58,500 acres northeast of Pagosa Springs. This fire involved in a complex of wildfires north of Wolf Creek Pass in Mineral County. Other fires in this series include the Papoose Fire south of Creede, and the Windy Pass Fire near Wolf Creek ski area. The West Fork Fire was significantly exacerbated by high winds and tree mortality associated with the spruce beetle. South Fork and Wagon Wheel Gap were evacuated, and Highway 160 and State Highway 149 were closed west of South Fork. Figure 4-45 displays the significant wildfires that have impacted Archuleta County from 1951 to 2022.

Figure 4-45 Archuleta County Response Area Wildfire History 1951-2022



wood.

Map compiled 8/2022;
intended for planning purposes only.
Data Source: Archuleta County, CDOT,
Interagency Fire Perimeter History

0 5 10 Miles

N

Urban Fire History

The populated areas of Archuleta County are not only at risk from wildland fires; there is also a substantial history of urban conflagration in Pagosa Springs. A series of fires from 1919 to 1943 significantly impacted the Town's business district. In May of 1919 one fire burned four businesses including the telephone building. A second fire six months later swept through the offices of the USFS, the Red Cross, and several local government and court offices. Fortunately, many of the irreplaceable public records were saved.

In 1921, at least nine businesses were damaged or destroyed, prompting the town to adopt an ordinance allowing only "fireproof" masonry and steel construction in the business district. This fire was initially almost brought under control after four businesses burned, but the failure of the water supply system resulted in the additional losses.

Nine businesses and an apartment building were damaged or destroyed during the 1943 fire that consumed a downtown block within twenty minutes. There was one fatality and four serious injuries during this incident. Mutual aid was provided by the USFS, Durango, and Monte Vista. Many of the effected businesses quickly reopened in temporary locations.

This history highlights several key points. The local fire service has a strong history in the area, repeatedly preventing the loss of the entire town, a very real possibility in the early twentieth century. The limits of the municipal water distribution system have proven a key factor in past fire suppression operations. There has been a demonstrable local need for continuity of government and business planning, and a history of success in this area through ad hoc methods. Recent urban conflagrations including the devastating Marshall Fire in Boulder County in late 2021 demonstrate the linkage with wildland fires and strong wind events.

Forest Health Issues

The majority of the county's WUI is in the Gambel oak, ponderosa pine, and dry mixed conifer vegetation. These vegetation communities are adapted to frequent fire occurrence and are more out-of-sync with their natural fire cycles due to fire exclusion as compared to the moister aspen and mixed conifer of the upper elevations. It is estimated that approximately 85% percent of these are in condition class 3 or in a state of "high departure" from historic conditions (USFS, 10-Year Strategy: Pagosa Ranger District, undated). As a result, the most hazardous fuels are likely concentrated around the highest value areas.

The forests of southwest Colorado have also been subjected to numerous insect infestations over the past decade. Prior to 2004 the Ips beetle impacted piñon pine. The spruce bark beetle has heavily impacted Mineral County and moving throughout Archuleta County (thought to have largely run its course by 2022). Outbreaks of spruce budworm and the Douglas fir beetle, frost kill in oak brush, as well as a general decline in aspen health are also taking a significant toll on the local forests.

Geographical Area Affected

Figure 4-46 illustrates the highest wildfire risk is concentrated in the southwest corner of the Archuleta response area near the Southern Ute Reservation. Figure 4-48 second figure below displays fire risk in Pagosa Springs, indicating that a vast majority of the city is either high or moderate risk outside of the unburnable/developed areas of the city. Figure 4-48 and Figure 4-49 and display the risk to subdivisions located in Archuleta and the Archuleta Response Area. This risk was determined by the Archuleta County Community Wildfire Protection Plan (CWPP) 2019 ratings. These figures indicate that over 50% of the planning has some risk to wildfire; therefore, the rating for geographic extent of wildfire is **extensive**.

While wildfires can occur anywhere in the County, the CWPP notes a particular concern for the development of new homes and subdivisions located in the ponderosa pine forests. These forests naturally experience

frequent, low-severity fires, however, an increase in development in these areas creates additional fuel that could create more severe and widespread wildfire.

Figure 4-46 Archuleta Response Area Wildfire Risk

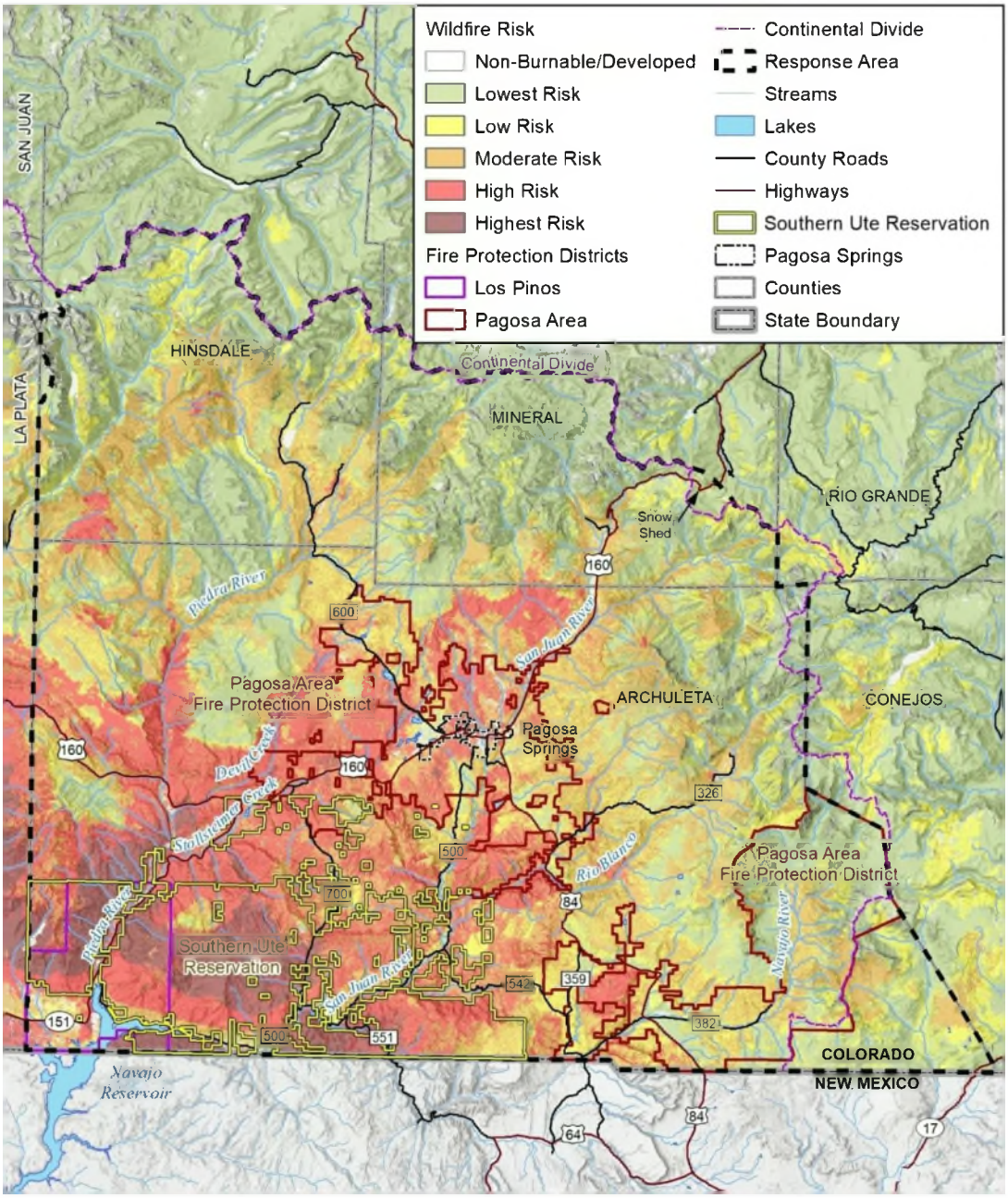


Figure 4-47 Pagosa Springs Wildfire Risk

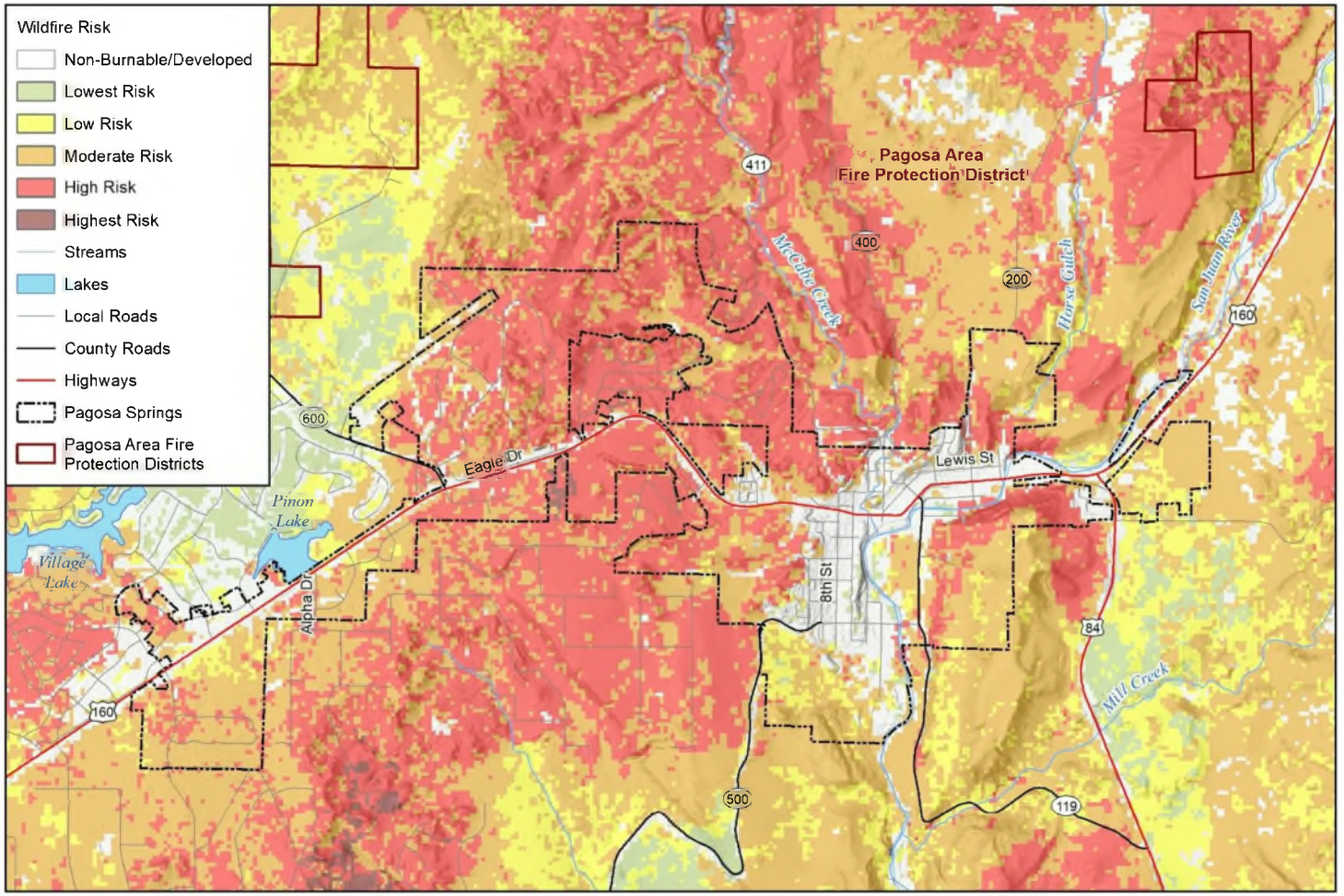


Figure 4-48 Archuleta Subdivision Fire Risk

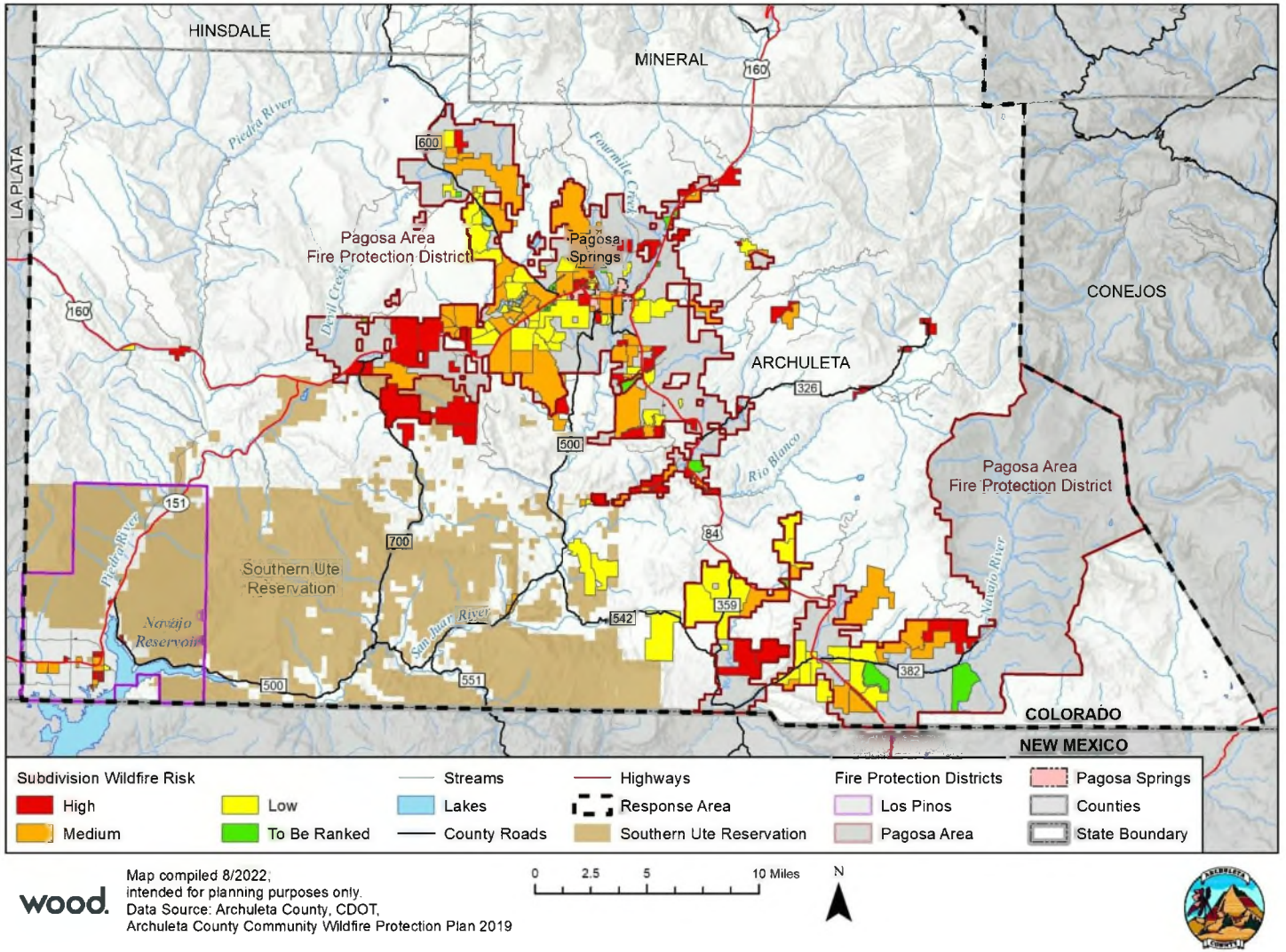
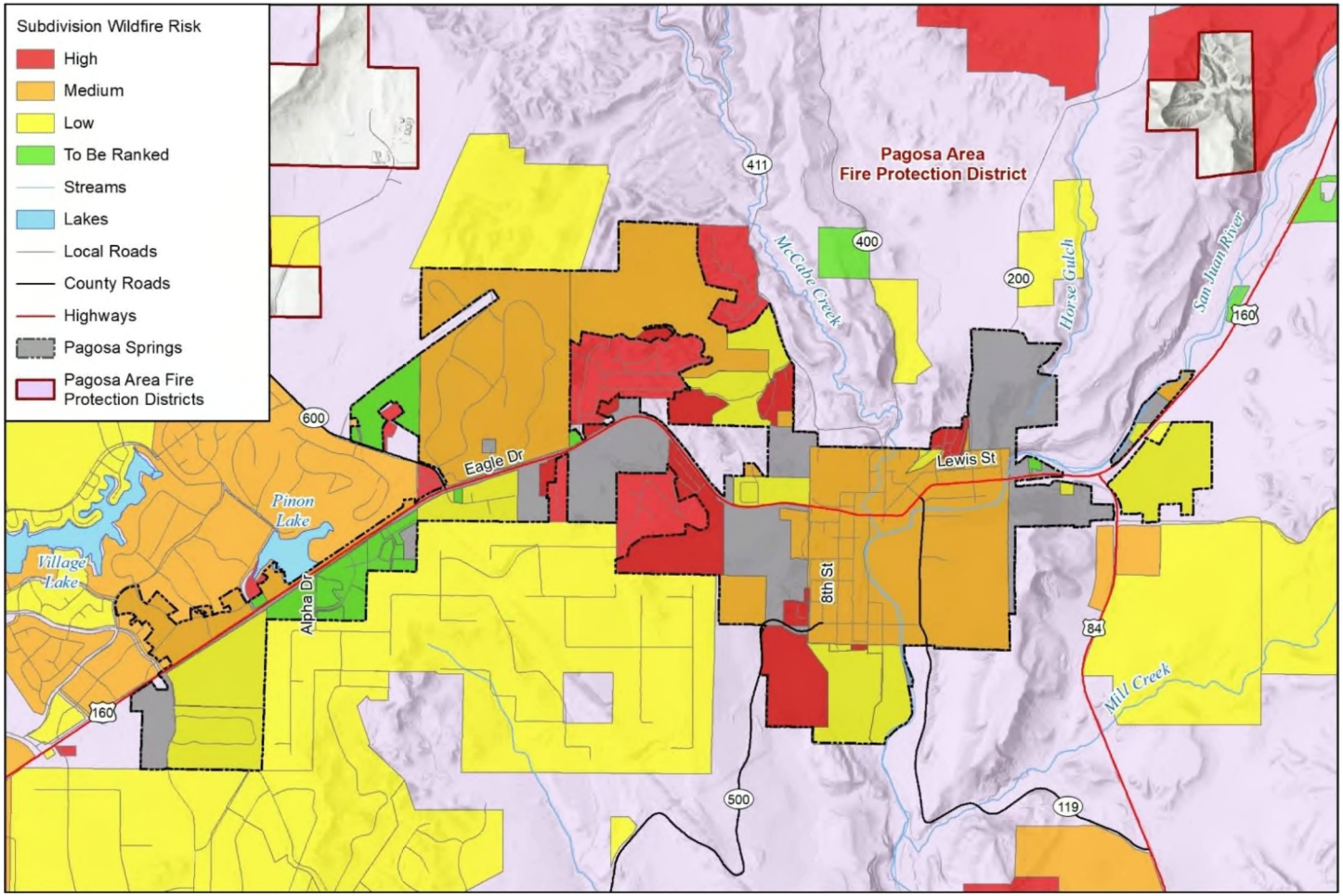


Figure 4-49 Pagosa Springs Subdivision Fire Risk



Magnitude/Severity

The potential magnitude of a wildland fire in the Archuleta County response area could be **critical**. It is a practical certainty that wildland fires will occur every summer in Archuleta County. The alignment of ignition, fuel and weather conditions, and values at risk that will produce a catastrophe is impossible to predict. But, as fuels become more hazardous and the county more populous, the potential for significant loss continues to increase.

Wildland fire poses a major public safety hazard in Archuleta County. Life safety and human health are serious concerns due to most of the County being considered a wildland urban interface area, and high influx of visitors during the prime wildland fire months. Wildland fire has the potential to cause widespread and severe damage to watersheds and property in the planning area. Although a natural process, wildland fires can mar scenic view-sheds, potentially reducing property values and negatively impacting the tourism-based economy. Fires can be intensified by drought, as was observed during the 2002 drought.

In addition to direct costs from wildland fire, the cost of a fire's impacts and rehabilitation can also be substantial. As an example, the Missionary Ridge Fire of 2002 was approximately $1,280 per acre while the total costs, including impacts and rehabilitation, nearly doubled to over $2,160 per acre (Kurt Makes et al. Journal of Testing and Evaluation, March 2007). Loss estimates from wildland fires are discussed further in the wildland fire vulnerability section.

Frequency/Likelihood of Occurrence

It is a virtual certainty that wildland fires will occur in Archuleta County every year, therefore, the frequency/likelihood fires are **highly likely**. However, most are of low significance with limited extent and magnitude. A large-scale fire of 1,000 acres or greater has approximately a 10% chance of occurring in any given year, according to estimates from the USFS. The extent of such a fire would likely still be limited, affecting 10% to 25% of the planning area. The significance of a 1,000+ acre fire would range from medium to high, depending on where the fire was located. A fire of 10,000 acres in size or more is even less likely to occur in any given year, but the impact would be much greater. The number, extent, and severity of these fires are subject to numerous climatic, weather, and stochastic factors. Historic trends and the condition of the local forests indicate that the occurrence of a large fire is a matter of time.

There is extensive evidence that wildfires across the western United States have been increasing and will likely continue to increase in the future. A 2006 study found a fourfold increase in the number of wildfires since 1986 compared to the 1970–1986 period, with a six-fold increase in burned acreage. Those results were attributed to a 78-day increase in active wildfire season and a fivefold increase in average fire duration. Much of that, in turn, can be attributed to earlier snowmelt and hotter summertime temperatures. Tree-ring records of fire scars and debris found in alluvial fans show that warmer and drier periods are associated with more frequent and severe wildfires. Given that climate projections indicate continued advance in snowmelt timing and increasing summer temperatures, wildfire conditions across the West are likely to worsen in the future. More intense wildfires can produce highly erodible soils that can lead to increased sediment loading in reservoirs and streams, damaging water infrastructure and degrading water quality.

Climate Change Considerations

Climate is a major determinant of wildfire through its control of weather, as well as through its interaction with fuel availability, fuel distribution and flammability at the global, regional, and local levels. With hotter temperatures, drier soil and worsening drought conditions in the entire Western U.S., wildfires have the potential to become more extreme. Currently humans are the main cause of fire ignition globally, although lightning has been predominantly responsible for large fires. Colorado and the Western United States have seen significant increases in forest area burned in recent years, and the risk of wildfires in the future are

expected to increase due to a lengthening fire season and drier conditions. According to a report from the International Panel on Climate Change, while it is likely that climate change will increase conditions for wildfires, "it is unclear whether climate change will have a significant impact on the frequency or severity of structural fires".

Vulnerability

People

Smoke and air pollution from wildfires, even those burning many hundreds of miles away, can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility. A study from the University of California San Diego found that wildfire smoke is more harmful to respiratory health in humans than pollution from cars (NPR 2021). Studies have also shown an increase in ambulance calls, hospital visits and an increase of people experiencing respiratory or cardiac emergencies (NPR 2020).

Many subdivisions in Archuleta County and Colorado in general have limited points of ingress and egress, which impact the ability of residents to safely and quickly evacuate. This can also reduce the ability of first responders to access at risk areas, and also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

Property

Property damage from wildfires can be severe and can significantly alter entire communities. Table 4-67 displays the number of structures in high-risk subdivisions within the planning area using 2022 county tax assessor data and the Archuleta Community Wildfire Protection Plan (CWPP). Wood preformed analysis on this data using GIS and the subdivisions outlined in the Archuleta County 2019 CWPP. The analysis found that, in total, 1,895 buildings with a total value of $410,915,885 are potentially exposed to wildfire high risk.

Table 4-67 County of Archuleta Exposure and Value of Structures in High Wildfire Risk Areas

Subdivision Name	Improved Parcel Count	Building Count	Improvement Structure Value
ADAMS - WHITAKER	1	1	$185,620
ALPINE HILLS	5	5	$3,138,790
ALPINE LAKES RANCH - ELK RIDGE 1	18	18	$7,131,570
ALPINE LAKES RANCH - ELK RIDGE 2	13	13	$5,096,390
ANDREWS 1	8	8	$967,770
ANDREWS 2	1	1	$160,130
AQUA VISTA	4	4	$1,139,250
ASPEN SPRINGS 1	133	134	$20,594,880
ASPEN SPRINGS 2	178	179	$23,241,890
ASPEN SPRINGS 3	113	114	$15,233,850
ASPEN SPRINGS 4	201	203	$30,595,450
ASPEN SPRINGS 6	138	138	$11,636,060
BENNETT BOOTHE COMMERCIAL PARK	2	3	$409,330
BLUE MOUNTAIN RANCHES 1	31	36	$9,796,240

Subdivision Name	Improved Parcel Count	Building Count	Improvement Structure Value
BLUE MOUNTAIN RANCHES 2	6	6	$2,400,070
CANDELARIA 1	3	3	$849,160
CARRI-BLANCO CABIN SITES	12	13	$2,081,350
CAT CREEK ESTATES	6	6	$829,010
CIMARRONA RANCH 2	1	1	$378,430
CONTINENTAL ESTATES 2	22	26	$8,915,720
ELK RUN ESTATES	7	7	$5,105,420
FOUR CORNERS VACATION PROPERTIES	20	20	$6,421,420
FRIENDLY FOREST	2	2	$739,090
GARVIN ADDITION	21	21	$3,915,850
GREVEY-LIBERMAN TRACT 2	3	4	$608,410
HARVEY MINOR IMPACT	2	2	$676,370
HATCHER VILLAGE CONDOS	20	25	$4,582,910
HERMANN & SCHLICHTING MINOR IMPACT	3	3	$936,490
HOLIDAY ACRES 3	18	18	$5,406,240
HUDSON RIO BLANCO 1	4	4	$953,590
HUDSON RIO BLANCO 2	8	11	$1,443,200
HUDSON RIO BLANCO 2A	5	6	$558,760
HUDSON RIO BLANCO 5	14	15	$1,275,240
HUDSON RIO BLANCO 5A	3	3	$428,130
HUDSON RIO BLANCO 6	3	3	$409,070
HUDSON RIO BLANCO 9	4	4	$1,313,210
LINDSEY	4	4	$1,090,520
LOG PARK	30	30	$11,931,110
LOMA LINDA 3	28	28	$13,005,210
LOMA LINDA 5	21	22	$9,672,430
LUTHERAN CHURCH MISSOURI SYNOD	1	1	$0
MAJESTIC MOUNTAIN HOMESITES PART 1	22	23	$6,500,050
MAJESTIC MOUNTAIN HOMESITES PART 2	3	3	$1,228,780
MARTINEZ CANYON ESTATES	5	6	$2,710,910
MASTERSON MINOR IMPACT	2	2	$135,300
MCKEOWN MINOR IMPACT	1	1	$462,560
MEES	2	3	$571,350
MESA HEIGHTS	34	34	$9,177,650
MOUNTAIN VISTA 1	21	24	$4,762,190
NAVAJO PEAK RANCH	11	11	$3,794,130
NAVAJO RIVER RANCH 5	7	7	$3,617,360
OAK HILL RANCHES	17	19	$5,310,090
OLD WEST LANDING	16	19	$5,222,230
PAGOSA DEVELOPMENT 1	18	19	$5,340,150
PAGOSA DEVELOPMENT 2	13	14	$1,924,970
PAGOSA HILLS 1	25	29	$3,541,860
PAGOSA HILLS 3	39	42	$10,962,340
PAGOSA HILLS 4	27	29	$8,861,140

Subdivision Name	Improved Parcel Count	Building Count	Improvement Structure Value
PAGOSA LODGE CONDOS	33	33	$6,644,270
PAGOSA PEAK ESTATES 1	16	16	$6,082,070
PAGOSA PINES 1	8	9	$2,430,190
PAGOSA PINES 2	5	7	$1,511,110
PAGOSA PINES 3	20	25	$6,905,160
PAGOSA SOUTH ADDITION	2	2	$170,600
PIEDRA PARK 10	8	8	$1,796,480
PIEDRA PARK 10A	9	9	$1,378,830
PIEDRA PARK 10B	6	7	$1,575,060
PIEDRA PARK 3	16	16	$3,495,640
PIEDRA PARK 4	15	15	$2,459,430
PIEDRA PARK 5	12	12	$2,311,890
PIEDRA PARK 6	12	12	$1,728,670
PIERCE SECOND ADDITION	1	1	$175,940
RIO BLANCO CABIN SITES 1	24	25	$5,227,760
RIO BLANCO VALLEY 2	27	27	$6,675,370
RIO BLANCO VALLEY 3	13	14	$2,847,960
RIO BLANCO VALLEY 4	23	23	$5,705,480
RIO BLANCO VALLEY REPLAT 1	1	1	$155,550
RITO BLANCO RANCH 1	2	2	$1,446,360
ROCK RIDGE COUNTRY ESTATES	55	56	$10,503,555
SAN JUAN RIVER RANCH	5	5	$7,938,650
SAN JUAN RIVER VILLAGE 1	88	89	$27,287,800
SPRING ESTATES	14	14	$4,302,800
SUNSET HEIGHTS	1	1	$144,550
THE RIVER RANCH	6	7	$3,675,490
TRUJILLO ACRES	11	13	$2,160,710
UNKNOWN 9	4	4	$709,110
WHISPERING WOOD	10	10	$3,398,320
WHITE	2	2	$694,390
Total	1,829	1,895	$410,915,885

Source: Archuleta County Assessor Data 2022, Archuleta Community Wildfire Protection Agency, Wood GIS Analysis

Critical Facilities and Lifelines

Wildfires frequently damage community infrastructure, including roadways, communication networks and facilities, power lines, and water distribution systems. Efforts to restore roadways include the costs of maintenance and damage assessment teams, field data collection, and replacement or repair costs. Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground distribution lines, and soil erosion or debris deposits into waterways after the fire. Repairs to utilities and communications lifelines are also necessary for equipment damaged by a fire. This includes power lines, transformers, cell phone towers, and phone lines. Table 4-68 displays the Wildfire Risk by risk category, jurisdiction, and Fire Protection District, based on a GIS intersection with the CSFS Wildfire Risk layer for the planning area. According to the analysis, many critical facilities are at moderate to high risk of wildfire. Additionally, communication and transportation are the most at-risk types lifelines.

Table 4-68 Critical Facilities at Risk to Wildfire by Jurisdiction

Wildfire Risk	Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Highest	Pagosa Springs	-	-	-	-	-	-	-	0
	Unincorporated	-	-	-	-	-	1	1	2
	Pagosa Area FPD	-	-	-	-	-	1	-	1
High	Pagosa Springs	2	-	-	-	-	1	1	4
	Unincorporated	36	1	1	-	-	5	5	48
	Pagosa Area FPD	10	1	1	-	-	5	5	22
Moderate	Pagosa Springs	6	-	-	-	1	-	-	7
	Unincorporated	30	2	4*	-	-	3	10	49
	Pagosa Area FPD	10	1	3	-	1	3	4	22
Low	Pagosa Springs	1	-	-	-	-	-	-	1
	Unincorporated	2	-	-	-	-	-	6	8
	Pagosa Area FPD	2	-	-	-	-	-	2	4
Lowest	Pagosa Springs	-	-	-	-	-	-	-	0
	Unincorporated	-	-	-	-	-	3	1	4
	Pagosa Area FPD	-	-	-	-	-	3	-	3
Non-Burnable Developed	Pagosa Springs	2	3	-	-	-	8	2	15
	Unincorporated	-	1	1	-	2	1	25	30
	Pagosa Area FPD	2	3	1	-	2	9	12	29

Source: Archuleta County Assessor Data 2022, Wood GIS Analysis

* 2 of the listed Food, Water Shelter Lifelines are wastewater treatment plants owned by PAWSD

Economy

Economic impacts of wildfires in Archuleta County have historically been limited. In addition to the losses described above, large fires can also force business closures, and impact recreation and tourism areas. The economic cost of fighting wildfires is also significant.

The cost of direct losses to structural fires, in terms of physical damages, the cost of repairs, and business interruption, can be significant. As discussed above, a significant amount of infrastructure is in risk areas to wildfire. Damage to any of these structures could result in significant economic damages.

The Future Avoided Cost Explorer (FACE) is a statewide planning resource in Colorado used to quantity direct impacts of wildfire on the economy. The FACE tool reports estimated annual losses from wildfire damages given changing climate conditions and population. The FACE tool models an estimated $7.5 million in annual losses given severe climate conditions and high population growth rate.

Table 4-69 Wildfire Future Avoided Cost Explorer

	Expected Annual Damage from Wildfire (in 2019 Dollars)		
	Current Climate	Moderate Climate	More Severe Climate
Current Population	$4.4M	$6.5M	$6.5M
Low Growth	$4.4M	$6.5M	$6.5M

Expected Annual Damage from Wildfire (in 2019 Dollars)			
	Current Climate	Moderate Climate	More Severe Climate
Medium Growth	$4.4M	$6.5M	$6.5M
High Growth	$4.4M	$6.5M	$7.5M

Source: Colorado Water Conservation Board, https://cwcb.colorado.gov/FACE

Historical, Environmental, and Cultural Resources

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, dictating in part the types, structure, and spatial extent of native vegetation. However, wildfires can cause severe environmental impacts, such as damage to fisheries, soil erosion, and spread of invasive plant species.

Many ecosystems are adapted to historical patterns of fire occurrence. These patterns, called "fire regimes," include temporal attributes (e.g., frequency and seasonality), spatial attributes (e.g., size and spatial complexity), and magnitude attributes (e.g., intensity and severity), each of which have ranges of natural variability. Ecosystem stability is threatened when any of the attributes for a given fire regime diverge from its range of natural variability.

Development Trends

The CWPP noted that the development of homes and subdivisions across Archuleta County has been drastically increasing in recent years. This is partially due to an increase in tourism and therefore the number of vacation homes and properties in the County is increasing. According to the CWPP, 44% of private parcels located in Archuleta County are owned by non-permanent residents. Most of this new development has occurred in high-vegetation areas, specifically in ponderosa pine forests, which creates more wildland-urban interface (WUI) at risk of wildfire. As development in WUI areas continues to increase, the risk to lives, property, and resources correspondingly increases.

Risk Summary

In summary, wildland fire is considered high significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-70 Wildland Fire Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Extensive	Highly Likely	Critical	High
Pagosa Springs	Extensive	Highly Likely	Critical	High
Pagosa Fire Protection District	Extensive	Highly Likely	Critical	High
Pagosa Area Water and Sanitation District (PAWSD)	Extensive	Highly Likely	Critical	High

- More than 50% of the planning area is vulnerable to wildfire, therefore, geographic extent of wildfire is rated as **extensive**
- USDA dataset reported 1,735 wildfire events impacting Archuleta County from 1992 to 2018; therefore, probability of a future wildfire event is rated as highly likely
- There is an increasing trend in the total number of fires and the total acres burned from fires annually in Archuleta County

- Future growth into interface areas and changing climatic conditions could increase wildfire risk. The FACE tool predicts $7.5 million in future annual losses in Archuleta County in high population growth/severe climate conditions; potential magnitude is therefore rated as critical
- Most wildfires in Archuleta County have been naturally caused
- Climate change could increase both the likelihood and severity of wildfires
- Related hazards: high wind, lightning, drought

4.3.17 Wildlife Hazards

Hazard/Problem Description

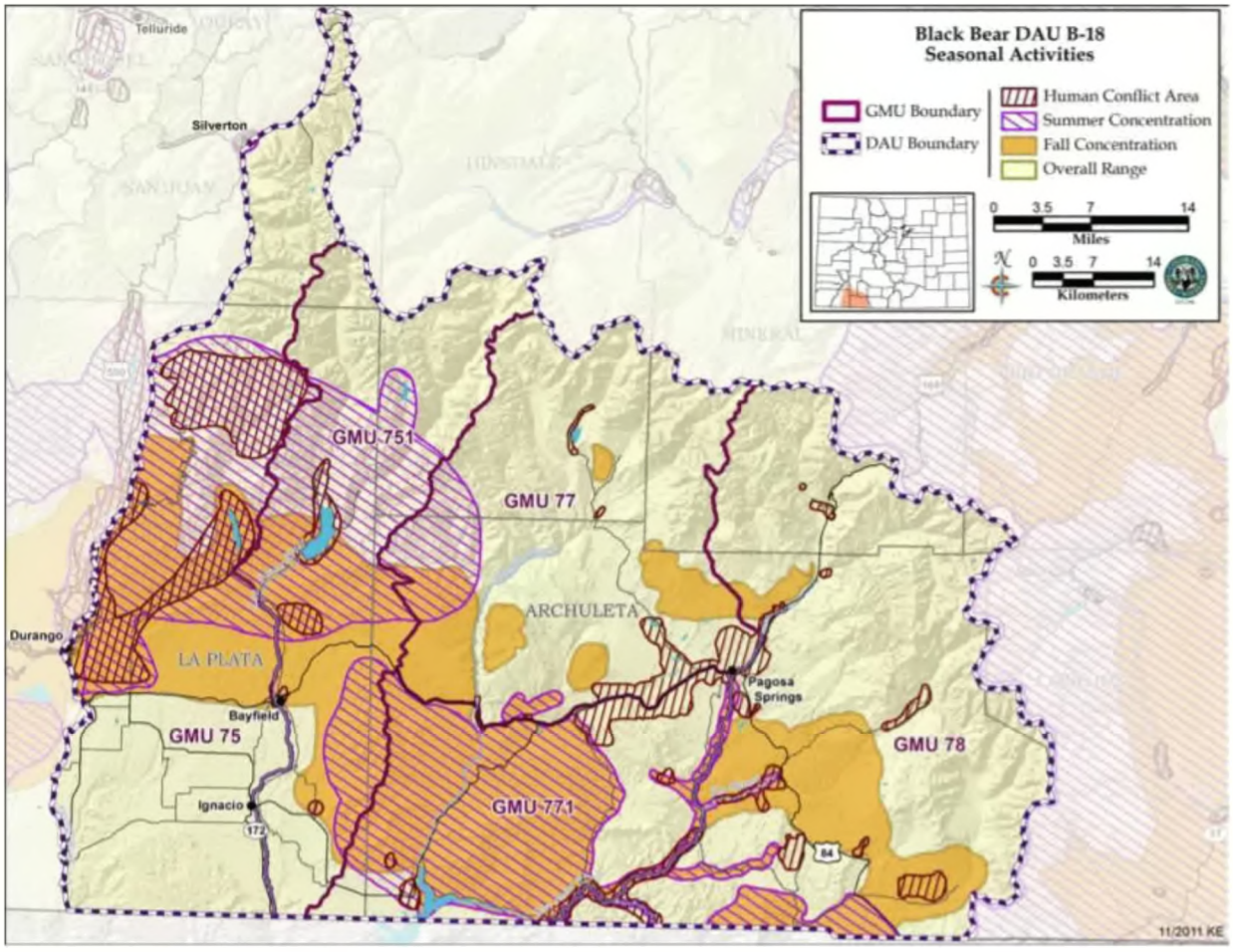
Wildlife-Vehicle Collisions and Wildlife Encounter Issues

Although traffic in the planning area is relatively low, animal-vehicle collisions are a prominent issue to discuss. Most animal-vehicle collisions (AVCs) in the area involve deer. Other large wildlife in the area include lynx, big horn sheep, mountain lions, elk, and black bears.

Wildlife-Human Hazards

In addition to wildlife-vehicle collisions, residents of the planning area also face wildlife encounters. Bears are known for clawing utility poles and getting into garbage cans. People also need to be wary in the Pagosa Junction and Juanita areas along County Roads 500 and 551. The autumn concentration area for black bears is expansive and covers much of the County, especially in the south and the west. Much of this area is public lands, so outdoor recreationalists in these areas need to be especially alert during the fall when bears are foraging for food to sustain them during hibernation. CDOT/USFS GIS data indicates that the human conflict areas for mountain lions and black bears are mainly in the Pagosa Springs area. During the summer, black bear territory tends to be relegated to the southwestern portion of the County. Figure 4-50 below identifies the black bear concentration areas, highlighting the human conflict area surrounding Pagosa Springs, as well as the fall concentration that extends from southeastern Hinsdale County to the southeast corner of Archuleta County.

Figure 4-50 Seasonal Black Bear Activity in Response Area



Source: Colorado Parks and Wildlife, 2013

Although the mountain lion-human conflict area is centered in Pagosa Springs, the mountain lion territorial range extends over the entire County. Elk migration corridors exist along Highway 160 on either side of Pagosa Springs and along much of Highway 84. Mule deer migration corridors are mapped along Highway 84 near Pagosa Springs and along most of Highway 160 and 151 in the western half of the County. The mapped migration corridors for elk in Archuleta County are much larger.

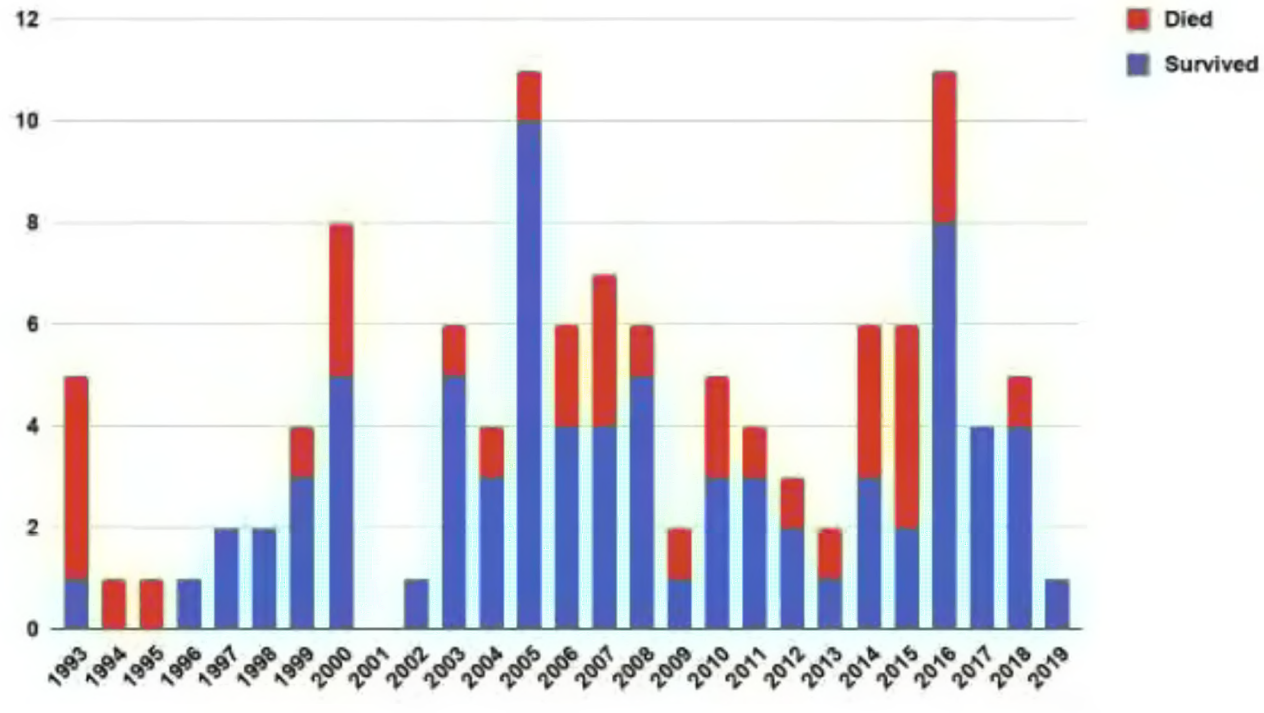
Hantavirus

Wildlife can also carry diseases that are extremely dangerous to humans. Hantavirus has been an issue in Colorado, especially in the four corners region. Although it is not difficult to come into contact with surfaces and materials that could transmit hantavirus, there are fortunately very few cases per year.

Hantavirus is included in this profile as it is carried by wildlife, namely deer mice. Hantavirus pulmonary syndrome (HPS) is transmitted in the saliva, urine, and feces of mice infected with the virus. People contract HPS by breathing in the freshly aerosolized virus. This is done by coming in direct contact with infected rodents or by disturbing mice nests or surfaces contaminated with rodent excretia. HPS is not transmissible from person to person. The disease can be fatal to humans. The HPS incubation time may last two to four weeks before symptoms present. Symptoms resemble the flu with fever, chills, and muscle ache. For a very brief period, the infected person begins to feel better. Within 24-48 hours, the individual develops shortness

of breath and may even suffer respiratory or renal failure. According to the Colorado Department of Public Health and Environment, there were 116 cases of HPS in Colorado between 1993 and 2019. The fatality rate among these cases was 35%. In 2015 alone, six confirmed cases of HPS were reported in Chaffee, Custer, Garfield, La Plate, Phillips, and Weld County. Hantavirus involving the kidneys can respond to treatment given in hospitals, although the chance of death persists. There is no effective treatment for hantavirus infections involving the lungs. Figure 4-51 illustrates the number of HPS cases in Colorado between 1993 and 2019, as well as the fatality rate among those cases.

Figure 4-51 Colorado HPS Cases by Year and Outcome: 1993-2019



Source: Colorado Department of Public Health and Environment, Disease Control and Environmental Epidemiology Division

Past Occurrences

Wildlife-Vehicle Collisions

Wildlife-vehicle collisions are, unfortunately, an often-unavoidable part of life in rural areas. As the population of the planning area has grown over the past several years, the incidence of WVCs has increased accordingly. Fortunately, the number of fatalities from this hazard has been relatively small. Table 4-71 shows the number of property damage only events (PDOs) (refers to events in which no injuries or fatalities occurred), injuries, and fatalities from wildlife-vehicle collisions in Archuleta County between 1994 and 2019. After 2015, specific information on the number of injuries and fatalities per year was not available. However, a total of 78 crashes with injuries and 1 with a fatality have occurred in Archuleta County between 2010 and 2019.

Table 4-71 Wildlife-Vehicle Collisions: 1994-2019

Year	PDO	Injuries	Fatalities	Total
1994	0	0	0	0
1995	9	1	0	10

Year	PDO	Injuries	Fatalities	Total
1996	17	4	0	21
1997	14	5	0	19
1998	24	3	0	27
1999	26	5	1	32
2000	30	2	0	32
2001	50	12	0	62
2002	86	6	0	92
2003	73	10	0	83
2004	82	7	1	90
2005	56	7	0	63
2006	25	3	0	28
2007	59	8	0	67
2008	48	5	0	54
2009	48	7	0	55
2010	48	6	0	54
2011	63	5	0	68
2012	68	8	0	76
2013	59	6	0	65
2014	81	7	0	88
2015	83	-	-	-
2016	90	-	-	-
2017	106	-	-	-
2018	92	-	-	-
2019	76	-	-	-
TOTALS	**1,413**	**117**	**2**	**1086**

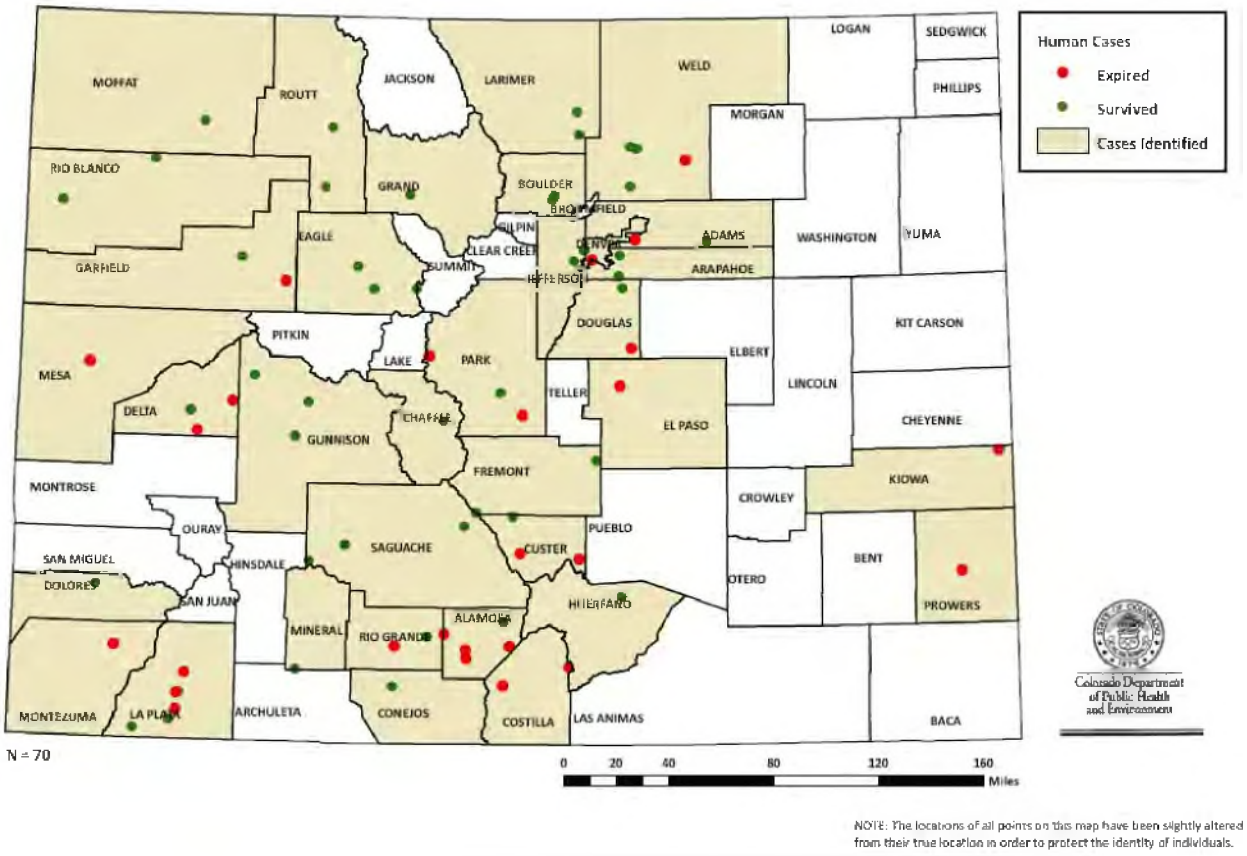
Source: Colorado Department of Transportation

Hantavirus

According to the Colorado Department of Public Health and Environment, 116 cases of hantavirus were reported in Colorado between 1993 and 2019. None of these cases were in Archuleta County, but nearly all the neighboring counties reported at least one case of HPS. It is difficult to determine whether any deaths in the County prior to 1985 were related to hantavirus because the disease was primarily identified as a public health issue in 1993. Additionally, HPS symptoms are like the flu, which could make it more difficult to diagnose a person's illness as HPS specifically. Perhaps other illnesses and fatalities in the planning area were caused by HPS in the past, but this is not known for certain.

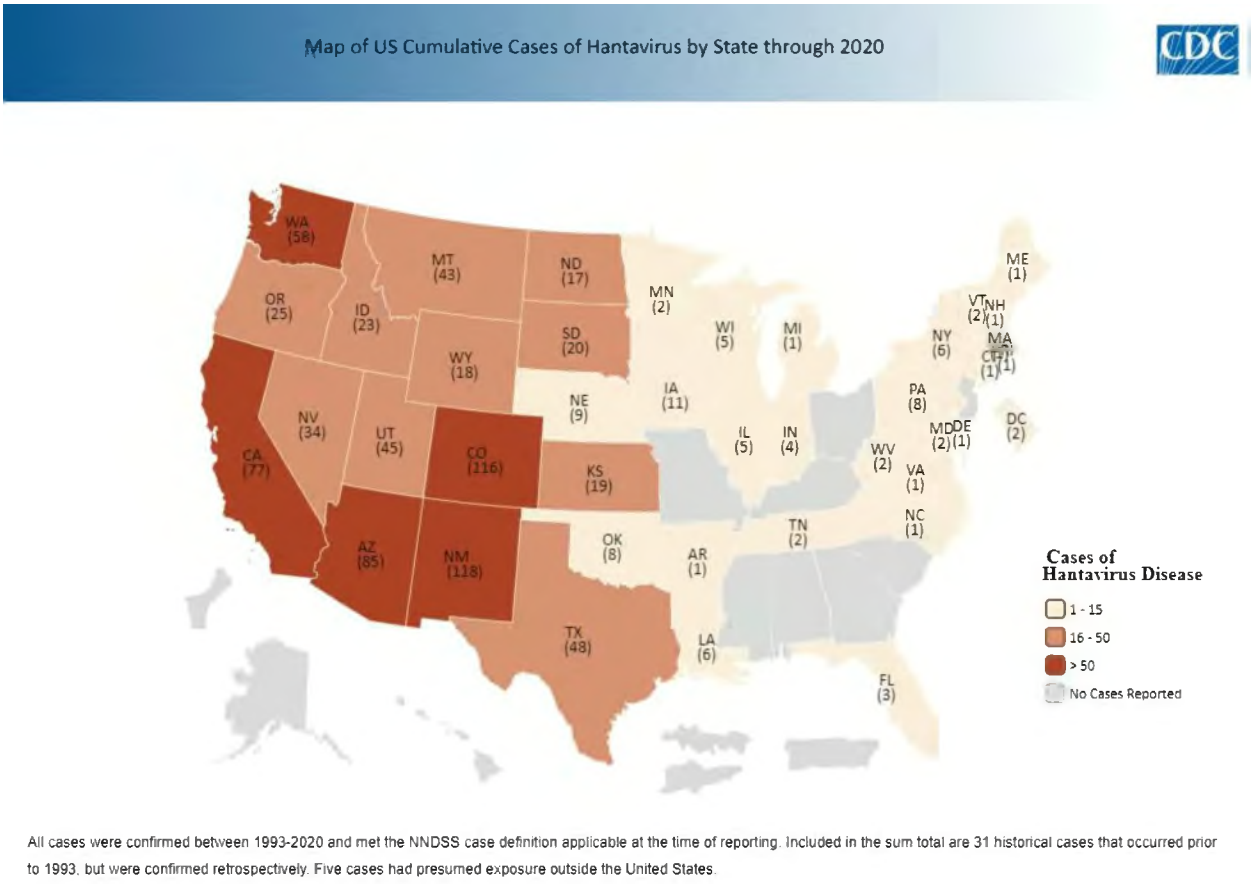
The entire County and population are at risk of contracting HPS. According to the CDC, "over half of the confirmed cases have been reported from areas outside the Four Corners area" and "about three-quarters of patients with HPS have been residents of rural areas" (CDC.gov). Most people contract the disease in their own homes. Figure 4-52 illustrates the geographical spread of hantavirus cases across Colorado between 1985 and 2009. Figure 4-53 below that shows the cumulative number of identified cases nationwide through 2020, from the CDC. As this map shows, the cases are heavily concentrated in the Western US, specifically the Southwest. Colorado has the second highest number of cumulative cases after New Mexico.

Figure 4-52 Colorado Human Hantavirus Pulmonary Syndrome Cases: 1985-2009



Source: Colorado Department of Public Health and Environment, Disease Control and Environmental Epidemiology Division

Figure 4-53 Map of US Cumulative Cases of Hantavirus by State Through 2020



All cases were confirmed between 1993-2020 and met the NNDSS case definition applicable at the time of reporting. Included in the sum total are 31 historical cases that occurred prior to 1993, but were confirmed retrospectively. Five cases had presumed exposure outside the United States.

Geographical Area Affected

The geographic extent of wildlife hazards in the Archuleta County response area is **significant**.

Magnitude/Severity

Wildlife-Human Hazards

The impacts of wildlife-human hazards in Archuleta County would likely be **negligible**. Less than 10 percent of the planning area would be affected by any single event. Generally, only a few people are affected by a wildlife hazard at any one time, although injuries or death are possible. It is unlikely that critical facilities and services would be impacted.

Hantavirus

Overall, hantavirus impacts to Archuleta County would likely be **negligible**, with less than 10% of the planning area's population affected.

Frequency/Likelihood of Occurrence

Wildlife-Human Hazards

Vehicular accidents or encounters involving wildlife are highly likely to occur in any given year in Archuleta County. According to the CDOT data described in Table 4-71, a total of 1,413 wildlife-vehicle accidents occurred between 1994 and 2019. 1,413 events over a 25-year span of time averages out to roughly 57 events per year. This equates to a 100% probability that a wildlife-vehicle crash will occur in the planning area during any year.

Hantavirus

The likelihood or frequency of hantavirus infections cannot be calculated for Archuleta County specifically because no reported cases have occurred in the planning area. However, given 116 Colorado cases over a 27-year span, the likelihood that a hantavirus case will occur in the State in any given year is 100%. Many of the past cases were located in the southwestern part of the state, so it is likely that a hantavirus case will occur in Archuleta County.

Climate Change Considerations

According to the best data available at the time of this plan update, the future impacts of climate change are expected to influence future WVC events, but the extent of these impacts is as yet unknown. Climate Change is projected to cause major shifts in species habitat forcing wildlife to migrate in search of new habitats and potentially using different routes and patterns as resources become scarce in their home habitats. Records dating back to the ice age shows shifts in species distributions as a result of a changing climate (Lister, Brocki and Ament 2105). Additional research is needed to determine the effects of climate change on the location, extent/intensity, frequency, and high-season duration of WVCs.

Vulnerability

People

People are the greatest source of vulnerability to this hazard. There have been 78 injuries and 1 death from wildlife-vehicle collisions in Archuleta County since 2010, resulting in multiple injuries per year. This is the biggest impact on people from this hazard.

Property

Throughout Archuleta County it is likely that dozens of personal vehicles will be damaged in any given year.

Critical Facilities and Lifelines

Buildings are generally not impacted by this hazard. Wildlife-vehicle collisions may damage road infrastructure and transportation lifeline if vehicles or animals collide with guardrails, barriers, etc. These impacts are typically short-term, however.

Economy

Wildlife-vehicle collisions often result in short-term blockage of roadways that prevent travel and access to local businesses by residents, recreationists, and tourists which could cause economic impacts, albeit short-lived. Due to the relatively low case rates of Hantavirus and the lack of human-to-human transmission, it is unlikely that Hantavirus would result in any measurable impact to the economy.

Historical, Environmental, and Cultural Resources

Environmental damage may occur when vehicles are forced from the roadway in collisions. Engine fluids may also leak onto the ground, though likely not in large enough quantities to cause extensive or long-term environmental damage.

Development Trends

Future growth and development in the county, both residential and commercial, will fuel increased traffic levels, and therefore increased chances for human and wildlife interactions. This includes vehicle collisions as well as an increased likelihood of direct human contact with animals, which may attack or spread diseases at increased rates as residential and tourist populations grow. Traffic in the area increases seasonally during ski season. If the proposed Village at Wolf Creek were completed, CDOT estimates that the rate of traffic could increase from roughly 2,000 vehicles a day to 20,000 during the peak recreational season. This could increase exposure to wildlife-vehicle hazards in the County.

Risk Summary

Table 4-72 Wildlife Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Archuleta County	Significant	Likely	Negligible	Low
Pagosa Springs	Significant	Likely	Negligible	Low
Pagosa Fire Protection District	Significant	Likely	Negligible	Low
Pagosa Area Water and Sanitation District (PAWSD)	Significant	Likely	Negligible	Low

- This hazard has a likely rate of occurrence in the county, but its impacts are generally viewed as negligible. The overall rating is **low**.
- Effects on people: There have been 78 injuries and 1 death from animal-vehicle collisions.
- Effects on property: The primary property impacts are on privately owned vehicles.
- Effects on the economy: Any economic impacts would be minimal and short lived.
- Effects on critical facilities/infrastructure: Damage to roadways and possible linear utilities, such as light poles and transmission lines, could result from animal-vehicle collisions.

4.3.18 Cyber-attacks

Hazard/Description

The 2018 Colorado State Hazard Mitigation Plan defines cyber-attacks as "deliberate exploitation of computer systems, technology-dependent enterprises, and networks." Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that, "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public sector networks. Cyber threats can take many forms, including:

- **Phishing attacks:** Phishing attacks are fraudulent communications that appear to come from legitimate sources. Phishing attacks typically come through email but may come through text messages as well. Phishing may also be considered a type of social engineering meant to exploit employees into paying fake invoices, providing passwords, or sending sensitive information.
- **Malware attacks:** Malware is malicious code that may infect a computer system. Malware typically gains a foothold when a user visits an unsafe site, downloads untrusted software, or may be downloaded in conjunction with a phishing attack. Malware can remain undetected for years and spread across an entire network.
- **Ransomware:** Ransomware typically blocks access to a jurisdiction's/agency's/ business' data by encrypting it. Perpetrators will ask for a ransom to provide the security key and decrypt the data, although many ransomware victims never get their data back even after paying the ransom.
- **Distributed Denial of Service (DDoS) attack:** Perhaps the most common type of cyber-attack, a DDoS attack seeks to overwhelm a network and causes it to either be inaccessible or shut down. A DDoS typically uses other infected systems and internet connected devices to "request" information from a specific network or server that is not configured or powerful enough to handle the traffic.

- **Data breach:** Hackers gaining access to large amounts of personal, sensitive, or confidential information has become increasingly common in recent years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.
- **Critical Infrastructure/SCADA System attack:** There have been recent critical infrastructure Supervisory Control and Data Acquisition (SCADA) system attacks aimed at taking down lifelines such as power plants and wastewater facilities. These attacks typically combine a form of phishing, malware, or other social engineering mechanisms to gain access to the system.

The 2018 Colorado State Hazard Mitigation Plan concludes: "This is a newly developing threat, so as more resources are devoted to countering the hazard, the risk of a disruption would hopefully decrease. Mitigation opportunities for this hazard include continued diligence of the state's Office of Information Technology (OIT), as well as for other government and private sector entities to continue to monitor, block, and report cyber-attacks, and continually assess the vulnerability of systems."

Past Occurrences

According to the FBI's 2021 Internet Crime Report, the FBI received an average of 552,000 cyber-crime complaints per year over the last five years. The Crime Report also noted a trend of increasing cyber-crime complaints and losses each year. Nationwide losses in 2021 alone exceeded $6.9 billion, a 392% increase since 2017. Over the past five years, nationwide cyber-crime complaints totaled to 2.76 million, with $18.7 billion in losses. Colorado ranked 14th among states in losses, with $130,631,286 in total losses, and 17th in number of victims, with 10,537 victims of cyber-crime.

Data on past cyber-attacks impacting Colorado was gathered from The Privacy Rights Clearinghouse. The Privacy Rights Clearinghouse, a non-profit organization based in San Diego, maintains a timeline of 9,741 data breaches resulting from computer hacking incidents in the United States from 2005-2021. The database lists 47 data breaches against systems located in Colorado, totaling over 400,000 impacted records; it is difficult to know how many of those affected Archuleta County residents. Attacks happening outside of the state can also impact local businesses, personal identifiable information, and credit card information. Table 4-73 shows several of the most significant cyber-attacks in Colorado in recent years. The data aims to provide a general understanding of the impacts from cyber-attacks by compiling an up-to-date list of incidents but is limited by availability of data: "this is an incomplete look at the true scope of the problem due in part to varying state laws."

Table 4-73 Major Cyber Attacks Impacting Colorado (100,000+ Records), 2005-2021

Date Reported	Target	Organization Type	Total Records	Description
7/9/2008	Division of Motor Vehicles Colorado	Government	3,400,000	The DMV failed to properly limit access to its database.
3/29/2012	Department of Child Support Services, IBM, Iron Mountain, Inc.	Government	800,000	Several computers being shipped were lost.
12/3/2010	Mesa County, Western Colorado Drug Task Force	Government	200,000	Sensitive information was accidently posted in a place that was publicly accessible on the Internet.
4/22/2008	College Invest	Non-government Organization	200,000	Customers had personal information stored on a computer hard drive that disappeared during a move.

Date Reported	Target	Organization Type	Total Records	Description
6/11/2006	Denver Election Commission	Government	150,000	Records containing personal information are missing at city election offices.
7/22/2010	Colorado Department of Health Care Policy and Financing	Government	105,470	A hard drive containing personal information was stolen.
7/9/2010	Governor's Office of Information Technology	Medical	105,470	Personal records were stolen.

Source: The Privacy Rights Clearinghouse

While The Privacy Rights Clearinghouse dataset did not specify any events that directly impacted the County, the Pagosa Springs Sun reported a cyber-attack incident in Archuleta County. The event took place on November 23rd, 2019, when a computer virus was downloaded to Archuleta County computers. The virus encrypted all county servers and files. A $300,000 Bitcoin ransom was demanded to resolve the virus. The HMPC noted that the ransomware attack resulted in an increase in training and awareness within the county government on cyber security. The county IT director does several trainings and raises awareness about this topic throughout the year.

Geographical Area Affected

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

Magnitude/Severity

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

Data breaches are often described in terms of the number of records or identities exposed. The largest data breach ever reported occurred in August 2013, when hackers gained access to all three billion Yahoo accounts. The hacking incidents associated with Colorado in the Privacy Rights Clearinghouse database are of a smaller scale, ranging from just 32 records to approximately 3.4 million, along with several cases in which an indeterminate number of records may have been stolen.

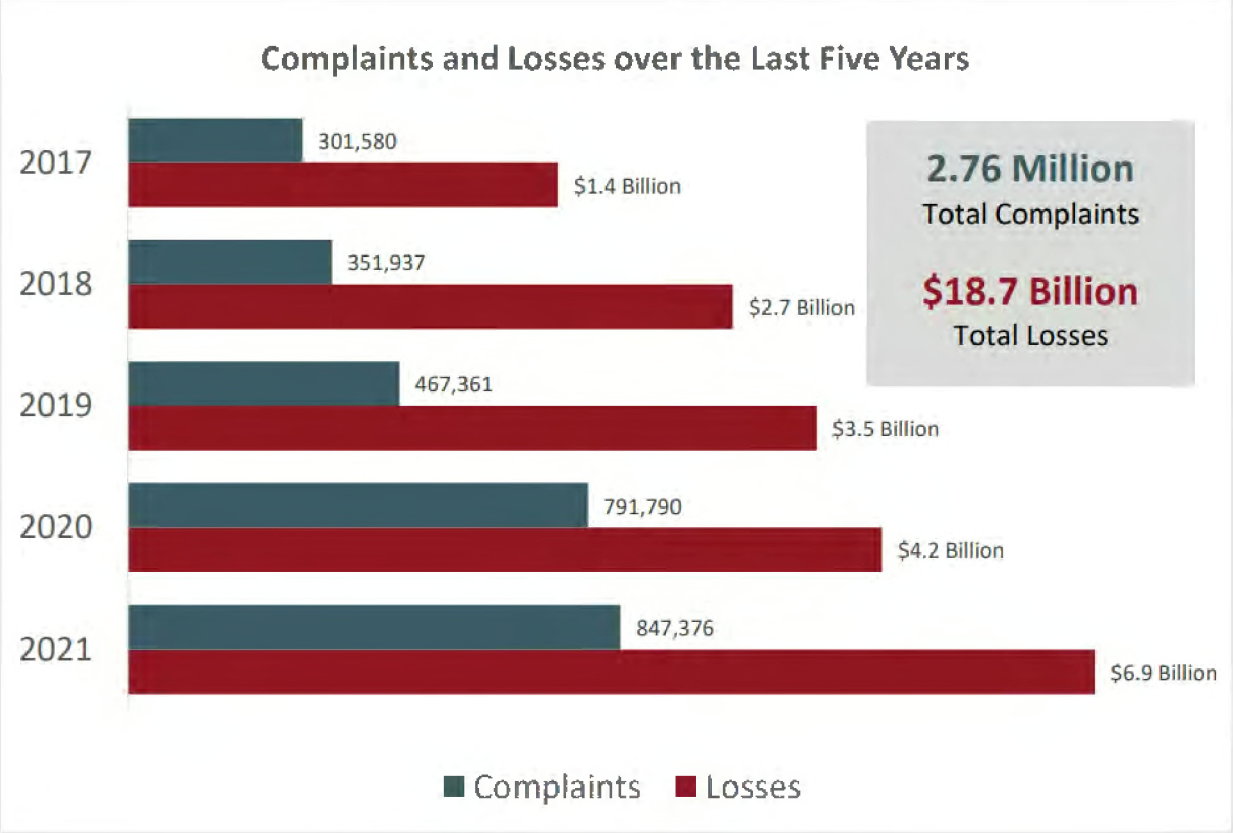
Ransomware attacks are typically described in terms of the amount of ransom requested, or by the amount of time and money spent to recover from the attack. One report from cybersecurity firm Emsisoft estimates the average successful ransomware attack costs $81 million and can take 287 days to recover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

Frequency/Likelihood of Occurrence

Small-scale cyber-attacks such as DDoS attacks occur daily, but most have negligible impacts at the local or regional level. Data breaches are also extremely common, but again most have only minor impacts on

government services. Additionally, the FBI Internet Crime Report 2021 found that there is a trend of increasing cyber-attacks over the past 5 years. These trends are shown in Figure 4-54 below.

Figure 4-54 Trends of the Frequency of Cyber-attacks, 2016-2021



Source: The FBI Internet Crime Report 2021

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

The possibility of a larger disruption affecting systems within the County is a constant threat, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Major attacks specifically targeting systems or infrastructure in the County cannot be ruled out, and there is a general increasing trend in the number of cyber-attacks each year across the United States. Therefore, the probably of future cyber-attack is **likely**.

Climate Change Considerations

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

As more systems become more reliant on technology, this will likely increase the community's vulnerability.

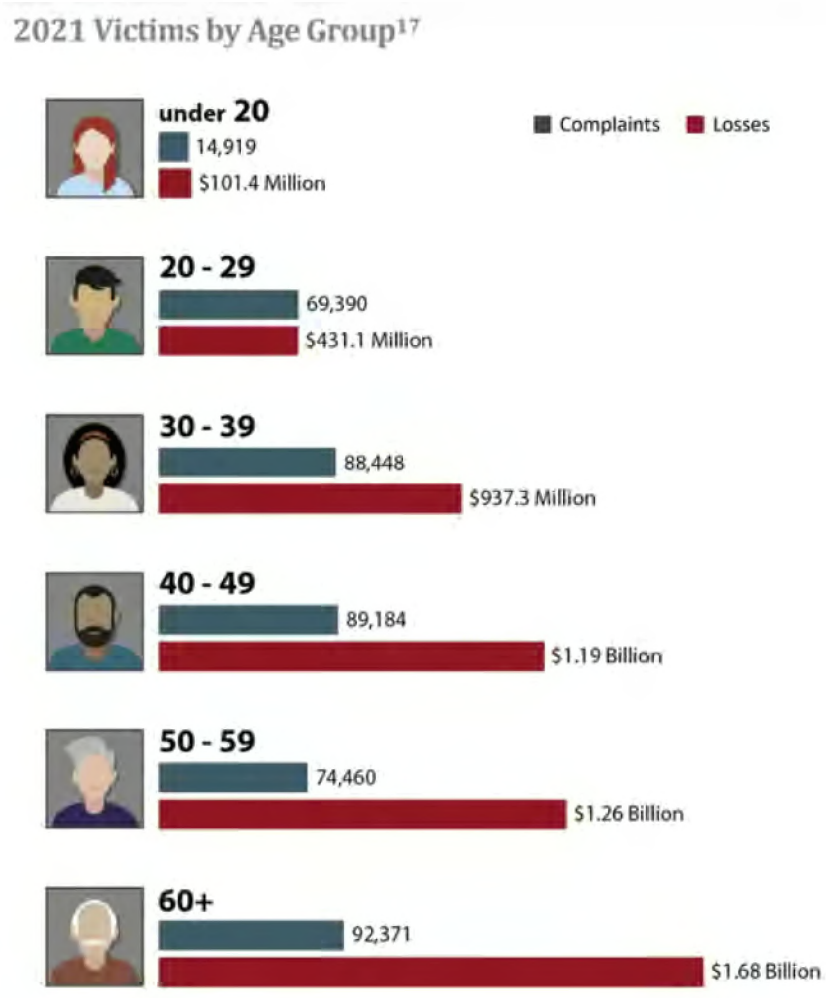
Vulnerability

People

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

The FBI Internet Crime Reports on the victims of cyber-attack by age group. While the number of cyber-attack complaints is comparable across age groups, the losses increase significantly as age group increases, with individuals 60 years and older experiencing greatest losses. This is likely due to seniors being less aware of cyberthreats, lack the tools to identify cyberthreats, and "Grandparent Scams", which is a cyberattack where criminals impersonate a loved one in need, such as a grandchild, and ask for money. In Archuleta County, 37.6% of the population was reported to be 60+ in 2020, according to the U.S. Census. Figure 4-55 displays the breakdown of victims by age group in 2021.

Figure 4-55 Victims by Age Group in 2021



Source: The FBI Internet Crime Report 2021

Property

Most cyber-attacks affect only data and computer systems and have minimal impact on general property.

Critical Facilities and Lifelines

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

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

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

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

Economy

Data breaches and subsequent identify thefts can have huge impacts on the public. The Internet Crime Complaint Center (IC3) estimates that identity theft alone resulted in $2.7 billion in losses to businesses and $149 million in losses to individuals. The FBI Internet Crime Report 2021 reported losses in Colorado due to cyber-attacks totaled $130,631,286 in 2021 alone.

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

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

Historical, Environmental, and Cultural Resources

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

Development Trends

Changes in the build environment typically have no impact to the threat, vulnerability, and consequences of a cyber-attack, but may expose more systems and provide avenues for attack. Cyber-attacks can and have targeted small and large jurisdictions, multi-billion-dollar companies, small mom-and-pop shops, and individual citizens. The decentralized nature of the internet and data centers means that the cyber threat is shared by all, regardless of new construction and changes in development. As more systems become more reliant on technology, this will likely increase the community's vulnerability.

Risk Summary

In summary, cyber-attack is considered medium significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-74 Cyber-Attack Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Significant	Likely	Critical	Medium
Pagosa Springs	Significant	Likely	Critical	Medium
Pagosa Fire Protection District	Significant	Likely	Critical	Medium
Pagosa Area Water and Sanitation District (PAWSD)	Significant	Likely	Critical	Medium

- The overall significance of cyber-attack is rated as medium
- 47 reported data breaches against systems located in Colorado since 2005. It is difficult to determine how many of these attacks impacted Archuleta County, but with increasing trends in the number of cyber-attacks across the United States each year, probability of future occurrence is ranked as likely
- Any server or computer network in the County is susceptible to a cyber-attack, therefore geographic extent is significant
- Individuals age 60+ experience greatest total losses from cyber-attacks
- Trend of increasing number of cyber-attacks and increasing losses each year. Growing concern as more systems become reliant on technology
- Cyber-attacks typically result in power and communication failures, economic disruptions, and breach of information; therefore, potential magnitude is ranked as critical

4.3.19 Hazardous Materials Incident

Hazard/Problem Description

Archuleta County is susceptible to accidents involving hazardous materials on roads, highways, and at fixed facilities that manufacture, use, or store dangerous chemical substances. A hazardous materials incident may occur at any time during routine business operations or as a result of a natural disaster. The release of hazardous materials can threaten people and natural resources in the immediate vicinity of the accident. Air releases can prompt large-scale population evacuations and spills into water or onto the ground can adversely affect public water and sewer systems.

A transportation incident refers to accidental and uncontrolled releases of chemicals or other hazardous materials during transport (i.e., highways, pipelines, and airways). A fixed-facility incident is an uncontrolled release of chemicals or other potentially hazardous materials from a facility. Fixed facilities include companies that store hazardous waste at their facility and all hazardous waste sites. Begun in 1988, the Toxics Release Inventory (TRI) is a federal program established by the U.S. Environmental Protection Agency

that contains information on releases of nearly 650 chemicals and chemical categories from industries including manufacturing, metal and coal mining, electric utilities, and commercial hazardous waste treatment, among others. TRI facilities are required to file reports of their disposal or other environmental releases as well as other waste management quantities of regulated chemicals if they manufacture, process, or otherwise use more than the established threshold quantities of these chemicals. Archuleta County has no reported TRI data.

Highway 160 is an authorized hazardous materials route. Fuel trucks traveling over Highway 160 are of concern to the County, though myriad materials apart from radioactive substances are transported through the planning area. Since Archuleta County is surrounded by mountains and diverse terrain, transportation of hazardous materials is at higher risk to accidents on high mountain passes with severe weather conditions and ice, wildlife, and debris on the roadways.

Note: The TRI does not cover all toxic chemicals that have the potential to adversely affect human health or the environment. The data does not include emissions from mobile sources nor releases of pesticides, volatile organic compounds, or fertilizers from many nonindustrial sources.

Past Occurrences

According to the National Response Center, Archuleta County typically experiences one or two hazardous materials incidents each year. This record of events suggests that Archuleta County's primary hazardous materials concern is transportation accidents involving trucks carrying hazardous materials such as fuel. Highway 160 can be particularly dangerous to travel during winter months when the roads can be snowy and icy. Inappropriate storage of hazardous materials on private and commercial property also seems to be an issue. Table 4-75 catalogues hazardous materials events reported in Archuleta County from 1998 to 2021.

Table 4-75 Hazardous Materials Incidents in Archuleta County, 1998-2021

Incident Date	Description of Incident	Type of Incident	Nearest City	Location	Materials
1/12/2021	Caller is reporting the release of 499 gallons of diesel fuel from a tanker truck transfer. The released material went onto the ground and soil. The cause of the release is due to operator error.	Mobile	Pagosa Springs	700 Honey Bee Place	Oil, diesel
12/17/2019	A caller reports a discharge of appx. Up to 150 gallons of diesel fuel from a left saddle tank of a tractor trailer truck that jack knifed on the highway 160 in Pagosa Springs. The caller stated that the discharge of diesel impacted asphalt and a nearby borrow ditch but reported no waterway impact.	Mobile	Pagosa Springs	Highway 160	Gravel

Incident Date	Description of Incident	Type of Incident	Nearest City	Location	Materials
12/4/2017	Caller stated that approximately 70 gallons of diesel was discharged from the saddle tank of a tractor trailer, onto pavement, due to the vehicle overturning. Approximately 5 gallons of diesel impacted soil. There were no injuries or fatalities reported.	Mobile	Pagosa Springs	Hwy 160, mile post 160	Oil, diesel
1/2/2015	Tractor trailer truck rolled onto its side at a turn resulting in a spill of diesel fuel.	Mobile	Pagosa springs	MP 160.6	Oil, diesel
12/11/2015	A reported 100 gallons of diesel discharged from the saddle tank of a tractor trailer truck, due to a truck rollover. No injuries, fires or water impact involved.	Mobile	N/a	Highway 84 at road mm13	Oil, diesel
1/30/2014	A single vehicle accident involving a tractor trailer, where there was a discharge of 10 gallons of diesel fuel from the saddle tank onto the roadway and ditch.	Mobile	Pagosa springs	Hwy 160 MP 133.5	Oil, diesel
1/27/2013	A pleasure craft sank due to unknown causes. There is no visible sign of sheening now.	Vessel	Arboles	Navajo state park	Oil, diesel
5/4/2013	A release of an unknown product from a tanker truck that rolled over, there were no fatalities.	Mobile	Pagosa springs	On Hwy 160 east about mp 126	Unknown material
5/4/2013	A discharge of an unknown amount of gasoline from a truck, the cause was due to a traffic accident, caller also stated that there was one injury reported with no fatalities.	Mobile	Pagosa springs	Hw 160 mp 126	Gasoline: automotive (unleaded)

Incident Date	Description of Incident	Type of Incident	Nearest City	Location	Materials
8/17/2011	Caller stated that there was a release of 50 gallons of diesel fuel from the saddle tank of the vehicle, the cause was due to a crash, there were no injuries and no fatalities.	Mobile	Pagosa Springs	Hw Milepost 8 On Hw 84	Oil, Diesel
6/8/2011	Caller stated this a spill of waste oil at an auto repair facility. The surface inside the facility near the spill is saturated with waste oil.	Fixed	Pagosa Springs	1435 East Hwy 160	Waste Oil
9/30/2010	Due to a single vehicle crash, there was a spill of materials from the saddle tank of a tractor trailer truck.	Mobile	Pagosa Springs	Highway 160	Oil, Diesel
11/29/2010	A hydraulic oil discharge due to a broken fitting on a pump. Caller stated the material is believed to be a biodegradable oil.	Fixed	Allison	Fosset Gulch Rd	Hydraulic Oil
1/12/2009	Diesel fuel spilled onto the pavement and possibly into a ravine leading into the San Juan national forest form the saddle tank of an overturned tractor trailer.	Mobile	Pagosa springs	Wolf creek pass	Diesel fuel
9/13/2008	County landfill caught on fire and released toxic fumes.	Fixed	Pagosa springs	Mile marker 9 on county road 500	Toxic fumes
9/8/2008	Release of diesel fuel from tractor trailer truck due to transport accident (single vehicle accident)	Mobile	Pagosa springs	Hwy 160, close to wolf creek summit	Diesel fuel
9/21/2007	A county landfill leaked and released material into a river every time it rained over a span of about 25 years.	Fixed	Pagosa springs	Archuleta county landfill, county rd 500	Landfill runoff
8/21/2007	Individual was dumping in the area and releasing materials into the ground	Fixed	Pagosa springs		N/a

Incident Date	Description of Incident	Type of Incident	Nearest City	Location	Materials
4/6/2006	Release of materials into ground from tractor trailer transport accident	Mobile	Pagosa springs	On highway 84	N/a
1/25/2006	Gasoline leaked from damaged sailboat into marina	Vessel	Arboles	County road 982	Boat fuel
5/4/2005	Private owner's storage tank leaked flammable liquids onto the ground	Storage tank	Pagosa springs	Aspen springs subdivision	Flammable liquids
3/10/2005	Anti-freeze stored in unsecured container on private property	Storage tank	Pagosa springs		Anti-freeze
6/27/2003	Tanker truck carrying liquid nitrogen rolled over. No hazardous materials were released in the incident	Mobile	Pagosa springs	Hwy 160 near mp 132	
10/11/2002	Pipeline spilling sewage into San Juan river	Pipeline	Pagosa springs	Hwy 160 and 1st street	Sewage
5/7/2001	The caller is reporting a chem trail from an unknown air craft that is now making her sick.	Aircraft	Pagosa Springs	Meadow Drive	Chem Trail from aircraft
10/13/2000	Dump truck went into a ditch. The fuel tank ruptured and diesel spilled onto a driveway	Mobile	Pagosa springs	Hurt Drive / Aspen Springs	Diesel fuel
5/5/2000	Material spilled from a supply hose from a gravity feed fuel tank due to a broken fitting	Fixed	Arboles	County road 982	Fuel
11/8/1999	The caller stated that the rp has several leaking garbage trucks /there are also several scattered oil spills and loose batteries.	Mobile	Pagosa Springs	1041 COUNTY ROAD 500	Battery Acid
5/18/1998	Tractor trailer / saddle tank ruptured due to a single vehicle accident.	Mobile	Pagosa Springs	Wolf Creek Pass	Oil, diesel

Source: National Response Center, www.nrc.uscg.mil/

County Landfill Fires

A deep-seated fire in the county landfill has been an ongoing problem for several years. Flare ups from the fire's resulting smoke can he a potential health hazard. Options investigated to extinguish the fire have been prohibitively expensive. A member of the public in the Town of Pagosa Springs noted that lithium batteries, which are found in most mobile phones, laptop computers, and other electronic devices have been known to cause fires in the trash vehicles and landfills. Creating a local disposal facility for these batteries could potentially reduce likelihood of a landfill fire in the future.

Geographical Area Affected

A hazardous materials incident in downtown Pagosa Springs could have severe consequences. It is more likely that an event would occur in the Wolf Creek Pass area where the potential for trucking accidents is higher.

Limited: Unincorporated and incorporated areas along Highway 160 are the most probable potential sites of hazardous materials transportation accidents.

Magnitude/Severity

Overall, impacts from a hazardous materials incident in Archuleta County would likely be limited, with 10-25 percent of the area affected. However, it is important to note that two schools and the county courthouse are located along Highway 160 and are therefore directly exposed to the dangers of hazardous materials incidents.

Frequency/Likelihood of Occurrence

The potential for a hazardous materials incident in the planning area is very real. Highway 160 has several sharp curves and narrow passages in places, making it a potentially dangerous route for trucks transporting hazardous materials. According to NRC records, 29 hazardous materials incidents occurred in Archuleta County between 1998 and 2021. Twenty-nine events over a 23-year span yields an 80% probability that a hazardous materials incident will occur in Archuleta County in any given year. This corresponds to a frequency/likelihood rating of highly likely.

Climate Change Considerations

There are not expected to be climate change impacts on human-caused hazards such as hazardous materials incidents.

Vulnerability

People

Hazardous materials events could potentially threaten public safety. It is important to note that schools and most of the County and Town's population are located within a one-mile corridor of Highway 160 and are therefore potentially exposed to the dangers of hazardous materials incidents.

Property

Three buildings belonging to the Archuleta School District are located along Highway 160 and are identified as being vulnerable to hazardous materials issues. These vulnerable buildings include Pagosa Springs Elementary, Pagosa Springs Middle School Building #1, and Pagosa Springs Middle School Building #2. Highway 160 makes an abrupt turn directly in front of the county courthouse. There is the potential for a vehicle traveling westbound to end up in the county clerk's office if the turn is missed.

Critical Facilities and Lifelines

Impacts of hazardous material incidents on lifelines are most often limited to the area or facility where they occurred, such as at a transit station, airport, fire station, hospital, or railroad. However, they can cause long-term traffic delays and road closures resulting in major delays in the movement of goods and services. These impacts can spread beyond the planning area to affect neighboring counties, or vice-versa. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to critical facilities. The hazardous materials and transportation lifelines are most likely to be impacted by this hazard, however in very severe situations impacts could be felt to other lifelines such as food, water, shelter, health and medical, and safety and secure in the event a large spill results in injuries, contaminated food or water, and medical attention and EMS services required for response to the incident.

Economy

Hazardous materials incidents can also interrupt transportation and delivery services, potentially resulting in economic losses.

Historical, Environmental, and Cultural Resources

The potential impact to the environment is often related to public safety issues such as air and water quality.

Development Trends

The number of hazardous materials that are stored, used, and transported across the county are not anticipated to increase over the next five years based on regional growth trends.

Risk Summary

In summary, hazardous materials incidents is considered medium significance overall for the county. Variations in risk by jurisdiction are summarized in the table below, followed by key issues noted in the vulnerability assessment.

Table 4-76 Hazardous Materials Incidents Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Limited	Highly Likely	Limited	Medium
Pagosa Springs	Limited	Highly Likely	Limited	Medium
Pagosa Fire Protection District	Limited	Highly Likely	Limited	Medium
Pagosa Area Water and Sanitation District	Limited	Highly Likely	Limited	Medium

- Based on historic data, Archuleta County experiences a hazmat incident every year, however, notable hazardous materials incidents occur every 5-10 years.
- Since 1982, none of these incidents have resulted in injuries, fatalities, damages, or required evacuations.
- Hazardous materials releases can complicate response to and recovery from natural disasters such as foods, earthquakes, and severe storms.
- Effects on people: Hazardous Materials incidents can cause injuries and fatalities, as well as long term health problems like increased cancer risks, but is highly dependent on the location of the incident.
- Effects on property: Impacted properties can require cleanup, but the effects are usually localized to the site of the release.
- Effects on economy: Extended road closures can result in economic losses and impact tourism.
- Effects on critical facilities and infrastructure: Impacted facilities and infrastructure can require cleanup, but the effects are usually localized to the site of the release.
- Related Hazards: Earthquake, Flood, High winds, tornadoes, Severe Winter Storm, Wildfire, Imminent Threat/Terrorism

4.3.20 Imminent Threat/Terrorism

Hazard/Problem Description

Imminent threat includes the potential for violent attacks, including but not limited to domestic and international terrorism. The Federal Bureau of Investigation (FBI) defines terrorism as "the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population,

or any segment thereof, in furtherance of political or social objectives." The threat of terrorism, both international and domestic, is ever present, and an attack is likely to occur when least expected. Terrorism is a growing threat worldwide that must be addressed through security and awareness. Needs associated with terrorism include training and equipping of local emergency response personnel in cooperation with state and federal agencies.

Terrorism exists in many forms, but eco-terrorism specifically is the most concerning to Archuleta County. Eco-terrorism is a form of domestic terrorism that the FBI defines as "the use or threatened use of violence of a criminal nature against innocent victims or property by an environmentally-oriented, subnational group for environmental-political reasons, or aimed at an audience beyond the target, often of a symbolic nature." According to the Southern Poverty Law Center, extremists within the environmental and animal rights movements have committed thousands of violent criminal acts in recent decades, more than those from any other radical sector. These acts have included arsons, fire bombings, assaults, and attacks on animal-based businesses and laboratories. The leading ecoterrorist groups are the Animal Liberation Front and the Earth Liberation Front. Since 1996, these groups have had committed more than 600 criminal acts, causing more than $43 million in damage nationwide.

There is potential for eco-terrorism to occur in the Archuleta County response area. Archuleta County is well-known for its unadulterated natural beauty. This is a major source of pride for many of the local communities. For the past several years, a proposal has been in development to construct a ski resort at the current Wolf Creek Ski area in Mineral County. Many people are highly concerned about the impact that this development, known as the Village at Wolf Creek, would have on the area's ecosystems and wildlife. It is likely that the Village would also increase the amount of traffic and the number of people living in the County by an estimated 8,000-10,000 individuals. For these and other reasons, many individuals within Archuleta County and surrounding areas believe very strongly that the Village should not be built. If the proposal for the Village were approved, there is a possibility of eco-terrorism from some of the more vehement anti-development individuals.

While there have been no documented reports of terrorist attacks in Archuleta County, the Federal Bureau of Investigation (FBI) identifies five categories of imminent threat that could impact any location in the United States:

- Racially or ethnically motivated violet extremism
- Anti-government or anti-authority violent extremism
- Animal rights/environmental extremism
- Abortion-related violent extremism
- All other domestic terrorism threats (e.g., related to religion, gender, or sexual orientation)

Imminent threats to public safety are a growing concern worldwide that must be addressed through security and awareness. Needs associated with imminent threats include training and equipping of local emergency response personnel in cooperation with state and federal agencies. See also the Cyber-attack profile.

Past Occurrences

In 2009, an individual committed an act of domestic terrorism within the planning area. This individual's house was foreclosed, prompting him to manufacture pipe bombs with the intent to use the explosives at the nearest Wells Fargo in an act of revenge. The Farmington Bomb Squad was called in to handle the event. The individual ended up killing himself, and no other people were physically harmed in the incident. In 2011, a bomb threat was received in the area of the county courthouse.

Geographical Area Affected

Limited: Potential ecoterrorist activity within the Archuleta County response area would most likely be concentrated near the Wolf Creek Ski Area. Given the event in 2009 described in Past Occurrences, it is possible that additional acts of domestic terrorism could occur in the future in the planning area. Other potential terrorist target sites include active mines, high hazard dams, power grids, substations, and communications facilities.

Magnitude/Severity

Overall, terrorism impacts in Archuleta County would likely be **negligible**, with 10-25 percent of the area affected.

Frequency/Likelihood of Occurrence

Unlikely - Between 1% and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.

Climate Change Considerations

At the time of this plane there are no known climate change impacts pertinent to this hazard.

Vulnerability

Potential losses from terrorism include human deaths and injuries, damage to property, infrastructure, critical facilities, crops, and animals. The degree of impact would be directly related to the type of incident and the target. Potential losses could include cost of repair or replacement of damaged facilities, lost economic opportunities for businesses, loss of human life, injuries to persons, loss of food supplies, disruption of the food supply chain, and immediate damage to the surrounding environment. Secondary effects of infrastructure failure could include public safety hazards, spread of disease, increased morbidity and mortality among the local and distant populations, public panic and long-lasting damage to the environment.

Terrorism events are rare occurrences and specific amounts of estimated losses for previous occurrences are not available due to the complexity and multiple variables associated with these types of hazards. In some instances, information about these events is secure and unavailable to the public in order to maintain national security and prevent future attacks.

People

With the exception of ecoterrorists, who have mostly focused on causing property damage, most terrorists and active shooters primarily target people. Individuals may be injured or killed by attacks. Furthermore, the county's low population means that even a small incident can have a proportionally high impact. Psychological effects of the incident, on not only victims and responders but also the general public, may last for years.

Property

Explosive attacks in particular can damage buildings and structures at or near the point of attack. While active shooter incidents rarely cause major property damage directly, indirect effects can be significant, such as the loss of critical facilities for days or weeks due to crime scene concerns.

Critical Facilities and Lifelines

Critical infrastructure is a popular target for terrorist groups, particularly attacks involving explosives. In addition to physical attacks on critical facilities, a cyber-attack by a terrorist organization could interfere with emergency response communications and result in power disruptions, consequently impacting other utilities such as sewer pumps. Depending on the type and severity of the attack, restoring function could take days or weeks. Impact could be critical depending on the function and importance of the asset.

Economy

Terrorist attacks can have significant economic impacts, mainly as a result of decreased travel and tourism following an attack. Terrorist attacks could also deter businesses from relocating to impacted areas, although there is not significant research to support this conclusion.

Historical, Environmental, and Cultural Resources

The County's abundant natural and historic resources can also be damaged, particularly from attacks involving explosives or arson. National Forests are particularly vulnerable to arson.

Development Trends

The link between increased development and imminent threat attacks is uncertain at best. A larger population could potentially make public events in the County more attractive targets for these types of attacks. Certain types of development, such as resorts, may become eco-terrorism targets.

Risk Summary

Table 4-77 Imminent Threat/Terrorism Hazard Risk Summary by Jurisdiction

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Archuleta County	Limited	Unlikely	Negligible	Low
Pagosa Springs	Limited	Unlikely	Negligible	Low
Pagosa Fire Protection District	Limited	Unlikely	Negligible	Low
Pagosa Area Water and Sanitation District (PAWSD)	Limited	Unlikely	Negligible	Low

- Archuleta County has two recorded Imminent Threat/Terrorism events from the year 2009 to 2022.
- Imminent Threats or Acts of Terrorism are considered unlikely in Archuleta County, but probability and Magnitude/ severity is difficult to predict.

5 Mitigation Strategy

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This chapter describes the mitigation strategy developed by the Archuleta County Hazard Mitigation Planning Committee (HMPC), based on the risk assessment that was updated at both planning workshops, survey feedback, and interviews with local officials. It explains how the County and participating jurisdictions accomplished Phase 3 of FEMA's 4-phase guidance, Develop the Mitigation Plan, and includes the following from the 10-step planning process:

- Planning Step 6: Set Goals,
- Planning Step 7: Review Possible Activities, and
- Planning Step 8: Draft an Action Plan.

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to the mitigation strategy and mitigation action plan for this HMP update. As part of the plan update process, a comprehensive review and update of the mitigation strategy portion of the plan was conducted by the HMPC. As part of this process the original goals and objectives from the 2017 Plan were reviewed and reaffirmed. While the goals were not changed, some objectives were modified to reflect current priorities. The mitigation actions from 2017 Plan were reviewed and assessed for progress and evaluated for their inclusion in this plan update. Section 5.1 below identifies the updated goals and objectives of this plan and Section 5.3.1 details the progress on 2017 mitigation actions and summarizes the updated mitigation action plan.

5.1 Goals and Objectives

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, the Hazard Mitigation Planning Committee (HMPC) has organized resources, assessed natural hazards and risks, and documented mitigation capabilities. A profile of the County's vulnerability to natural hazards resulted from this effort, which is documented in the preceding chapter. The resulting goals, objectives, and mitigation actions were developed based on this profile. The HMPC developed the new updated mitigation strategy based on a series of meetings and worksheets designed to achieve a collaborative mitigation planning effort, as described further in this section. The goals for this plan were developed by the HMPC based on the plan's risk assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and the mitigation strategy for Archuleta County.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard for implementation, that is, implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that the goals are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

Based upon the risk assessment review and goal setting process, the HMPC developed the following goals and associated objectives. These were revisited and validated by the HMPC during the 2022 HMP update process. The goals did not change but a modification to the objectives occurred based on HMPC input. Objectives 1.3 was added as part of the update process, based on feedback received during planning meeting #2.

- Goal 1: Increase awareness of hazards that affect the Archuleta Response Area
  - Objective 1.1 - Continue to develop and improve detection and warning systems
  - Objective 1.2 – Emphasize the importance of personal responsibility for mitigating impacts to oneself, family, and property
  - Objective 1.3 - Provide community education programs to increase awareness and opportunities to reduce risk to cyber-attacks, imminent threat/terrorism and pandemics.
- Goal 2: Reduce impacts of hazards on life, property, and the environment
  - Objective 2.1- Continue to reduce wildfire risk in subdivision and forest areas
  - Objective 2.2- Protect existing property to the extent possible
  - Objective 2.3- Ensure access to county roads for fire and utilities equipment
  - Objective 2.4- Community fire mitigation and CWPP development
  - Objective 2.5- Reduce impacts to new development
  - Objective 2.6- Continue to reduce flood losses through compliance with National Flood Insurance Program requirements
- Goal 3: Protect critical facilities and infrastructure from hazard impacts
  - Objective 3.1 – Continue partnerships and projects that reduce impacts to public utilities including electric, gas, water and communications.
- Goal 4: Strengthen and develop partnerships in regards to mitigating hazard impacts
  - Objective 4.1- Promote coordination between counties, states, federal agencies, tribes, special districts, non-governmental organizations, and the private sector.
  - Objective 4.2 - Reconvene on an annual basis the multiple jurisdictions and agencies on the Hazard Mitigation Planning Committee to discuss plan implementation and monitor progress.

5.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation measures to support the mitigation goals, each hazard identified in Section 4.1: Identifying Hazards was evaluated. The HMPC analyzed a comprehensive set of viable mitigation alternatives that would support identified goals and objectives. Each HMPC member was

provided with the following list of categories of mitigation measures, which originate from the NFIP Community Rating System:

- **Prevention**: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural**: Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection**: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services**: Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

The HMPC members were also provided with several lists of alternative multi-hazard mitigation actions for each of the above categories via email and at a mitigation strategy meeting in September 2022. Another reference handout document titled "Mitigation Ideas" and the Mitigation Action Portfolio developed by FEMA was distributed to the HMPC via an online link and a reference hardcopy brought to the HMPC mitigation strategy meeting in 2022. This reference provides four categories of mitigation actions that were discussed at the HMPC meeting in addition to the NFIP/CRS categories. These include:

- Plans and Regulations
- Structure and Infrastructure Projects
- Education and Awareness
- Natural systems protection

Other alternatives discussed at the meeting include the four 'A's' of mitigation:

- Alter the physical nature of the hazard
  - Such as wildfire defensible space and fuels treatments, snow fences etc.
- Avert the hazard away from people, buildings, and infrastructure
  - Can include engineered solutions, drainage, and channel improvements, floodproofing, fire breaks
- Adapt to the hazard
  - Through land use planning, building codes and design standards, warning systems etc.
- Avoid the hazard
  - Natural systems protection, open space, acquisition or relocation of properties out of hazardous areas

To facilitate the brainstorming process, the HMPC referred to a matrix of typical mitigation alternatives organized by CRS category for the hazards identified in the plan, in addition to a handout that explains the categories and provided examples. These materials are included in Appendix D. HMPC members were encouraged to develop mitigation alternatives that would protect future, as well as existing, development from hazards per the DMA 2000 regulations. A facilitated discussion then took place to examine and analyze the alternatives. With an understanding of the alternatives, a brainstorming session was conducted to generate a list of preferred mitigation actions. HMPC members wrote project ideas on large sticky notes. These were posted on flip charts labeled with the goals. The result was a number of project ideas with the intent of meeting the identified goals and mitigating identified hazards.

5.2.1 Prioritization Process

The prioritization of mitigation actions during the 2022 update followed a similar process used during the original development of this plan. The HMPC members were provided with several sets of decision-making tools, including FEMA's recommended criteria, STAPLE/E (which considers social, technical, administrative, political, legal, economic, and environmental constraints and benefits). The STAPLE/E factors are noted in more detail below.

- **Social**: Does the measure treat people fairly?
- **Technical**: Will it work? (Does it solve the problem? Is it feasible?)
- **Administrative**: Is there capacity to implement and manage the project?
- **Political**: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support the project?
- **Legal**: Does your organization have the authority to implement? Is it legal? Are there liability implications?
- **Economic**: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?
- **Environmental**: Does it comply with environmental regulations or have adverse environmental impacts?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining project priority (the 'economic' factor of STAPLE/E). Other criteria used to recommend what actions might be more important, more effective, or more likely to be implemented than another included:

- Does action protect lives?
- Does action address hazards or areas with the highest risk?
- Does action protect critical facilities, infrastructure or community assets?
- Does action meet multiple objectives (Multiple Objective Management)?

At the mitigation strategy update meeting the HMPC used STAPLEE considerations to determine which of the identified actions were most likely to be implemented and effective. Prioritization of previous mitigation actions identified in the 2017 HMP that are continuing in the updated plan were revisited during a HMPC meeting. New actions identified in 2022 were also prioritized using the process previously described.

5.3 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section outlines the development of the updated mitigation action plan. The action plan consists of the specific projects, or actions, designed to meet the plan's goals. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

5.3.1 Progress on Previous Mitigation Actions

Archuleta County and the majority of the participating jurisdictions have been very successful in implementing actions identified in the 2017 HMP Mitigation Strategy, thus, working diligently towards

meeting the 2017 plan goals. Table 5-1 is a summary of the completed and deleted actions since the previous plan update. Some of the deleted items include projects that have been deferred due lack of funding or other priorities.

The 2017 mitigation strategy contained 33 separate mitigation actions. As of November 2022, three of these actions have been completed, four have been deleted, and 24 are considered continuing-in process or annual implementation items, representing progress on the actions previously identified. Many of the continuing-in process actions include actions that are implemented on a regular or annual basis that contribute to the goals of this plan that will continue to be needed moving into the future. These include public hazard awareness and outreach campaigns, Wildfire Adapted Partnership activities, and wildfire fuels treatment activities.

Table 5-1 Completed and Deleted Actions

ID	Hazard(s)	Mitigation Action	Action Status Notes
Multi-Hazard-1	All Hazards	Archuleta NOAA All-Hazards Radio Transmitter.	Deleted. Doppler radar is going up in La Plata County.
Multi-Hazard-4	All Hazards	Improve Radio Coverage.	Completed.
Multi-Hazard-12	Severe Winter Storm, Wildfire, Avalanche, Lightning, High Wind, Tornadoes	Biomass Power Facility Development.	Deleted.
Wildland Fire-1	Wildland Fire	Reduce fuels around 115 KV line to protect from wildfire from Yellow Jacket to Pagosa Springs.	Completed.
Wildland Fire-11	Wildland Fire	4,370 acres of understory prescribed burning in the Upper Rio Blanco Basin.	Deleted.
Wildland Fire-12	Wildland Fire	Update Community Wildfire Protection Plan.	Completed. Update done in 2020
Wildland Fire-7	Wildland Fire	Evaluate feasibility of Upgrading Domestic Water Systems to Accommodate Fire Flow Requirements.	Deleted.

Continued Compliance with NFIP

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study (FIS). The FIS presents water surface elevations for floods of various magnitudes, including the 1% annual chance flood (also known as a 100-year flood) and the 0.2% annual chance flood (also known as a 500-year flood). Base flood elevations and the boundaries of the 1% and 0.2% floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principal tool for identifying the extent and location of the riverine flood hazard. FIRMs are the most

detailed and consistent data source available, and for many communities they represent the minimum area of oversight under their floodplain management program.

Recognizing the importance of the NFIP in mitigating flood losses, an emphasis will be placed on continued compliance with the NFIP. As an NFIP participants Archuleta County and Pagosa Springs have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain ordinance. Compliance beyond the minimum NFIP standards required for Colorado NFIP-participating jurisdictions include compliance with Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1).

Actions related to continued NFIP compliance include:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital FIRMs in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

All communities are in compliance with Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1), by adopting language in their floodplain resolutions that include the higher standards summarized in the table below.

Table 5-2 CWCB Higher Standards for the State of Colorado

Category	State of Colorado	Minimum NFIP
Floodway [Rule 8(A)]	0.5-foot maximum surcharge*	1.0-foot maximum surcharge
Freeboard for new structures [Rule 11(B)]	Lowest floor (including basements) 1-foot above BFE	Lowest floor (including basements) at or above BFE
Required LOMR [Rule 12(H)]	Any change to BFE +/- 0.3-foot	----
LOMR-F Areas [Rule 11(C)]	Lowest floor must have 1-foot freeboard above previous BFE	Area removed from SFHA
Critical Facilities [Rule 6(D)]	Lowest floor 2-feet freeboard above BFE	No specific standards

*0.5-foot for flooding sources with no effective floodway; new/updated studies.

Source: Rules and Regulations for Regulatory Floodplains in Colorado, Department of Natural Resources, CWCB

Also, to be considered are the flood mitigation actions contained in this HMP that support the ongoing efforts by Archuleta County and the Town of Pagosa Springs to minimize the risk and vulnerability of the community to the flood hazard, and to enhance their overall floodplain management program.

5.3.2 Updated Action Plan

During the 2022 update planning process the HMPC reviewed and refined the mitigation action strategy. The following table represents a summary of the updated action plan for each jurisdiction, including new mitigation actions identified.

Table 5-3 Mitigation Actions Summary by Jurisdiction

Jurisdiction	# of Actions in 2017 HMP	# of Actions Completed	# of Actions Deleted	# of Actions Continued	New Actions Added	# of Actions in 2022 HMP
Archuleta County	23	3	3	17	1	18
Pagosa Springs	3			3	1	4
PAWSD	3			3	1	3
Pagosa FPD	4		1	3		3
Total	33	3	4	24	3	28

The results of mitigation action review and update, identification and prioritization are summarized in Table 5-4. This includes new actions identified during the 2022 process. These projects detail specific actions for reducing future hazard-related losses within Archuleta County's response area and the participating jurisdictions. The projects are grouped by the jurisdictions and hazards that the projects are intended to mitigate. Included are the affected jurisdiction(s) and notes about the department and partners necessary to implement the project. Also included are the goal(s) that the projects primarily align with, with an understanding that some projects may help to achieve more than one goal. The mitigation projects are marked with their relative level of priority: H=high, M=medium, and L=low.

Specific actions, comments, and the parties responsible for each objective are captured in Table 5-4. For each identified project, a worksheet designed to capture additional details was filled out by the HMPC member or organization taking the lead on project implementation. These details include project intent, hazard(s) mitigated, other alternatives considered, applicable jurisdiction(s), cost, benefits (losses avoided), responsible entity, priority, and potential funding. Many of these mitigation actions are intended to reduce impacts to existing development. Those that protect future development from hazards, as required per the DMA 2000 regulations, are indicated by a double asterisk '**' in the action title. These actions include those that promote wise development and hazard avoidance, such as building code, mapping, and zoning improvements, and continued enforcement of floodplain development regulations.

Table 5-4 Archuleta County Mitigation Action Summary Table

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
AC-1	Goals: 1, 2, 4	Southwest Colorado Radar and Early Detection System Improvement. The four corners area of Colorado does not have adequate radar coverage. The Archuleta Response Area is one of the worst areas. The area also has a very limited stream and rain gage network. This makes it very hard to observe storm systems as they affect the area.	Flooding, Lightning, Severe Winter Storm, Hailstorm, High Winds, Tornadoes, and Wildland Fire	Archuleta County	All counties, tribes and municipalities in the four corners area, and the National Weather Service (NWS) ACSO-EM, LCOEM, and CWCB	2023-2028	$200,000 /small radar site and NWS integration $6,000 /unimproved rain gauge site $30,000 / unimproved stream gauge site $20,000 / unimproved weather station $10,000 for data collection system (if 800 systems can be used) Pre-disaster mitigation funding, FEMA, Homeland Security, Counties, Tribes and Colorado Water Conservation Board	Medium	Continue In-Progress
AC-2	Goals: 1, 2, 4	Early Warnings to Structures and Populations in the Floodplains and Dam Inundation Zones. Early warning for flood events is the only way to ensure that the public will know to go to safe ground. This project will use multiple forms of technology to target the population in potential danger. The goal is to make the notification process automatic, so that no human interaction is required: gauges reach a threshold and warnings are automatically issued to the affected population. This project is also linked with the Southwest Colorado Radar and Early Detection System Improvement Project. Without detection, no warning can occur.	Flooding, Dam Failure	Archuleta County	Hinsdale, Mineral, SUIT, School District and Pagosa Springs Archuleta County Combined Dispatch, and Dam owners; PAWSD and USGS	2023-2028	Unknown, depends on scope Pre-disaster mitigation funding, FEMA, Homeland Security, etc.	Medium	Continue In-Progress
AC-3	Goals: 1, 2, 4	Expand Cell Phone / Broadband Coverage. Cell phone and wireless broadband coverage, although improving, is still limited in much of the Archuleta County Response Area. This project would seek to improve cell phone and broadband communications.	All Hazards	Archuleta County	Century Link; Archuleta, Hinsdale, Mineral Counties, SUIT, and Pagosa Springs	2023-2028	Unknown; Federal broadband grants, if they become available	Medium	Continue In-Progress. Increasing coverage, working with Century Link to improve coverage in outlying communities.
AC-4	Goals: 1, 2, 4	Evacuation Route Identification, Marking, and Corridor Improvement. Evacuations route aid in moving the public to safe areas when an emergency or disaster occurs. At this time, there are no formally designated routes in the county. Many of the routes that would be used for evacuations are overgrown or of poor road surface quality.	Wildland Fire and Flood	Archuleta County	County Road and Bridge, ACSO-EM; Hinsdale, Mineral, SUIT, and Pagosa Springs – Streets Dept. Homeowners Associations	2023-2028	Unknown; Homeowners Associations, Metro Districts, County and Town budgets	High	Continue In-Progress. Implementing Zonehaven evacuation route for county starting 2023.
AC-5	Goals: 1, 2, 4	Public Education Program. A strong public education program helps the public prepare for emergencies and disasters. Archuleta uses a series of different techniques to educate the public including: brochures, talks, interviews, websites, social media, and an annual safety expo. The challenges are acquiring the staff time and money to keep the programs going.	All Hazards	Archuleta County	County ACSO-EM; Archuleta, Hinsdale, Mineral, SUIT, School District and Pagosa Springs Emergency 5-8gmt.. offices and special districts	Annual Implementation	$200/yr budget for materials; Archuleta County, Homeland Security, State of Colorado, FEMA, Ready Colorado	Medium	Continue In-Progress
AC-6	Goals: 2,3	Placement of a redundant fiber optic route into Archuleta County. There is currently only one single Ethernet path into Archuleta County for communications. This project would involve constructing an alternative transport route into Archuleta County. The path would follow the highway 84 corridor to the New Mexico state line.	All Hazards	Archuleta County	Century Link; Archuleta, Hinsdale, Mineral, SUIT, Pagosa Springs, CDOT, and La Plata County	2023-2028	$750,000; CenturyLink Communications	Medium	Continue In-Progress

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
AC-7**	Goals: 1,2,3,4	Mapping Comprehensive Hazards for Development and Hazard Aversion. DFIRMs for the planning area are on-line. The Planning Department does not have other hazard maps (geo, fire, etc.) which are referred to in their land use regulations. This project lends itself to education / awareness but also reducing losses to future development through avoidance and planning. The hazard mapping developed during the Hazard Mitigation Plan can be used to guide where more detailed mapping is needed for areas such as landslide, land subsidence, and avalanche areas. Hardcopy maps of avalanche potential areas identified during the planning process should be digitized.	Avalanche, Dam Failure, Earthquake, Land Subsidence, and Floods	Archuleta County	Archuleta County GIS, Planning; ACSO-EM, SUIT, Pagosa Springs	Annual Implementation	Unknown; BRIC	Medium	Continue In-Progress. Floodplain mapping capacity improved. Partner with ESRI for County enterprise account. Updating parcels and data sets.
AC-8**	Goals: 2	Assess the feasibility of adopting the current international building code standards, and if feasible, adopt the standard in Pagosa Springs and Archuleta County. Archuleta County and the Town of Pagosa Springs currently have adopted the 2006 ICC series of codes. Both jurisdictions understand the value of current codes.	Earthquake, Extreme Cold, Severe Winter Storm, High Winds, and Flooding	Archuleta County	County Planning, Pagosa Springs Building Dept.; ACSO-EM	2023-2028	Unknown; BRIC	Low	Continue-Not Started. No political will to adopt 2021
AC-9	Goals: 2, 3, 4	Alternative 115 KV feed line from the South. This is a future work plan which could take 20 years or longer to implement and execute. Other alternatives are being investigated. One very limited alternative is the bio-fuels generation project. Another is the wildland fire line mitigation project.	Earthquake, Extreme Cold, Severe Winter Storm, High Winds, and Flooding	Archuleta County	Tri-State Electric, La Plata Electric Association; Archuleta, Hinsdale, Mineral, SUIT, and Pagosa Springs	2023-2028	Unknown; BRIC	High	Continue In-Progress. Significant progress has been made since last update.
AC-10	Goals: 2, 4	Address Improvements. Accuracy between agencies and jurisdictions, and communication of address changes has been an ongoing issue. Archuleta County has an ongoing addressing project involving correcting addresses, improving inconsistencies, and distributing those changes/correcting. Sustainment / expansion of this project is needed. Addresses in Southern Mineral and Southern Hinsdale are ongoing issues also.	Wildland Fire, Severe Winter Storm, and Flooding	Archuleta County	Archuleta GIS, County Planning; Archuleta, Hinsdale, Mineral, SUIT, and Pagosa Springs Archuleta Assessor's Office, Hinsdale County and Mineral County	2023-2028	Unknown; County Budgets	High	Continue In-Progress. County GIS has worked with planning to improve. Also working with Pagosa Springs. 2 issues of note: (1) physical address on properties (2) Digital - ability to navigate with GPS
AC-11	Goals: 1, 2, 4	Wildland Fire Mitigation on County Public Non-Federal Lands. Archuleta County has a few areas of Open Space, about 200 acres. As land stewards and good neighbors, it is Archuleta County's responsibility to take care of our open lands, just as it is our residents'. This includes keeping the areas clean and healthy. As most of the areas are ponderosa forests with interspersed grassland, this means required selective thinning, and regularly prescribed fire operations. The property the county currently owns, for the most part, is over-grown and susceptible to disease and fire. Should a fire start on county lands and spread to private lands, the county may be responsible for private losses, in particular, if the county is found negligent in their care of their land.	Wildland Fire	Archuleta County	Archuleta County, Archuleta BoCC, and SO-OEM; PLPOA, Town of Pagosa Springs	2023-2028	$400/acre thinning $500 / acre mastication/ chipping or piling $300/wooded or brush acre prescribed fire $200/grass acre prescribed fire	Medium	Continue - In Progress.
AC-12	Goals: 2, 3	Wildland Fire Dip Site Location Identification. This project would involve locating potential bodies of water to utilize as a dip site in the event of a wildland fire. Ponds or water bodies on private lands would be identified, which would necessitate obtaining permission from property owners to utilize. A spreadsheet with names, number and the address of participating owners will be developed which will help fire personnel access water quickly during a fire.	Wildland Fire	Archuleta County	Archuleta County SO-OEM; Archuleta County, Hinsdale County, Mineral County, La Plata County, US Forest Service, Pagosa Fire	Annual Implementation	Can be accomplished with staff time	Medium	Continue - In Progress. Continued acquisition of dip site permissions and mapping. Number have been identified. Ongoing.

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
					Protection District, Southern Ute				
AC-13	Goals: 1,2,4	Prescribed Burning on Private Property and public federal property. The risk of wildland fire occurrence in Archuleta County is very high. Much of the risk is on the extensive public lands in the County; fuels management projects are traditionally carried out by the public land stewards including USFS and the BLM. However, there is also risk on private property, including large parcels that could benefit from prescribed burns or other fuels treatment methods. A proposal has been submitted to the Board of County Commissioners in 2018 for the approval to proceed with research and investigation for the potential of carrying out prescribed burns on private property in coordination with willing property owners. Reduction of fuel loads on private lands would complement the parallel efforts ongoing on neighboring public lands.	Wildland Fire	Archuleta County	Archuleta County Emergency Management; Pagosa Fire Protection District, Town of Pagosa Springs, Los Pinos Fire Protection District, Archuleta County Sheriff's Office, San Juan Public Lands (USFS and BLM), Bureau of Indian Affairs, Colorado State Forest Service, Private landowners, Nature Conservancy	Annual Implementation	Unknown	High	Continue - In Progress. MOU put in place for agricultural burning
AC-14**	Goals: 2	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program and Updated Statewide Floodplain Rules. This project restates the commitment of Archuleta County to implement sound floodplain management practices, as stated in the flood damage prevention ordinance. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development is elevated above the base flood elevation. Floodplain managers will remain current on NFIP policies and are encouraged to attend appropriate training and consider achieving Certified Floodplain Manager (CFM) status.	Flood	Archuleta County	County Planning	Annual Implementation	Low cost, covered in existing budget	Medium	Continue - In Progress. Colorado Water Conservation Board hazard mapping project update beginning 2022
AC-15	Goals: 2, 3, 4	Support Ongoing Avalanche Mitigation and Control Efforts on Highway 160 near Wolf Creek Pass. Avalanches routinely close Highway 160 over Wolf Creek Pass in the winter. This project supports the ongoing avalanche mitigation and control operations on the pass.	Avalanche, Landslide	Archuleta County	CDOT and CAIC, XCEL Energy, ACSO-EM; Archuleta County, Mineral County, USFS, Pagosa Springs CWCB	Annual Implementation		Low	Continue - In Progress.
AC-16	Goals: 2, 3, 4	Implement East Fork Landslide monitoring and early warning. In the spring of 2008 a landslide near the junction of the east fork San Juan River and Sand Creek (T36N, R1E, Sec 4) destroyed the East Fork Road (FDR 667) and ruptured the natural gas line. An attempt has been made to stabilize the slide area with significant mitigation actions. The road has been repaired and the gas line was re-installed above ground. Although very unlikely, there is still potential for this landslide to move again and dam the East Fork River. This would create a potentially unstable landslide dam. Even more unlikely in this event, a dam break-like flood event could occur in areas along the East Fork and mainstem of the San Juan River. Because of the catastrophic implications, continued active monitoring of the area is needed for early warning.	Landslide	Archuleta County	CDOT; Archuleta County and USFS	Annual Implementation	$20,000 - Permanent stream gauge and remote site monitoring. XCEL gas (pipeline), Federal Highway Administration (road)	Medium	Continue - In Progress. Continued monitoring
AC-17	Goals: 2, 3, 4	Jackson Mountain Landslide Mitigation & Early Warning. CDOT completed stabilization work in 2011. The work completed serves as the initial stage for a larger/comprehensive project to fully mitigate the risk in this area. It is recommended that Archuleta County continue to support any future mitigation efforts on the Jackson Mountain slide which affects Highway 160 and utility lines.	Landslide	Archuleta County	CDOT; Archuleta County and USFS	Annual Implementation	Unknown; CDOT Budget	Medium	Continue - In Progress. Continued monitoring

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
AC-18	Goals: 1, 2, 4	Fire adapted Archuleta. The goal of this program would be to aid and consolidate efforts of the agencies and non-profit organizations that are working to prepare the community for wildfire. Currently, the US Forest Service and Southern Ute Indian Tribe are working to treat acreage on the Federal and Tribal lands over which they have jurisdiction. Private lands treatments are facilitated by NRCS, the San Juan Conservation District, the Chama Peak Land Alliance and Wildfire Adapted Partnership (WAP). Communication and coordination of efforts by these groups and agencies is done mainly by the stakeholders in the San Juan Headwaters Forest Health Partnership (SJHFHP) and the 2-3-2 Cohesive Strategy Partnership.	Wildfire	Archuleta County	Wildfire Adapted Partnership, San Juan Headwaters Forest Health Partnership, Archuleta County, Pagosa Fire Protection District (and Partners to above groups)	Annual Implementation	$20,000-$30,000 annually; divided equally between the Wildfire Adapted Partnership (WAP) and San Juan Headwaters Forest Health Partnership (SJHFHP). Funding: SRS Title III, Archuleta County general fund, Emergency Management budget	Medium	New in 2022

Table 5-5 Pagosa Springs Mitigation Action Summary Table

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
P-1**	Goals: 2	Assess the feasibility of adopting the current international building code standards, and if feasible, adopt the standard in Pagosa Springs and Archuleta County. This will help reduce vulnerability of future construction to multiple hazards, may include standards for water efficiency and drainage for new structures.	Drought, Earthquake, Extreme Cold, Lightning, Severe Winter Storm, High Winds, and Flooding	Pagosa Springs	County Planning Dept. and Pagosa Springs Community Development Department; ACSO-EM	2023-2024	Unknown	Low	Continue - In progress. Town will review 2021 IBC and adopt, hopefully in conjunction with Archuleta County in late 2023 or 2024. At this point we will likely skip the 2018 edition.
P-2**	Goals: 2, 4	McCabe Creek Flood Mitigation. Flooding along McCabe Creek is exacerbated by existing under-sized (5 ft. overtopping of Highway 160 during a 100-year event) and poorly maintained culverts at several locations on the creek. Though the Town has adopted regulations for building within town boundaries in identified flood risk areas, older portions of the North Pagosa Springs residential districts along N 5th and 6th Street were built within mapped floodway of McCabe Creek prior to the mapping, with approximately 3 dozen homes in the floodway and another 2 dozen in the floodplain. Numerous dilapidated out buildings and some existing non-flood proof houses in the floodplain and floodway create a potential debris flow problem in the event of a 100-year event. Most significantly, a potential debris flow could clog the downstream culvert at Highway 160 and 6th Street. Actions involved in this project include: • repairing/replacing inadequately sized culverts; • coordination with CDOT on replacement of the Highway 160 culvert • requiring removal of dilapidated outbuildings through property maintenance code enforcement, and potentially help with mitigation cost defrayal; and • purchasing or condemning various properties for public land improvements such as river parks and walks.	Flood	Pagosa Springs	Pagosa Springs Community Development Department; CDOT, private landowners	2023-2028	Depends upon the scope of work; Cost to town is for administration of development regulations, property conveyances, Town culvert improvements. Town infrastructure cost unknown. Town General and Capital improvement funds	Medium	Continue - In Progress. CDOT has been working on this project since summer of 2021. The culverts have been installed and significant in channel work has been completed. CDOT will be coming back to the project after winter shut down to finish the remaining work in the spring.
P-3**	Goals: 2	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program and Updated Statewide Floodplain Rules. This project restates the commitment of Pagosa Springs to implement sound floodplain management practices, as stated in the flood damage prevention ordinance. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and	Flood	Pagosa Springs	Pagosa Springs Community Development Department	Annual Implementation	Low Covered in existing budget	Medium	Continue - In Progress.

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
		ensuring that this development is elevated above the base flood elevation. Floodplain managers will remain current on NFIP policies and are encouraged to attend appropriate training and consider achieving Certified Floodplain Manager (CFM) status.							
P-4**	Goals: 1, 2, 4	Reduce fuels in high-risk areas. Particular areas of concern in town limits include the WUI subdivisions and Reservoir Hill. The Town has budgeted approximately $7500 per year for Southwest Conservation Corps to perform this function on an annual basis. However, they have limited capacity to address the areas on private property (the south and east sides of Reservoir Hill and subdivisions). The Town is seeking quotes from private sector on significant thinning operations in order to address the north facing slopes, which are very sloped and difficult to reach with standard methods.	Wildland Fire	Town of Pagosa Springs	Town of Pagosa Springs, Pagosa FPD, Archuleta County	Annual Implementation	$7,000; Town capital funds; grant sources	High	New in 2022

Table 5-6 Pagosa Area Water and Sanitation District Mitigation Action Summary Table

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
PAWSD-1**	Goals: 2	Watershed Thinning Project. Wildfires and post wildfire flood and debris flow has the potential to significantly impact the water supply and water treatment capabilities for the residents of Archuleta County. This project would do fuels reduction through thinning of trees in critical portions of the watershed that affect water supply. While primarily a wildfire mitigation project, secondary benefits would include reduced potential for severe burns in the watershed, as well as a reduced likelihood for lightning sparked fires to ignite and spread, mitigating the potential for post wildfire flood and debris flows.	Wildland Fire, Lightning	PAWSD	PAWSD; Archuleta County United States Forest Service San Juan Mountain Associations (SJMA) Private Contractors Town of Pagosa Springs Private and Commercial Landowners	Annual Implementation	$250,000	Medium	Continue - In Progress.
PAWSD-2	Goals: 1, 2, 4	Water Conservation Program. In times of extended dry weather, water supply in the Archuleta Response Area could be limited. The Pagosa Area Water and Sanitation District has made continued efforts to conserve water through efficiency improvements. PAWSD has also implemented a Water Conservation Program that seeks to educate the public on the value and importance of water and the need to use it wisely. During times of drought this could include water restrictions as outlined in the District's drought mitigation and response plan.	Drought	PAWSD	Private Residents; Town of Pagosa Springs	Annual Implementation	Unknown	Medium	Continue - In Progress.
PAWSD-3	Goals: 1, 2, 4	Drought Management Plan Update. PAWSD's Drought Management Plan is a dynamic document that is revisited often as new techniques, technologies, procedures and protocol develop. The most current update activity will seek to more closely align PAWSD's plan with recommendations made by the CWCB concerning drought management.	Drought	PAWSD	PAWSD; Archuleta County, Town of Pagosa Springs	Annual Implementation	Dept. Budget	Medium	Continue - In Progress. Updated in 2020. Will continue to update to add up to date information
PAWSD-4	Goals: 2, 3	Snowball Water Treatment Plant. Replace existing 2 million gallon per day (MGD) water plant with new 3.5 MGD plant. This will allow the District to move water to various locations in the district in the event of a catastrophic failure at Hatcher or San Juan WTP's.	Drought	PAWSD	PAWSD	2025	$44 Million; SRF	High	New in 2022

For the 2023 plan update, the Pagosa Fire Protection District did not develop any new mitigation actions and instead chose to focus on implementing uncompleted actions from the previous plan.

Table 5-7 Pagosa Fire Protection District Mitigation Action Summary Table

ID	Goal(s)*	Action Description	Hazard(s) Mitigated	Jurisdiction	Lead Agency and Partners	Timeline	Cost Estimate and Potential Funding	Priority	Status/ Implementation Notes
PFPD-1	Goals: 1, 2, 4	Implement Wildfire Adapted Partnership (Formerly FireWise) Workshops and Community meetings. A strong public education program on Wildfire Adapted Partnership mitigation techniques helps the public better understand what they need to do to reduce the potential for property loss from wildfire. Archuleta County and partners including Wildfire Adapted Partnership uses a series of different techniques to educate the public: brochures, talks, interviews, websites, surveys, social media and an annual safety expo to name a few methods.	Wildland Fire	Pagosa FPD	Pagosa FPD; Archuleta, Hinsdale, Mineral, SUIT, and Pagosa Springs Fire Protection Districts, Sheriff's Offices, PLPOA, CSFS, and USFS/BLM Wildfire Adapted Partners	Annual Implementation	Unknown; Agency budgets	Medium	Continuing – In Progress. Regular meetings and activities (monthly)
PFPD-2**	Goals: 2, 4	Encourage Wildland Fire Mitigation on Private Lands and Joint Community Lands. Education and awareness of fire mitigation activities on private property will save houses from wildland fire. A few of the encouraged activities would include: cleaning up yard waste, thinning and limbing trees and brush, improving structure access, installing non-combustible and drought resilient landscaping within two feet of structure, etc.	Wildland Fire, Drought	Pagosa FPD	Pagosa FPD; Archuleta, Hinsdale, Mineral, SUIT, CSFS, and Pagosa Springs Fire Protection Districts, Homeowners Associations including PLPOA, and Sheriff's Offices, Wyndham Resort, The Nature Conservancy, Chama Peak Land Alliance Rio Blanco watershed group Wildfire Adapted Partners	Annual Implementation	Varies depending on activity, some activities are free and require very little time, while others are expensive and time intensive. US Fire Administration, USFS/BLM grants, homeowners associations, and private funding, FEMA	Medium	Continue – In Progress. Ties in to ongoing Firewise activities; Some burn certification training completed; TREX program (prescribed fire burning exchange)
PFPD-3**	Goals: 2, 3	Establish structural triage to make structures in the WUI less susceptible to fire spread. Fast moving WUI fires can cause significant damage as well as total destruction of buildings and homes. By knowing what to look for and how to provide defensible space, home owners can significantly reduce the threat of structural fires to existing and future buildings and infrastructure caused by wildland fires. This could also reduce risk from lightning sparked fires as well by identifying items such flagpoles or trees which might increase the risk of individual properties. As such, the Triage project will assess vulnerability and build an inventory of at-risk properties in the WUI to include targeted outreach to home owners with most at-risk properties.	Wildland Fire, Lightning	Pagosa FPD	Pagosa FPD; Archuleta County, Hinsdale County, Mineral County, La Plata County, Archuleta County Sheriff's Dept. OEM, US Forest Service, Pagosa Fire Protection District, SUIT	2023-2024	$2,500; FPD training budget, grants, Donations	High	Continue In-Progress. New triage plan developed but hasn't been implemented yet.

*Goal 1: Increase awareness of hazards; Goal 2: Reduce impacts of hazards on life, property, and the environment; Goal 3: Protect critical facilities and infrastructure from hazard impacts Goal; 4: Strengthen and develop partnerships in regard to mitigating hazard impacts.

**Indicates actions that will reduce impacts to future development

6 Plan Implementation and Maintenance

Requirement §201.6(c)(3): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process and Phase 4 of FEMA's Four- phase process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

6.1 Plan Adoption

The purpose of formally adopting this plan is to secure buy-in from Archuleta County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan. The governing board for each participating jurisdiction has adopted this local hazard mitigation plan by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix E: Plan Adoption and Approval.

6.2 Implementation

Implementation will be accomplished by adhering to the schedules identified for each mitigation action (see Section 5.3 Mitigation Action Plan) and through pervasive efforts to network and highlight the multi-objective, win-win benefits of each project to the Archuleta County community and its stakeholders. These efforts include the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. The three main components of implementation are:

- IMPLEMENT the action plan recommendations of this plan;
- UTILIZE existing rules, regulations, policies and procedures already in existence; and
- COMMUNICATE the hazard information collected and analyzed through this planning process so that the community better understands what can happen where, and what they can do themselves to be better prepared. Also, publicize the "success stories" that are achieved through the HMPC's ongoing efforts.

Simultaneous to these efforts, the community partners, accessed through the Archuleta County Multi-Agency Coordination (MAC) Group, will monitor funding opportunities that could be leveraged to implement some of the more costly actions. When funding does become available, the community partners will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, special district budgeted funds, state and federal earmarked funds, and other grant programs, including those that can serve or support multi-objective applications.

6.2.1 Role of Archuleta Multi-Agency Coordination Group in Implementation and Maintenance

With adoption of this plan, the HMPC will be assimilated back into the Archuleta MAC Group, until the next planned revision. The MAC Group will have the responsibility of plan implementation and maintenance. The MAC Group will act as an advisory body. Its primary duties will be to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities. The MAC Group agrees to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Maintain a monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the Archuleta Board of County Commissioners, Town Council, and other partners; and
- Inform and solicit input from the public.

Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the Emergency Management website and in local newspapers.

6.3 Maintenance/Monitoring

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as required or as progress, roadblocks, or changing circumstances are recognized.

6.3.1 Maintenance/Monitoring Schedule

In order to track progress and update the mitigation strategies identified in the action plan, the MAC Group will revisit this plan at the following times or occurrences:

- Annually, to assess if projects have been completed;
- Following a significant hazard event;
- Following a disaster declaration;
- Any other time the MAC group sees it is prudent or necessary.

County emergency management will facilitate these reviews.

This plan will be updated, approved, and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000. Efforts to begin the update should begin no later than June 2027. The County will monitor planning grant opportunities from the Colorado Division of Homeland Security and Emergency Management (DHSEM) and FEMA for funds to assist with the update. Grant funding should be submitted in 2025-2026, as there is typically a three-year performance period to expend the funds, and there is no guarantee that the grant will be awarded when initially submitted. This allows time to resubmit the grant in subsequent years, if needed. Updates to this plan will follow the most current FEMA and DHSEM planning guidance. The next plan update is anticipated to be completed and reapproved by DHSEM and

FEMA Region VIII by March 2028. The HMPC, based on MAC group members and those entities identified in Appendix C, will be reconvened for this process by Archuleta Emergency Management.

6.3.2 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Such changes in vulnerability may include:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

The MAC Group/HMPC will use the following process to evaluate progress, note changes in vulnerability, and consider changes in priorities as a result of plan implementation:

- A representative from the responsible entity identified in each mitigation measure will be responsible for tracking and reporting the MAC Group/HMPC when project status changes. The representative will provide input on whether the project as implemented meets the defined goals objectives and is likely to be successful in reducing vulnerabilities.
- If the project does not meet identified goals and objectives, the MAC Group/HMPC will select alternative projects for implementation.
- New projects identified will require an individual assigned to be responsible for defining the project scope, implementing the project, monitoring success of the project.
- Projects that were not ranked high priority but were identified as potential mitigation strategies will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation.
- Changes will be made to the plan to accommodate for projects that have failed or are not considered feasible after a review for their consistency with established criteria, the time frame, priorities, and/or funding resources.

Updates to this plan will:

- Consider changes in vulnerability due to project implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Document hazard events and impacts that occurred within the five-year period,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Document continued public involvement
- Document changes to the planning process, which may include new or additional stakeholder involvement
- Incorporate growth and development-related changes to building inventories,
- Incorporate new project recommendations or changes in project prioritization,
- Include a public involvement process to receive public comment on the updated plan prior to submitting the updated plan to DHSEM/FEMA, and

Include re-adoption by all participating entities following DHSEM/FEMA approval.

6.3.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other jurisdictional plans and mechanisms. Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As stated in Section 6.2 of this plan, implementation through existing plans and/or programs is recommended, where possible. This point is re-emphasized here. Based on this plan's capability assessment and progress made on mitigation actions noted in Chapter 5, the participating jurisdictions have and continue to implement policies and programs to reduce losses to life and property from natural hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing projects, where possible, through these other program mechanisms. These existing mechanisms include:

- Updates to the Pagosa Springs Land Use and Development Code
- Updates to the 2017 Archuleta County Community Plan
- Updates to the 2020 Archuleta County Community Wildfire Protection Plan
- Pagosa Area Water and Sanitation District Drought Plan
- Archuleta County Emergency Operations Plan
- Mineral County Emergency Operations Plan
- Hinsdale County Community Wildfire Protection Plan
- Hinsdale County Emergency Operations Plan
- Hinsdale County Hazard Mitigation Plan
- Mineral County Community Wildfire Protection Plan
- Southwest Colorado Homeland Security Strategy

MAC Group/HMPC members involved in the updates to these mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, as appropriate. An example of this is noted in Chapter 3 in regard to the HMP being cross-referenced in the update of the County Community Plan in 2017 and the Archuleta County Emergency Operations Plan. The mitigation plan can be considered as a "hub on the wheel" with spokes radiating out to other related planning mechanisms that will build from the information and recommendations contained herein.

6.3.4 Continued Public Involvement

Continued public involvement is also imperative to the overall success of the plan's implementation. This updated plan will be made publicly available on each adopting jurisdictions website within three months of FEMA approval, replacing old versions where applicable. The update process provides an opportunity to publicize success stories from the plan implementation and seek additional public comment. A public hearing(s) to receive public comment on plan maintenance and updating will be held during the update period. When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. The plan maintenance and update process will include continued public and stakeholder involvement and input through participation in designated committee meetings, surveys, web postings, and press releases to local media.

ACS: American Community Survey

APA: Approved Pending Adoption

AVC: Animal-Vehicle Collision

BCEGS: Building Code Effectiveness Grading Schedule

BLM: Bureau of Land Management

BRIC: Building Resilient Infrastructure and Communities

BIA: Bureau of Indian Affairs

BLM: Bureau of Land Management

CAIC: Colorado Avalanche Information Center

CARES: Coronavirus Aid, Relief, and Economic Security

CBRNE: Chemical, Biological, Radiological, Nuclear, and Explosive

CDC: Centers for Disease Control

CDPHE: Colorado Department of Public Health & Environment

CO DHSEM: Colorado Division of Homeland Security and Emergency Management

CDOT: Colorado Department of Transportation

CDOW: Colorado Division of Wildlife

CEPC: Central Electric Power Cooperative

CFM: Certified Floodplain Administrator

CFR: Code of Federal Regulations

CGS: Colorado Geological Survey

CIS: Community Information System

CISA: Cyber & Infrastructure Security Agency

COOP: Continuity of Operations Plan

COVID-19: Coronavirus Disease 2019

CPT: County Planning Team

CRO: Colorado Resiliency Office

CRHRS: Colorado Rockfall Hazard Rating System

CRS: Community Rating System

CSFS: Colorado State Forest Service

CWCB: Colorado Water Conservation Board

CWPP: Community Wildfire Protection Plan

DFIRM: Digital Flood Insurance Rate Map

DMA: Disaster Mitigation Act

DMV: Department of Motor Vehicles

DNR: Colorado Department of Natural Resources

DOT: U.S. Department of Transportation

DR: (Major) Disaster Declaration

DWR: Division of Water Resources

EAP: Emergency Action Plan

EF: Enhanced Fujita

EM: Emergency Declarations

EOC: Emergency Operations Center

EMS: Emergency Medical Services

EPA: U.S. Environmental Protection Agency

EPR: Emergency Response and Preparedness

FACE: Future Avoided Cost Explorer

FBFM: Fire Behavior Fuel Models

FBI: Federal Bureau of Investigation

FEMA: Federal Emergency Management Agency

FERC: Federal Energy Regulatory Commission

FIRM: Flood Insurance Rate Map

FIS: Flood Insurance Study

FMA: Flooding Mitigation Assistance

FM: Fire Management Declaration

FPD: Fire Protection District

FTP: File Transfer Protocol

FY: Fiscal Year

GIS: Geographic Information Systems

GPS: Global Positioning System

HAZMAT: Hazardous Materials

HAZUS: Hazards US

HAZUS-MH: Hazards US – Multi-Hazard

HIFLD: Homeland Infrastructure Foundation-Level Data

HMA: Hazard Mitigation Assistance

HMGP: Hazard Mitigation Grant Program

HMP: Hazard Mitigation Plan

HMPC: Hazard Mitigation Planning Committee

HIRA: Hazard Identification and Risk Assessment

HOA: Homeowner's Association

HPS: Hantavirus Pulmonary Syndrome

HSIP: Highway Safety Improvement Program

JAMA: Journal of American Medical Association

LEPC: Local Emergency Planning Committee

MAC: Multi-Agency Coordination

ML: Magnitude Scale

MMI: Modified Mercalli Intensity (scale)

MPH: Miles per Hour

NASA: National Aeronautics and Space Administration

NBI: National Bridge Inventory

NCDC: National Climatic Data Center

NCEI: National Centers for Environmental Information

NDIS: Natural Diversity Information Source

NEPA: National Environmental Policy Act

NFHL: National Flood Hazard Layer

NFIP: National Flood Insurance Program

NEHRP: National Earthquake Hazard Reduction Program

NICB: National Insurance Crime Bureau

NOAA: National Oceanic and Atmospheric Administration

NPMS: National Pipeline Mapping System

NRC: U.S. Coast Guard's National Response Center

NPR: National Public Radio

NWS: National Weather Service

OIT: Office of Information Technology (State of Colorado)

PA: Public Assistance

PAWSD: Pagosa Area Water and Sanitation District

PDM: Pre-Disaster Mitigation

PDO: Property Damage Only

PGA: Peak Ground Acceleration

PIF: Pandemic Intervals Framework

PLPOA: Pagosa Lakes Property Owners Association

PPE: Personal Protective Equipment

PSSGID: Pagosa Springs Sanitation General Improvement District

REC: Rural Electric Cooperative

RETAC: Regional Emergency Medical and Trauma Advisory Council

RHMPC: Regional Hazard Mitigation Planning Committee

RMP: Risk Management Plan

SBA: Small Business Administration

SCADA: Supervisory Control and Data Acquisition

SFHA: Special Flood Hazard Area

SHELDUS: Spatial Hazard Events and Losses Database for the United States

SLV: San Luis Valley

STAPLEE: Social, Technical, Administrative, Political, Legal, Economic, and Environmental

TRI: Toxics Release Inventory

USACE: U.S. Army Corps of Engineers

USDA: United States Department of Agriculture

USFS: United States Forest Service

USGS: United States Geologic Survey

VFD: Volunteer Fire Department

WATF: Water Availability Task Force

WHO: World Health Organization

WRCC: Western Regional Climate Center

WSSI: Winter Storm Severity Index

WUI: Wildland-Urban Interface

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Sandy Gladfelter	Arboles	ml.sand@hotmail.com
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Pamela Flowers	Archuleta County	pflowers@archuletacounty.org
Logan Davis	Colorado State	Logan.davis@state.co.us
Terry Wetherill	Mineral Sheriff's Office	mincoemc@gmail.com
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Tomas McNamara	Colorado State	Tomas.mcnamara@state.co.us
Will Spears	KWUF	will@kwuf.com

APPENDIX D: PLANNING PROCESS DOCUMENTATION

Note: This appendix provides documentation of the plan update process during the 2022-2023 timeframe

From: Johnson, Christopher A
To: Baum, Melissa
Subject: FW: Archuleta County Hazard Mitigation Planning
Date: Wednesday, January 25, 2023 11:07:17 AM

From: Ryan Foster <rFoster@archuletacounty.org>
Sent: Wednesday, April 6, 2022 9:58 AM
To: Carr, Amy <amy.carr@woodplc.com>; Brislawn, Jeff P <jeff.brislawn@woodplc.com>; Johnson, Christopher A <christopher.johnson3@woodplc.com>; Chambers, Mack <mack.chambers@woodplc.com>; Schoen, Natalie <natalie.schoen@woodplc.com>; Bill Rockensock <brockensock@pagosasprings.co.gov>; Bill Trimarco <archuletafirewise@gmail.com>; Brandon Bishop <bbishop@archuletacounty.org>; Brien Gardner <brien.gardner@blackhills.com>; Bruce Evans <bevans@upperpinefpd.org>; Chris Torres <ctorres@archuletacounty.org>; Derek Woodman <derek.woodman@archuletacounty.org>; director@pagosachamber.com; Don Brockus <dbrockus@southernute-nsn.gov>; Fred Hosselkus <mincosheriff@centurytel.net>; Gabriel Cersonsky <GCersonsky@archuletacounty.org>; Grant Hammers <ghammer@lpea.coop>; James Dickoff <jdickhoff@pagosasprings.co.gov>; Jamie Jones <jjones@archuletacounty.org>; Jason Webb <jason.webb@psmedicalcenter.org>; Jay Godson <jgodson@fs.fed.us>; Johanna Elliott <jelliott@archuletacounty.org>; Katherine Harr <kHarr@archuletacounty.org>; Kristy Archuleta <karchuleta@archuletacounty.org>; Larry Lynch <larryl@plpoa.com>; Laura Mijares <lmijares@pagosa.k12.co.us>; Laura Vanoni <lvanoni@archuletacounty.org>; Logan Davis <Logan.davis@state.co.us>; Lorena Medina <LMedina@archuletacounty.org>; Martin Schmidt <mschmidt@pagosasprings.co.gov>; Mike Le Roux <mleroux@archuletacounty.org>; Pamela Flowers <pFlowers@archuletacounty.org>; Randy Larson <rlarson@pagosafire.com>; Rich Valdez <rvaldez@archuletacounty.org>; Richard Gustafson <richard.gustafson@bia.gov>; Ryan Foster <rFoster@archuletacounty.org>; Sandy Gladfelter <ml.sand@hotmail.com>; Sean Killoy <Sean.killoy@redcross.org>; Sean Peck <speck@fs.fed.us>; Terry Wetherill <mincoemc@gmail.com>; Timothy Hatch <tHatch@archuletacounty.org>; Toby Cook <tcook@fs.fed.us>; Tom McNamara <Tomas.mcnamara@state.co.us>; Will Spears <will@kwuf.com>
Cc: Christina Kraetsch <cKraetsch@archuletacounty.org>; Wesley Laverty <wLaverty@archuletacounty.org>; Samuel Montoia <sMontoia@archuletacounty.org>; Andrea Phillips <aphillips@pagosasprings.co.gov>; kmacht@pagosafire.com; justin@pawsd.org; pgraham@lakecity.net; Robert.goodrich@blackhillscorp.com; Thompson - CDPS, Mark <markw.thompson@state.co.us>; fred.ellis@usda.gov; cholyfield@jan-riskmgmt.com
Subject: Archuleta County Hazard Mitigation Planning

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Good Morning,

Archuleta County is kicking off the update to the Archuleta County Hazard Mitigation Plan with a presentation from the consultant hired to manage this planning process, Wood Environmental & Infrastructure Solutions, Inc. (Formerly Amec Foster Wheeler). The existing plan was developed in

accordance with the Disaster Mitigation Act of 2000 which requires all local governments and special districts to develop a plan to assess their risks to hazards and identify actions that can be taken in advance to reduce future losses. Hazard mitigation plans are to be updated every five years in order to maintain eligibility for FEMA Hazard Mitigation Assistance grants, and many of you participated in this process for the 2018 plan. This will be the first of three planning meetings to update the County's Hazard Mitigation Plan. During the kickoff presentation we will discuss the benefits of updating the hazard mitigation plan, the project schedule, and all of the hazards that affect Archuleta County. This agenda will also serve as a MAC Group Meeting.

The meeting will be held from 13:30 to 15:00 at the EOC located at 777 County Road 600, Pagosa Springs.

Here is a link to the existing multi-hazard mitigation plan for reference.

I look forward to meeting with everyone. Please feel free to bring anyone from your respective offices that would benefit from this meeting.

Ryan Foster
Emergency Management Commander
Archuleta County Sheriff's Office
Email: rfoster@archuletacounty.org
Ph: 970.264.8339

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ARCHULETA COUNTY

MULTI-HAZARD MITIGATION PLAN UPDATE

KICKOFF MEETING

Monday April 18, 2022
1:30pm- 3:00pm
Archuleta County EOC
777 County Road 600
Pagosa Springs, CO

1. **Introductions**
2. **Hazard Mitigation Overview (CO DHSEM)**
3. **Hazard Mitigation Planning Process and Requirements**
4. **Role of the Hazard Mitigation Planning Committee**
5. **Plan Update Requirements, Key Elements, and Schedule**
6. **Review of Identified Hazards and 2018 Mitigation Plan**
7. **Coordinating with Other Agencies/Related Planning Efforts/Planning for Public Involvement**
8. **Initial Information Needs/Next Steps**

wood.

Archuleta County, Colorado Multi-Jurisdictional Hazard Mitigation Plan 2022 Update

Kick-Off Webinar Summary

Monday, April 18, 2022
1:30 – 3:30 pm MST
Hybrid (Microsoft Teams and In-Person) Meeting

Introductions and Opening Remarks

This document summarizes the kickoff meeting for the Archuleta County Hazard Mitigation Plan update in 2022. The meeting was facilitated by Wood Environment & Infrastructure Solutions, Inc. (Wood) via Microsoft Teams, with members of the Hazard Mitigation Planning Committee (HMPC) attending in person at the Emergency Operations Center (EOC) in Pagosa Springs. Wood serves as the consulting firm working under a contract with Archuleta County to facilitate the planning process and develop the updated County plan.

Ryan Foster with Archuleta County Emergency Management began the meeting with a brief introduction of the plan update and emphasized the importance of maintaining a current Hazard Mitigation Plan (HMP), which is necessary for jurisdictions who seek FEMA grant funding before or after disasters. Ryan then asked those attending to introduce themselves by stating their name, title, and agency/jurisdiction. Twenty-two (22) persons representing a mix of, county departments, town departments, special districts, and stakeholders were present for the meeting. Chris Holyfield, the Emergency Manager with the Jicarilla Apache Nation, joined the meeting virtually on Teams.

Jeff Brislawn, Project Manager at Wood, thanked everyone for attending the meeting. Jeff served as the Project Manager on the previous two HMPs for Archuleta County and has worked with many of the same people who will be assisting with the 2022 HMP update. Jeff emphasized the importance of jurisdiction participation throughout the planning process and explained that Ryan Foster will be the lead point of contact for the Hazard Mitigation Planning Committee (HMPC). Other people who may contact the HMPC include Mack Chambers, GIS Specialist with Wood, and Amy Carr, Deputy Project Manager with Wood.

Following introductions, Jeff discussed the agenda items; the key discussion is summarized below, and additional details are within the meeting PowerPoint presentation.

Hazard Mitigation Overview (Colorado DHSEM)

Emily Palmer with Colorado Division of Homeland Security & Emergency management (DHSEM) gave a presentation on the concept of hazard mitigation planning and its importance. Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from natural or human-caused hazards. Mitigation Planning guides mitigation activities in a coordinated and economic manner to make communities more disaster resilient. An example of a hazard mitigation strategy is the practice of elevating homes located near a river, so the house stays above rising water during a flooding event and therefore minimizes damages to the home. The FEMA definition of mitigation does not include purchasing

emergency vehicles or radios for communication, because those resources would be used to respond to a disaster, not prevent one.

Emily explained the U.S. Disaster Mitigation Act of 2000 requires state and local governments to adopt a hazard mitigation plan, updated every 5 years, to maintain eligibility for pre- and post-disaster FEMA mitigation assistance grants. Emily stated there are two main types of benefits a community gain from having a FEMA approved hazard mitigation plan (HMP); (1) the planning process is a great way to collaborate with other jurisdictions in the community; (2) having an HMP approved by FEMA makes a community eligible for FEMA grants (Hazard Mitigation Assistance Pre-Disaster, Flood Mitigation Assistance, Hazard Mitigation Grant Program-Post-Disaster). She noted that any funding requests from FEMA needs to be based on the hazards and mitigation strategy in the HMP. She added that information from the HMP, specifically the vulnerability assessment and mitigation strategy, can be used in other hazard related plans such as an Emergency Operations Plan or Community Wildfire Protection Plan.

There are trends resulting in increased costs for disaster response and recovery related to population growth and the increase in the types of events we experience as a community. Emily explained we need these plans for several reasons because the reduce future recovery costs, we can plan around predictive events, and they guide mitigation activities in a coordinated manner. Additionally, mitigation efforts are economically beneficial. It was found that, on average, for every $1 spent on mitigation, and average of $6 is saved during disaster response. Emily concluded the section by emphasizing that the HMP is not a regulatory document and there is no penalty for jurisdictions who are not able to meet all the hazard mitigation goals. Rather, this plan is used to outline the goals and actions that help communities better prepare for and respond to disaster events

Hazard Mitigation Planning Process and Requirements

Amy Carr, Deputy Project Manager on the Wood team, presented a slide with the jurisdictions that are expected to participate in 2022 and will need to re-adopt the plan:

- Archuleta County
- Town of Pagosa Springs
- Pagosa Fire Protection District
- Pagosa Area Water and Sanitation District (PAWSD)

Amy continued the meeting with the specific planning requirements the County will have to meet to have a FEMA approved plan. Amy explained that the Archuleta County Multi-Jurisdictional Hazard Mitigation Plan (HMP) will be updated in accordance with the Disaster Mitigation Act (DMA) requirements. The original FEMA planning process involves a 4 Phase approach:

1. **Get Organized:** Amy described that the first phase in the approach is a commitment from jurisdictions to participate in planning and determine the planning team. The Hazard Mitigation Planning Committee (HMPC) includes county, municipalities, and special districts. Amy emphasized that local input and participation from HMPC members is required for full FEMA approval. Stakeholders include other local, state, and federal agencies with a stake in hazard mitigation in the County or may include academic institutions and local business and industry. Neighboring counties were also notified about

the update and will be given an opportunity to provide input into the process. Amy identified the planning area for the HMP update as all areas of Archuleta County (incorporated and unincorporated) as well as counties in the emergency management response area, including southern portions of Mineral County and Hinsdale County as well as portions of the Ute Tribal Lands. Mark Thompson, Colorado State Hazard Mitigation Officer, recommended that the Rural Electric Coop should be included in the planning process as well.

2. **Risk Assessment:** Amy explained that the hazard identification and risk assessment (HIRA) is used to describe hazards, identify community assets, analyze risk based on gaps in assets, and summarize vulnerability. Conducting a risk assessment is a key aspect of a hazard mitigation plan and involves two components; hazard identification (what can happen here) and the vulnerability assessment (what will be affected). The HMP update will be based on existing documents and studies, with the Archuleta County Hazard Mitigation Plan (2018) providing the baseline for identified hazards and the groundwork for goals, policies, and actions for hazard mitigation. Data on hazards from the past 5 years will be used to conduct the risk assessment, using sources such as GIS-based maps, historic records, insurance data, etc. Members of the HMPC and the public will ground truth this data to ensure the HMP is accurate and to maximize the utility of the document. The 7 community lifelines will be used to organize community assets and then a vulnerability assessment will be conducted to identify infrastructure and groups of people who will be more likely to experience losses.

3. **Develop a Mitigation Plan:** Amy continued to explain that the third step consists of reviewing goals and objectives from the 2018 Archuleta HMP, reviewing mitigation alternatives to expand or improve previous goals, and then drafting an action plan. Several types of mitigation projects are eligible for FEMA funding, including wildfire, flooding, winter storms, landslides, generator installation, climate resilience activities, etc. Mark Thompson mentioned including fire mitigation within the Town of Pagosa Springs as a mitigation action, a change from past advice He continued by suggesting potential mitigation actions such as changes to landscape and zoning ordinances, such as minimizing the construction of wooden decks on homes to reduce fuels in urban areas.

4. **Adoption and Implementation:** Amy described how the public will provide input on the draft HMP before the official adoption of the plan by the governing board occurs. Once the plan is officially adopted, the designated project manager for each participating jurisidction will integrate the plan into existing structures and track progress of the mitigation actions. The HMP will be revised as necessary to keep the plan current. Amy emphasized that in order to keep this HMP used, it is important to incorporate the document into existing plans and reference the document in future plans.

Role of the Hazard Mitigation Planning Committee

Amy continued to emphasize the importance of all jurisdictions stay involved in the planning process to get full FEMA approval of the HMP and ensure that the plan is suited to local needs. The role of the HMPC is to provide accurate information and contribute ideas that will ensure the HMP is a useful document.

Participation includes the following for the **Hazard Mitigation Planning Committee (HMPC) members**:

- Attend meetings and participate in the planning process

- Provide requested information to update or develop jurisdictional information
- Provide status of previous mitigation projects
- Identify new mitigation projects
- Review drafts and provide comments
- Assist with and participate in the public input process
- Track your time for local match purposes

Participation for **jurisdictions**:

- Participate in the County HMPC
- Coordinate with other departments/agencies from your jurisdiction
- Update jurisdictional information
- Identify new mitigation actions
- Complete and return Plan Update Guide
- Coordinate formal adoption

Participation for **stakeholders**:

- Attend HMPC meetings or stay in loop via email list
- Provide data/information
- Partner on mitigation efforts
- Review and comment draft plan

Plan Update Requirements and Key Elements

Amy shared with the group the specific requirements for plan updates. She explained that this HMP update will build on the previous HMP, approved in 2018. A significant part of the update requirements includes revisiting the old plan and noting any changes in the risk assessment and capability assessment. Additionally, Amy explained that the Wood team will rely on the HMPC and the public for any mitigation success stories . This information is important because it helps the team understand where improvements can be made in strategies and understand the strategies that worked well for the area. Other requirement for the plan update includes revisiting goals and identify completely, deleted, or deferred actions.

Amy then continued with discussing the key elements for the plan update, such as updating the risk assessment to reflect changes in current hazards, risk and vulnerability, and climate change considerations since the 2018 HMP. Additionally, she noted another key element of the HMP update is to analyze the progress on previous mitigation actions and create new actions.

Review of Identified Hazards and 2018 Mitigation Plan:

An overview of the previous Archuleta County HMP and the goals created in 2018 were reviewed.

1) **Goal 1:** Increase awareness of hazards that affect the Archuleta Response Area

2) **Goal 2:** Reduce impacts of hazards on life, property, and the environment

3) **Goal 3:** Protect critical facilities and infrastructure from hazard impacts

4) **Goal 4:** Strengthen and develop partnerships in regard to mitigating hazard impacts

Based on hazards from the 2018 County HMP, the list of potential hazards was reviewed. Amy showed a slide that listed the hazards in the 2018 HMP.

- Avalanche
- Dam Failure
- Drought
- Earthquake
- Extreme Temperatures
- Flooding
- Hailstorm
- High Winds and Tornadoes
- Landslide/Rockfall/Debris Flow
- Land Subsidence
- Lightning
- Pandemic Disease
- Severe Winter Storm
- Volcano
- Wildland Fire
- Wildlife Hazards
- Hazardous Materials Incident
- Imminent Threat/Terrorism

The group thought that the original list of hazards was still valid although there was discussion to add cyber-attacks to the list of hazards for the updated HMP. It was also mentioned to add electricity and power outages to the list of hazards. Amy then showed a slide of how the hazards were ranked by significance in the 2018 plan. There will be more detail provided on methodology during the next meeting.

Coordination with Other Agencies/Related Planning Efforts and Planning for Public Involvement:

Amy facilitated a discussion on recent studies of hazards in other documents and reports that are related to the Archuleta County HMP. Amy again emphasized the importance of integrating the updated HMP into other plans and vice versa to ensure the plan is being used effectively Amy asked the group what existing plans, reports, or studies should be reviewed for this planning process. Several plans were mentioned, including drought plans, local emergency water usage plans, and the Multiagency Coordination (MAC) Group risk assessment.

Amy noted that an online survey will be developed to gather input from the public on hazard concerns and mitigation ideas. It is advantageous to involve the public in the planning process to strength local support for the plan and ensure that the mitigation actions outlined in the HMP will better suit local needs. The survey is an online form that takes less than 5 minutes to complete. The URL for the survey will be sent to the HMPC to be advertised to community members through public information channels, official websites, social media, email blasts, etc. Mark Thompson emphasized the importance of the public outreach to find the gaps between what the experts think and what the community perceives as risk. Amy asked the group

was asked if there are any upcoming opportunities for outreach at scheduled public meetings or events. The May 20th Wildfire Preparedness Day event and the local new media outlets were two communication methods mentioned by the group.

Initial Information Needs/Next Steps:

Jeff (Wood) concluded the meeting by discussing the next steps in the planning process. Jeff explained that the HMP will be updated over the next nine months, with at least two more meetings with the HMPC and a predicted final approval date for the HMP by February 2023. Wood will be updating the Hazard Identification and Risk Assessment (HIRA) in the next couple of months, with input from the HMPC. Three drafts of the HMP will be created: the first for internal review by HMPC committee, a second for public review, and a third for FEMA review. The first draft for HMPC review is targeted for September 2022, a public review draft in October followed by a review by Colorado DHSEM in November and then tentatively approved by FEMA in January 2023.

Project Milestones	Anticipated Timeline
Meeting #1 Kickoff	April 18th
Public Survey	April-May
Meeting #2 HIRA review	June/July
HIRA Draft for HMPC review	July
Meeting #3 Mitigation Strategy	July-August
HMPC Review Draft	September
Public Review Draft	October
DHSEM Review Draft	November
Final Plan for FEMA Review (estimated)	November-December
Final Approved HMP for local adoption	January-February

Jeff discussed a slide with initial information needs and next steps. Jeff encouraged the group to send by email information on:

- Recent hazard events (since 2018) – damages, incident logs, damage assessments, etc.
- Growth and development trends
- Updated Community Wildfire Protection Plan (CWPP)
- Recent updated plans and policies
- Latest GIS data

A Plan Update Guide will be sent to all participating jurisdictions. Jurisdictions should review the hazard identification and ranking and fill out the status of actions from the previous HMP and **return the Plan**

Update Guide to Wood by May 27, 2022. Jeff also encouraged all jurisdictions to send the public survey as broadly as possible.

Ryan Foster, Archuleta County Emergency Management Commander, will share a link to a Google Drive folder via email with the meeting summary, handouts, presentation, and meeting recording so that other HMPC members that could not attend today's meeting could get up to speed. Wood will begin work on the Hazard Identification and Risk Assessment update and develop a public survey that can be used online. The next HMPC meeting will be following the update of the Hazard Identification and Risk Assessment section of the plan. The specific date will be shared when available.

Jeff Brislawn (Wood), Amy Carr (Wood), and Ryan Foster (Archuleta County) ended the meeting by thanking everyone for their attendance and active participation throughout the meeting.

Adjourn

The meeting adjourned at 3:05 pm MST.

SIGN-IN SHEET
ARCHULETA COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE
Kickoff Meeting
Monday April 18, 2022; 1:30pm- 3:00pm
EOC 777 County Road 600, Pagosa Springs, CO

Name	Organization and Department	Title	Phone	E-mail
Terry Wetherill	Mineral County OEM	Emergency Manager	719 850 0541	mincooem@gmail.com
Jay Gordon	USFS	FMO Pagosa RD	970 580 7713	john.gordon@usda.gov
Fred Ellis	USFS	AFMO Pagosa RD	970 799-4438	fred.ellis@usda.gov
Joel Claus	Upper Pine Fire	FD Response Coord	970-946-3779	jclaus@upperpinefpd.org
Logan Davis	DFPC	BC-43	970 844 0630	logan.davis@state.co.us
Joshua Sanchez	ASD	Maintenance Director	970-749-4246	jsanchez@pagosa.k12.co.us
Will Spears	KWUF Radio	Owner Manager	970 759 8230	will@kwuf.com
Bill Trimarco	Wildfire Adapted Partnership	A/C Coordinator	970-398-0305	btrimarco@wildfireadapted.org
Christina K	ACSO	Dep Dir of Emerg	398.0948	
Dan Brockus	So. Ute OEM	Em Mgr	563-2449	dbrockus@southernute-nsn.gov
Mark Thompson	DHSEM	SHMO	720)630-[illegible]	mark.thompson@state.co.us
Emily Palmer	DHSEM	HM Planning Specialist	303-656-1601	emily.palmer@state.co.us
Rich Valdez	Archuleta County SO	Sheriff	–	rvaldez@archuletacounty.org

Name	Organization and Department	Title	Phone	E-mail
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Derek Leedman	Archuleta County	County Mgr	9702648444	derek.leedman@archuletacounty
Jason Webb	Pagosa Springs Medical center	chief Planner	303-910-2068	Jason.webb@psmedical center.org
Mary Jo Coulehan	Chamber of Comm	Ex. Dir.	970-264-2360	director@pagosachamber.com
Martin Schmidt	T.O.P.S.	Public Works	970-398-1021	mschmidt@pagosasprings.co.gov
Kati Harper	Dispatch	Emgy Comm. Dir.	398 0755	kharper@archuletacounty.org
Kevin Machin	PFPD	Deputy chief	970 731 4151	Kmachin@pagosafire.com
Chris Holyfield	Jicarilla Apache EOC	EM		

ARCHULETA COUNTY

MULTI-HAZARD MITIGATION PLAN UPDATE

KICKOFF MEETING

Wednesday August 3rd, 2022
9:00am-11am
Archuleta County EOC
777 County Road 600
Pagosa Springs, CO

1. **Introductions**
2. **Review of Hazard Mitigation Planning Process and Requirements**
3. **Update on public involvement activities**
4. **Review of hazards and vulnerability assessment update**
5. **Review of mitigation goals**
6. **Next Steps**
7. **Questions and answers**

wood.

Summary of the Archuleta County, Colorado
Multi-Jurisdictional Hazard Mitigation Plan Update
Risk Assessment and Goals Meeting

Tuesday, August 3, 2022
9:00am-11:00 am MST
Archuleta County EOC 777 County Road 600, Pagosa Springs, CO

This document summarizes the risk assessment meeting held for the Archuleta County Hazard Mitigation Plan (HMP) 2022 update. The meeting was conducted by Wood Environment & Infrastructure Solutions, Inc. (Wood), the consultant firm hired to facilitate the planning process and develop the updated plan. The purpose of the meeting was to review the highlights of the updated Hazard Identification and Risk Assessment, review public survey results and begin to revisit the plan's goals. This meeting was delivered as an in-person meeting at the Archuleta County EOC in Pagosa Springs. Ryan Foster, County Emergency Coordinator began the meeting with introductions. Attendance included 16 individuals representing a mix of the consultant team, county and town departments, representatives from the participating special districts, and various stakeholders.

Introductory Remarks/Review of the planning process

Following introductions, Amy Carr, Deputy Project Manager, Wood, reviewed the planning process being followed and discussed the project status and progress made thus far. Highlights include:

- Kickoff meeting April 18, 2022
- GIS analysis and map updates complete
- Risk assessment update in progress
- Plan Update Guide sent out to participating jurisdictions
- Online public survey closed July 29, 2022

Update on Public Involvement Activities

Amy shared information on the public involvement activities thus far in the plan. This includes an online public survey which closed on July 29th and received 140 responses. The survey asked residents about their perceived level of significance for various hazards, the frequency with which hazards have disrupted their lives, and any suggestions for potential mitigation actions. The results revealed a large emphasis on wildfire and drought hazards and related mitigation efforts. Other higher priority hazards included lightning and winter storm. Complete results of the public survey will be shared with the HMPC via email following the meeting.

Review of identified hazards and vulnerability assessment update highlights

The general risk assessment requirements were outlined before turning to a detailed discussion of each hazard. Highlights were presented on each hazard included in the updated risk assessment chapter of the plan. Refer to the PowerPoint presentation for specific details on each hazard. Highlights of the discussion are noted by hazard in the table below.

Hazard or Topic	Meeting Discussion and Problem Statements
Avalanche	• The HMPC confirmed there were not aware of any fatalities in recent years. • Rated as Medium

Hazard or Topic	Meeting Discussion and Problem Statements
Dam Failure	• It was noted that there is a private dam across the state line in New Mexico that Emergency Management has received information that it poses a risk to residential structures in Archuleta County. • The Oso diversion dam on the Rio Blanco was noted as having the potential to be blocked if not cleared. The dam is owned by the Bureau of Reclamation. • Impacted by the 2019 spring runoff (most significant in recent years) • Rated as Medium

Flooding	• McCabe Creek CDOT project estimated to be completed this Fall. Likely LOMRs will be required once work is finished.
	• The wastewater facility previously listed as vulnerable may have moved near Hatcher.
	• The Town of Pagosa Springs has a lift station south of town that is located in to the 0.2% annual flood area.
	• PAWSD noted having a lift station located in the 1% annual flood area.
	• Sheriff's office was relocated out of the 0.2% annual flood area
	• The County building currently located in 0.2% annual chance flood area but opportunities to relocate these offices are being considered.
	• 2019 spring run off caused rail washout, river braiding and creating new channels in Pagosa Springs.
	  ○ County Road 500 experienced bank stability issues
	  ○ MM 17: a residential home was flooded and displaced a family. Suspected that there were unauthorized changes to the river front that contributed to flooding
	  ○ Working with Southern Ute to address some of the issues
	• Currently experiencing heavy rains with monsoon in July/August 2022. Some issues with debris, and washouts on Fish Creek, BLM roads
	• Rated as High

Wildland Fire	• Beetle kill was noted as being stabilized and that regeneration was starting to happen but due to the number of dead standing trees it continues to be a concern as added fuel for wildfire • Noted that residents are having trouble receiving insurance in the County for homes in WUI. Even after completing mitigation on their property. • Wildfire Partners noted as having maps of fuel treatments in the county combined with federal mapping but have challenges with private land. • Pagosa Lakes HOA west of town will start mitigating the green belt space that goes through the community. High population area of county. • Rated as High
Earthquake	• One HMPC member noted 3 or 4 years ago a 3.2 event in the Farmington area caused a crack in their wall. • Rated as Low
Landslide, Rockfall, Debris Flow	• Landslide on south side of river opposite of San Juan River Village ○ Has been checked by County OEM and USFS Geologist

Hazard or Topic	Meeting Discussion and Problem Statements
	○ Concern with altering the flow of the river and impacting the Village. ○ Has impacted PAWSD diversion ditch ○ Changes to the slide have not been witnessed in the last year. • Snowball pipeline (PAWSD owned) had to be relocated because of the Jackson Mountain slide. ○ Xcel has a natural gas pipeline in the same area that was impacted by the Jackson Mountain slide. • Rated as High
Volcano	• No comments • Rated as Low
Land Subsidence	• HMPC noted there is a coal seam that may still be burning from the Webber Fire • Rated as Low
Drought	• Comment that long term drought made trees more susceptible to beetle kill • Rated as High
Extreme Temperatures	• Noted that the southern portion of the county gets much hotter than the average temperature data show, which is based in the central county. • New buildings in the county are including air conditioning; most existing buildings do not have AC. • Rated as Low
Hail	• A comment was made that hail events can contribute to traffic accidents as roads can become slick. • Rated as Low
Lightning	• An incident involving a USFS employee was noted circa 2021 • In 2017 or 2018 lightning hit public safety communications tower, which caused interruptions for 3 days. • Rated as High
Severe Wind and Tornadoes	• During spring of 2022 lots of blowdown on USFS roads has been reported. • Rated as Medium
Severe Winter Storm	• Out of state visitors tend to be less prepared for winter road conditions. • Rated as High
Hazardous Materials Incidents	• No recent incidents of note • Rated as High
Wildlife Hazards	• A comment was made that the CDOT statistics generally undercount (by as much as 2/3rds) the actual number of accidents since many go un-reported. • US Hwy 151 wildlife bridge and tunnel project finished in 2021. • Rated as Low
Pandemic	• Noted that the County and Town experienced an influx of out of state residents in the past two years causing an increase in sales tax revenue. May be caused by delay in testing and testing results that lead to a misrepresentation of Covid positivity rates in the County. • Rated as Medium
Imminent Threat/Terrorism	• No incidents of note • Rated as Low

Hazard or Topic	Meeting Discussion and Problem Statements
Cyber-Attack	• New hazard in HMP. Previously was covered under imminent threat/terrorism. • The County experienced a cyber-attack (ransomware incident) in 2019 that has led to an increase in training and awareness within county government on cyber security. • County IT director does several trainings and raises awareness on this topic. • Suggested rating as Medium; change the likelihood to "likely"
Other	• A comment was made about infrastructure failure and where does it fit? It is addressed in most hazards as a consequence. It was noted that human accidental impacts sometimes cause issues. • Another comment was made about alignment with public perception; Wood will revisit this and note any disparities.

Review of Mitigation Goals

Amy led a brief discussion on current goals and objectives. It was noted that the goals and objectives can be readopted as is if the group still feels they are relevant, or edits and additions could be made.
The group felt the goals were still relevant but some of the objectives could be adjusted or expanded. For example, adding cyber incident, domestic terrorism, and pandemic awareness objectives under Goal 1 "Increase awareness of hazards that affect the Archuleta Response Area" made sense to recent events.

This feedback will be incorporated into revised goals for review at the third and final meeting.

Capability Assessment

Some discussion on mitigation capabilities noted that the county had recently cut mitigation funding, but some more grant money was being made available through the recent passage of the Infrastructure bill. One issue is limited staff capacity to implement projects funded by grants. A potential opportunity for improvement may be an amendment to the land use code for new construction related to wildfire mitigation.

Next Steps/Adjourn

Next Steps:

- Review public survey results
- Participating jurisdictions - Complete and return completed Mitigation Action Tracker to Amy Carr (amy.carr@woodplc.com) by August 31st.
- Be ready to review and provide input on draft HIRA.

The project schedule was reviewed:

Project Milestone	**Anticipated Timeline**
• Draft HIRA for HMPC Review	August
• HMPC Meeting #3 Mitigation Strategy	September
• HMPC Review Draft	October

Project Milestone	Anticipated Timeline
• Public Review Draft	November
• CO DHSEM Review	November
• Final Plan for FEMA Review (estimated)	November-December
• Final Approved HMP for local adoption	January-February 2023

SIGN-IN SHEET
ARCHULETA COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE
Risk Assessment Meeting
Wednesday August 3, 2022; 9:00am- 11:00am
EOC 777 County Road 600, Pagosa Springs, CO

Name	Organization and Department	Title	Phone	E-mail
Kati Harr	ACCDC	ECD	9.398 0755	KHARR@ARCHULETACOUNTY.ORG
Karen Machl	PFPD	Deputy Chief	970 731 4191	Kmachl@pagosafire.com
Justin Ramsey	PAWSD	Mgr	9736063549	JUSTIN@PAWSD.ORG
Brandon Breman	ACSO	wildland fire	970 946 4834	BBreman@archuletacounty.org
Carson Laverty	ACSO	wildland Fire	970-946-7201	Carsonlaverty20@gmail.com
Emily Palmer	DHSEM	Hazard Mitigation Planner	303-656-1607	emily.palmer@state.co.us
Sam Montoia	GIS	GIS Analyst	970 264 8312	SMontoia@archuletacounty.
ROY A. VEGA	ACSO-EM	Deputy Director	970-398-0948	RVEGA@ARCHULETACOUNTY.ORG
BILL TRIMARCO	WILDFIRE ADAPTED	ARCH COORD.	970.398.0305	btrimarco@wildfireadapted.org
Gabriel Cordova	IT	IT Dir	970-903-6815	gcordova@ar...
Harley Rowan	Arch. County IT	GIS Tech I	(303)889-6025	hrowan@archu...c.org
MIKE LE ROUX	ACSO	UNDERSHERIFF	970 398 5209	MLEROUX@ARCHULETACOUNTY.ORG
ANDRE PHILIPS	TOWN OF PAGOSA SPRINGS	TOWN MANAGER		

SIGN-IN SHEET
ARCHULETA COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE
Risk Assessment Meeting
Wednesday August 3, 2022; 9:00am- 11:00am
EOC 777 County Road 600, Pagosa Springs, CO

Name	Organization and Department	Title	Phone	E-mail
DEREK WOODMAN	ARCHULETA COUNTY	MANAGER	9702648444	derekwoodman@ARCHULETA

ARCHULETA COUNTY

MULTI-HAZARD MITIGATION PLAN UPDATE

KICKOFF MEETING

Wednesday August 3rd, 2022
9:00am-11am
Archuleta County EOC
777 County Road 600
Pagosa Springs, CO

1. **Introductions**
2. **Review of Hazard Mitigation Planning Process and Requirements**
3. **Update on public involvement activities**
4. **Review of hazards and vulnerability assessment update**
5. **Review of mitigation goals**
6. **Next Steps**
7. **Questions and answers**

wood.

Summary of the Archuleta County, Colorado
Multi-Jurisdictional Hazard Mitigation Plan Update
Risk Assessment and Goals Meeting

Tuesday, August 3, 2022
9:00am-11:00 am MST
Archuleta County EOC 777 County Road 600, Pagosa Springs, CO

This document summarizes the risk assessment meeting held for the Archuleta County Hazard Mitigation Plan (HMP) 2022 update. The meeting was conducted by Wood Environment & Infrastructure Solutions, Inc. (Wood), the consultant firm hired to facilitate the planning process and develop the updated plan. The purpose of the meeting was to review the highlights of the updated Hazard Identification and Risk Assessment, review public survey results and begin to revisit the plan's goals. This meeting was delivered as an in-person meeting at the Archuleta County EOC in Pagosa Springs. Ryan Foster, County Emergency Coordinator began the meeting with introductions. Attendance included 16 individuals representing a mix of the consultant team, county and town departments, representatives from the participating special districts, and various stakeholders.

Introductory Remarks/Review of the planning process

Following introductions, Amy Carr, Deputy Project Manager, Wood, reviewed the planning process being followed and discussed the project status and progress made thus far. Highlights include:

- Kickoff meeting April 18, 2022
- GIS analysis and map updates complete
- Risk assessment update in progress
- Plan Update Guide sent out to participating jurisdictions
- Online public survey closed July 29, 2022

Update on Public Involvement Activities

Amy shared information on the public involvement activities thus far in the plan. This includes an online public survey which closed on July 29th and received 140 responses. The survey asked residents about their perceived level of significance for various hazards, the frequency with which hazards have disrupted their lives, and any suggestions for potential mitigation actions. The results revealed a large emphasis on wildfire and drought hazards and related mitigation efforts. Other higher priority hazards included lightning and winter storm. Complete results of the public survey will be shared with the HMPC via email following the meeting.

Review of identified hazards and vulnerability assessment update highlights

The general risk assessment requirements were outlined before turning to a detailed discussion of each hazard. Highlights were presented on each hazard included in the updated risk assessment chapter of the plan. Refer to the PowerPoint presentation for specific details on each hazard. Highlights of the discussion are noted by hazard in the table below.

Hazard or Topic	Meeting Discussion and Problem Statements
Avalanche	• The HMPC confirmed there were not aware of any fatalities in recent years. • Rated as Medium

Hazard or Topic	Meeting Discussion and Problem Statements
Dam Failure	• It was noted that there is a private dam across the state line in New Mexico that Emergency Management has received information that it poses a risk to residential structures in Archuleta County. • The Oso diversion dam on the Rio Blanco was noted as having the potential to be blocked if not cleared. The dam is owned by the Bureau of Reclamation. • Impacted by the 2019 spring runoff (most significant in recent years) • Rated as Medium

Flooding	• McCabe Creek CDOT project estimated to be completed this Fall. Likely LOMRs will be required once work is finished.
	• The wastewater facility previously listed as vulnerable may have moved near Hatcher.
	• The Town of Pagosa Springs has a lift station south of town that is located in to the 0.2% annual flood area.
	• PAWSD noted having a lift station located in the 1% annual flood area.
	• Sheriff's office was relocated out of the 0.2% annual flood area
	• The County building currently located in 0.2% annual chance flood area but opportunities to relocate these offices are being considered.
	• 2019 spring run off caused rail washout, river braiding and creating new channels in Pagosa Springs.
	  ○ County Road 500 experienced bank stability issues
	  ○ MM 17: a residential home was flooded and displaced a family. Suspected that there were unauthorized changes to the river front that contributed to flooding
	  ○ Working with Southern Ute to address some of the issues
	• Currently experiencing heavy rains with monsoon in July/August 2022. Some issues with debris, and washouts on Fish Creek, BLM roads
	• Rated as High

Wildland Fire	• Beetle kill was noted as being stabilized and that regeneration was starting to happen but due to the number of dead standing trees it continues to be a concern as added fuel for wildfire • Noted that residents are having trouble receiving insurance in the County for homes in WUI. Even after completing mitigation on their property. • Wildfire Partners noted as having maps of fuel treatments in the county combined with federal mapping but have challenges with private land. • Pagosa Lakes HOA west of town will start mitigating the green belt space that goes through the community. High population area of county. • Rated as High
Earthquake	• One HMPC member noted 3 or 4 years ago a 3.2 event in the Farmington area caused a crack in their wall. • Rated as Low
Landslide, Rockfall, Debris Flow	• Landslide on south side of river opposite of San Juan River Village ○ Has been checked by County OEM and USFS Geologist

Hazard or Topic	Meeting Discussion and Problem Statements
	○ Concern with altering the flow of the river and impacting the Village. ○ Has impacted PAWSD diversion ditch ○ Changes to the slide have not been witnessed in the last year. • Snowball pipeline (PAWSD owned) had to be relocated because of the Jackson Mountain slide. ○ Xcel has a natural gas pipeline in the same area that was impacted by the Jackson Mountain slide. • Rated as High
Volcano	• No comments • Rated as Low
Land Subsidence	• HMPC noted there is a coal seam that may still be burning from the Webber Fire • Rated as Low
Drought	• Comment that long term drought made trees more susceptible to beetle kill • Rated as High
Extreme Temperatures	• Noted that the southern portion of the county gets much hotter than the average temperature data show, which is based in the central county. • New buildings in the county are including air conditioning; most existing buildings do not have AC. • Rated as Low
Hail	• A comment was made that hail events can contribute to traffic accidents as roads can become slick. • Rated as Low
Lightning	• An incident involving a USFS employee was noted circa 2021 • In 2017 or 2018 lightning hit public safety communications tower, which caused interruptions for 3 days. • Rated as High
Severe Wind and Tornadoes	• During spring of 2022 lots of blowdown on USFS roads has been reported. • Rated as Medium
Severe Winter Storm	• Out of state visitors tend to be less prepared for winter road conditions. • Rated as High
Hazardous Materials Incidents	• No recent incidents of note • Rated as High
Wildlife Hazards	• A comment was made that the CDOT statistics generally undercount (by as much as 2/3rds) the actual number of accidents since many go un-reported. • US Hwy 151 wildlife bridge and tunnel project finished in 2021. • Rated as Low
Pandemic	• Noted that the County and Town experienced an influx of out of state residents in the past two years causing an increase in sales tax revenue. May be caused by delay in testing and testing results that lead to a misrepresentation of Covid positivity rates in the County. • Rated as Medium
Imminent Threat/Terrorism	• No incidents of note • Rated as Low

Hazard or Topic	Meeting Discussion and Problem Statements
Cyber-Attack	• New hazard in HMP. Previously was covered under imminent threat/terrorism. • The County experienced a cyber-attack (ransomware incident) in 2019 that has led to an increase in training and awareness within county government on cyber security. • County IT director does several trainings and raises awareness on this topic. • Suggested rating as Medium; change the likelihood to "likely"
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Review of Mitigation Goals

Amy led a brief discussion on current goals and objectives. It was noted that the goals and objectives can be readopted as is if the group still feels they are relevant, or edits and additions could be made.
The group felt the goals were still relevant but some of the objectives could be adjusted or expanded. For example, adding cyber incident, domestic terrorism, and pandemic awareness objectives under Goal 1 "Increase awareness of hazards that affect the Archuleta Response Area" made sense to recent events.

This feedback will be incorporated into revised goals for review at the third and final meeting.

Capability Assessment

Some discussion on mitigation capabilities noted that the county had recently cut mitigation funding, but some more grant money was being made available through the recent passage of the Infrastructure bill. One issue is limited staff capacity to implement projects funded by grants. A potential opportunity for improvement may be an amendment to the land use code for new construction related to wildfire mitigation.

Next Steps/Adjourn

Next Steps:

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The project schedule was reviewed:

Project Milestone	**Anticipated Timeline**
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• CO DHSEM Review	November
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• Final Approved HMP for local adoption	January-February 2023

From: Bauer - DNR, Kallie
To: Chambers, Mack; Brislawn, Jeff P; Field, Scott; Carr, Amy
Cc: John Hunyadi - DNR; Mark Thompson - CDPS
Subject: Re: Dam Safety GIS data to support various hazard mitigation planning efforts.
Date: Thursday, May 12, 2022 11:00:39 AM
Attachments: image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Mack,
Please see our responses below in blue. In general, we have this data collected in google folders and has been kept relatively up to date, Please recall this shapefile information is collected from Owners development of inundation maps and is not necessarily updated on a routine schedule.

Thanks,
Kallie

On Wed, May 11, 2022 at 5:18 PM Chambers, Mack <mack.chambers@woodplc.com> wrote:

> Hi Kallie,
>
> Wood is under contract with several Colorado local government entities supporting the update of local hazard mitigation plans. Currently we are working the following plans and we are reaching out to ensure we have the latest data that may be available from the DWR:
>
> - City of Manitou Springs
> - Archuleta County
> - Pitkin County
> - San Luis Valley Region (Alamosa, Conejos, Costilla, Mineral, Rio Grande and Saguache)
>
> Data we are looking for include:
>
> - GIS data with point locations of Dams with attributes including hazard level and condition rating
> - we have access to 2022 NID but will use DWR if more current
> - can download spreadsheet and convert to shapefile if needed

You should be able to download the information from the Colorado Information Market place which is updated more frequently than the NID.

> -
> - Low head dams
> - can download spreadsheet and convert to shapefile if needed, latest update is 2020.

This data is located on the DNR website https://dnr.colorado.gov/initiatives/colorado-low-head-dams
To be clear these are viewed as a recreational user risk not a public safety downstream of the low head dam. We do not regulate these.

> -
> - Latest version of database of dams with ratings for non-failure release flood potential

The google file you have access to should be the most up to date. We have not done another version lately. You should receive an invite from John Hunyadi granting you access.

> -
> - Inundation Limits

There is a google drive that has all of the inundation maps for the state. John has shared this folder with you. As you stated these are for official use only and not to be shared with the public or published as part of the hazard mitigation plan.

> -

We have been using the DWR Inundation layer since 2019 and have the 2021 version. We are also understand that the inundation data is for official use only; we do not intend to publish any maps representing their extents but expect to use them for analysis of downstream risk.

We are looking to have the data by the end of May.

Thank you!

Mack Chambers

GIS Analyst

Mobile: (720) 839-1516

www.woodplc.com

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Kallie Bauer, P.E.
Dam Safety Engineer

P 970.352.8712 | C 970.420.4539
1809 56th Avenue, Greeley, CO 80634

kallie.bauer@state.co.us | www.colorado.gov/water

From: Brislawn, Jeff P
To: Field, Scott; Johnson, Christopher A
Subject: FW: Coordination with CO Climate Center on various Local Hazard Mitigation Plan updates
Date: Wednesday, November 2, 2022 10:13:39 AM
Attachments: image001.png
image002.png

Here is response from CCC for planning process documentation and suggested resources.

Jeff Brislawn, CFM
Sr Associate, Hazard Mitigation and Emergency Management

M+ 1 303-704-5506

From: Schumacher,Russ <Russ.Schumacher@colostate.edu>
Sent: Wednesday, October 19, 2022 8:11 PM
To: Brislawn, Jeff P <jeff.brislawn@wsp.com>
Subject: Re: Coordination with CO Climate Center on various Local Hazard Mitigation Plan updates

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi Jeff,

Thanks for getting in touch about this.

Probably the one thing worth being aware of is that we're in the process of updating the "Climate Change in Colorado" report that was last published in 2014 (http://wwa.colorado.edu/sites/default/files/2021-07/Climate_Change_CO_Report_2014_FINAL.pdf). We've finished some of the preliminary work (mainly updating some of the figures from the 2014 report to include observations from more recent years), and will soon be starting some updates to the future projections, etc. The plan is to finish and publish it by next spring/summer.

Other than that though, we haven't really been involved in new work that's at the level of what would be worth incorporating into these plans. There has been a lot of recent research related to drought and wildfire given what's happened in the west in the last couple decades – it's generally not specific to Colorado, but still relevant. For example, the NOAA report on the 2020 drought: https://www.drought.gov/documents/noaa-drought-task-force-report-2020-2021-southwestern-us-drought and various wildfire studies like https://www.pnas.org/doi/full/10.1073/pnas.1607171113 and https://www.pnas.org/doi/pdf/10.1073/pnas.2111875118

I've also been contacted by a couple of county officials about their plan updates (though not any of the counties you mentioned).

Anyway, hope that helps a bit – let me know if there's additional info I can help with!

Russ

—

Russ S. Schumacher
Director, Colorado Climate Center
Colorado State Climatologist
Professor, Department of Atmospheric Science
Colorado State University
e-mail: russ.schumacher@colostate.edu
phone: 970.491.8084
web: https://www.atmos.colostate.edu/people/faculty/schumacher/

From: "Brislawn, Jeff P" <jeff.brislawn@wsp.com>
Date: Wednesday, October 19, 2022 at 11:08 AM
To: "Schumacher,Russ" <Russ.Schumacher@colostate.edu>
Cc: "Field, Scott" <scott.field@wsp.com>, "Johnson, Christopher A" <christopher.johnson@wsp.com>
Subject: Coordination with CO Climate Center on various Local Hazard Mitigation Plan updates

**** Caution: EXTERNAL Sender ****

Hi Russ,
Hope you are doing well. I wanted to let you know that Wood has sold its Environment & Infrastructure business, which includes our Hazard Mitigation and Emergency Management program, to WSP recently. Our emails now have WSP.com on them, but other than that its business as usual and we are excited to be part of a global firm with a core focus on resiliency and sustainability.

Also, I wanted to make you aware that we are under contract with several CO local governments to update their local hazard mitigation plans. I am reaching out on behalf of our clients to see if there are any initiatives or studies related to these entities that the Colorado Climate Center may be engaged in that we should be aware of. We have been incorporating climate change into the hazard risk assessment as to how it may influence severity and frequency of relevant hazards, based on Colorado studies (Colorado Climate Change Vulnerability Study, CO State HMP, CO Drought Plan etc.) and the 4th National Climate Assessment.
Many of the planning efforts are in final stages and we will be making the drafts available for review

and comment also when we get to that point. Below is the list of current clients and planning efforts.

City of Manitou Springs
City of Westminster (initial stages)
San Luis Valley Region: Alamosa County, Conejos County, Costilla County, Mineral County, Rio Grande County and Saguache County
Archuleta County
Pitkin County
Delta County (initial stages)

Regards,
Jeff

Jeff Brislawn, CFM
Sr Associate, Hazard Mitigation and Emergency Management

M+ 1 303-704-5506

WSP USA
2000 S. Colorado Blvd., Ste. 2-1000
Denver, CO 80222

wsp.com

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From: Scot Fitzgerald
To: Chambers, Mack
Cc: Brislawn, Jeff P; Field, Scott; Carr, Amy; Karen Berry; Jonathan Lovekin
Subject: Re: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.
Date: Thursday, May 12, 2022 11:57:12 AM
Attachments: image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Mr Chambers

You can in fact add them for visualization in ArcCatalog and pull them into your ArcMap or ArcPro projects with steps 1-3 below. You can do limited analysis with just the feature service which meets most peoples needs.

If you need to further analysis in custom workflows and want the feature classes then you can do the workflow below and export your region of interest. We don't typically advertise this workflow, especially for this web map because it is a beta product, but Im guessing you can export what you need faster than I can package it up for you. If you do not feel like doing this you can send me your regions of Interest and I will export what you need.

1. Open ArcCatalog, choose "Add ArcGIS Server"
2. Choose "use GIS service" and then in the Server URL box put your full server location, ie CGS's REST directory: https://cgsarcimage.mines.edu/arcgis/rest/services
3. Open a project in ArcMap or Pro and then drag over your feature class from the REST service directory you just added in Catalog
4. Then search for the tool "Feature Class to Feature Class" in ArcMap or "WFS to Feature Class" in Pro
5. Export the Feature class to your working GDB for that project and then add to your map.

As for the question about recent or ongoing geologic studies I have CC'd Karen Berry and Jonathan Lovekin to reply to this. Feel free to reach out to them and they might be able to provide more information on those that what I am aware of.

Please let me know if you need further help!

thanks,

F Scot Fitzgerald, GISP
Colorado Geological Survey
Colorado School of Mines
GIS Analyst II
ffitzger@mines.edu

From: Chambers, Mack <mack.chambers@woodplc.com>
Sent: Thursday, May 12, 2022 11:42 AM
To: Scot Fitzgerald <ffitzger@mines.edu>
Cc: Brislawn, Jeff P <jeff.brislawn@woodplc.com>; Field, Scott <scott.field@woodplc.com>; Carr, Amy <amy.carr@woodplc.com>
Subject: RE: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.

Hi Scot,
Thank you for the response and the link. From what I can tell I can only view these layers and can't export them for analysis or mapping outside of your server. Is it possible to obtain the shapefiles? If I'm missing something please let me know.

Are there any recent (past 4-5 years) or ongoing studies on geologic hazards that we should know about or describe in

the Hazard Mitigation Plans we currently have projects in? There are new requirements from CO DHSEM that we formally consult with the Colorado Geological Survey as part of our planning process.

- City of Manitou Springs
- Archuleta County
- Pitkin County
- San Luis Valley Region (Alamosa, Conejos, Costilla, Mineral, Rio Grande and Saguache)

Thank you,

Mack Chambers
GIS Analyst
Mobile: (720) 839-1516
www.woodplc.com

wood.

From: Scot Fitzgerald <ffitzger@mines.edu>
Sent: Thursday, May 12, 2022 10:12 AM
To: Chambers, Mack <mack.chambers@woodplc.com>
Subject: Re: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Mr Chambers,

Hello, my name is Scot Fitzgerald and I work for the Colorado Geological Survey.

So we can chat on the phone but I wanted to first send you this webmap beta we have been working on the past couple of years. It will show you the latest things we have mapped. Some of the things will not appear unless you are zoomed in further so make sure and look around at different extents.

You can also add this to a map through ArcCatalog. Let me know if you need those instructions. That way you always have the latest data and dont need to ask for it again.

https://cologeosurvey.maps.arcgis.com/apps/webappviewer/index.html?id=d6c1453c76bf419f936c4ef2baa0ab8d

thanks!

F Scot Fitzgerald, GISP
Colorado Geological Survey
Colorado School of Mines
GIS Analyst II
ffitzger@mines.edu

From: Matthew Morgan <mmorgan@mines.edu>
Sent: Wednesday, May 11, 2022 9:54 PM
To: Karen Berry <kaberry@mines.edu>; Scot Fitzgerald <ffitzger@mines.edu>
Subject: Fw: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.

Received this inquiry. Karen not sure how you are handling these types of requests.

<><><><><><><><><><>

Matt Morgan
Assistant Director/Senior Research Geologist
Colorado Geological Survey
College of Earth Resource Sciences & Engineering
Colorado School of Mines
1801 Moly Road
Golden, CO 80401
email: mmorgan@mines.edu
phone: o-303-384-2647 c-720-346-8606
website: http://coloradogeologicalsurvey.org/staff/matt-morgan/

From: Chambers, Mack <mack.chambers@woodplc.com>
Sent: Wednesday, May 11, 2022 9:34 AM
To: Matthew Morgan <mmorgan@mines.edu>
Subject: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.

Hi Matt,
Wood is under contract with several Colorado local government entities supporting the update of local hazard mitigation plans. Currently we are working these plans and we are reaching out to ensure we have the latest geologic hazards data that may be available from the CGS:

- City of Manitou Springs
- Archuleta County
- Pitkin County
- San Luis Valley Region (Alamosa, Conejos, Costilla, Mineral, Rio Grande and Saguache)

Data we are looking for include landslide, rockfall, debris flow, unstable soils, expansive soils, and earthquakes (faults, liquefaction). I may have most of this data but it would be good to know if I have the latest and or if something shouldn't be used. I recently went to the CGS website to obtain layers that were in Manitou Springs' last plan but the GIS data is only viewable through your service and not for download. I am connected to the CGS GIS Server through ArcMap but these layers are only for viewing as well.

Here are 2 layers I was trying to obtain for Manitou Springs.
https://coloradogeologicalsurvey.org/publications/debris-flow-susceptibility-map-colorado/
https://coloradogeologicalsurvey.org/publications/landslide-inventory-el-paso-colorado/

We are looking to have the data by the end of May.

Thank you,

Mack Chambers
GIS Analyst
Mobile: (720) 839-1516
www.woodplc.com

From: Miller - DOLA, Anne
To: Brislawn, Jeff P
Cc: Field, Scott; Johnson, Christopher A
Subject: Re: Coordination with CRO on various Local Hazard Mitigation Plan updates
Date: Wednesday, October 19, 2022 2:07:16 PM
Attachments: image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi Jeff,
Thanks for the update.

CRO is working with 16 rural regions on resiliency and recovery roadmaps, with a focus on economic resiliency. You can learn more here. We're over a year into the 2-year initiative with roadmaps under development now.

Best regards,
Anne

On Wed, Oct 19, 2022 at 10:55 AM Brislawn, Jeff P <jeff.brislawn@wsp.com> wrote:

> Hi Anne
>
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> Archuleta County

Pitkin County

Delta County (initial stages)

Regards,

Jeff

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Town of Pagosa Springs Seeking Food Vendors, Survey Input

Posted on July 14, 2022 by Post Contributor

The Town of Pagosa Springs is extending the application deadline for interested food vendors to operate at the Bell Tower Park at the corner of Lewis and San Juan Streets. The Town is interested in activating this small park/parking lot by permitting up to two food trucks or trailers to operate between May 15 – October 15. The Town has installed 220v electric hook ups to accommodate food vendor needs. If this sounds like a good opportunity for your business, please visit the "Bell Tower Food Vendor" page for more information and application.

In support of Archuleta County's efforts, the Town invites you to please take a moment to answer the 10 survey questions to help update the Archuleta County Multi-Jurisdictional Hazard Mitigation Plan in 2022. The Hazard Mitigation Plan analyzes the county's, Town of Pagosa Springs', Pagosa Fire Protection District's and Pagosa Area Water and Sanitation District's vulnerabilities to natural and human caused hazards. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey is to solicit public input on hazards of concern, and suggestions for reducing the impacts of hazards before they occur. The survey is open until July 29, 2022. To take the survey, please click here.

The Town has recently funded 4 public arts projects by local artists that will be installed in the late summer in downtown locations. Please come by to watch their progress and follow this site for information on the unveiling of the projects! To learn more about the Public Arts Program, please click here.

You can sign up for urgent Town alerts, News & Announcements, and Contractor/Consultant Requests for Bids by clicking here.

LETTERS TO THE EDITOR are welcome. Send to pagosadailypost@gmail.c include your full name and town of residence, and indicate that you would like to share your letter with our readers. **View our submission guidelines here.**

We also welcome general suggestions not meant for publication.

Phone: 970-903-2673

Post Contributor

The Pagosa Daily Post welcomes submissions, photos, letters and videos from people who love Pagosa Springs, Colorado. Call 970-903-2673 or email pagosadailypost@gmail.com

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County updating hazard mitigation plan

July 28, 2022

By Josh Pike | Staff Writer

Archuleta County is currently in the process of updating the multi-jurisdictional Hazard Mitigation Plan and is soliciting public feedback through an online survey.

The survey can be accessed at https://bit.ly/3zrzbgf and closes tomorrow, July 29.

Undersheriff Mike Le Roux explained that the hazard mitigation plan is required by the state and federal government for the county to leverage emergency funding and is updated every five years, with the last version being completed in 2018.

He added that the primary entities involved in the plan are Archuleta County, the Town of Pagosa Springs, the Pagosa Area Water and Sanitation District and the Pagosa Fire Protection District, although the plan also considers Chromo and Arboles as satellite communities and identifies hazards in the portions of Hinsdale and Mineral counties that are south and west of the Continental Divide.

Le Roux explained that the plan identifies hazards within the county and allows various jurisdictions in the county to focus efforts to mitigate them.

As an example of this process, Le Roux mentioned accidents involving deer and elk on U.S. 160 west of Pagosa Springs, which was identified as a hazard in the 2018 plan and is being mitigated through the Colorado Department of Transportation wildlife overpass and tunnel located near the junction of U.S. 160 and Colo. 151.

He also mentioned that the plan had previously identified fire risks above Plumtaw Road as a hazard, which has been mitigated by the U.S. Forest Service.

However, Le Roux indicated that this would likely continue to be identified as an area of concern given the Plumtaw Fire in the area this summer.

He added that the survey helps the jurisdictions identify and rank the hazards in the area, although he noted that the survey is limited by the "public participation or lack thereof."

Le Roux commented that the hazard mitigation plan process is approximately halfway complete, with the county having hired a consultant to oversee the process last year and hoping to complete and submit the plan to the Federal Emergency Management Agency by January or February of 2023.

He also mentioned that there will be further meetings to gather public feedback on the plan in the upcoming months.

josh@pagosasun.com

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ID	Please indicate the community you live in	How long have you lived in this community?	How many times has a natural hazard disrupted	Avalanche	Dam Failure	Drought	Earthquake	Flooding	Hailstorm	High Winds and Tornadoes	Landslide/ Rockfall/ Debris Flow	Land Subsidence	Lightning	Pandemic Disease	Severe Winter Storm	Volcano	Wildland Fire	Wildlife Hazards	Hazardous Materials Incident	Imminent Threat/ Terrorism	Extreme Temperatures
1	Unincorporated Archuleta County	1-5 years	1-2	Moderate	Low	High	Low	Moderate	High	High	High	Moderate	High	Moderate	High	Low	High	Moderate	Low	Low	Moderate
2	Unincorporated Archuleta County	over 10 years	1-2	Low	Moderate	High	Low	High	Moderate	High	High	High	High	Moderate	High	Low	High	Moderate	Moderate	Moderate	Moderate
3	Unincorporated Archuleta County	over 10 years	3-5	Moderate	Low	High	Low	High	Moderate	Moderate	High	Moderate	High	Moderate	High	Low	High	High	Low	Low	Moderate
4		over 10 years	0	High	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Low	High	Moderate	Moderate	Low	Moderate
5	Unincorporated Archuleta County	1-5 years	0	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
6	Unincorporated Archuleta County	over 10 years	0	Low	Low	Moderate	Low	Low	Low	Low	Low	Low	Moderate	Low	Moderate	Low	Moderate	Moderate	Low	Low	Moderate
7			0	Low	Low	High	Low	Moderate	Low	High	Moderate	Moderate	Moderate	Low	High	Low	High	Moderate	Low	Low	High
8	Unincorporated Archuleta County	5-10 years	3-5	Moderate	Low	High	Low	Moderate	High	High	Moderate	Moderate	High	Moderate	High	Low	High	Low	Moderate	Moderate	High
9	Unincorporated Archuleta County	5-10 years	ore than 5 tim	Low	Low	High	Low	High	High	High	High	High	High	High	High	Low	High	Low	Low	Low	High
10	Unincorporated Archuleta County	over 10 years	1-2	High	Moderate	High	Low	Low	High	High	Moderate	Moderate	High	High	High	Low	High	Moderate	Low	Low	Low
11		5-10 years	1-2	Moderate	Low	High	Low	Low	Low	Low	Moderate	Moderate	Low	Low	High	Low	High	Moderate	Low	Low	Moderate
12	Unincorporated Archuleta County	5-10 years	0	Low	Low	Moderate	Low	Low	Low	Low	Low	Low	Low	Low	Moderate	Low	Moderate	Low	Low	Low	Low
13	Aspen Springs	Less than 1 year	0	High	Low	High	Low	Moderate	Moderate	Moderate	Moderate	High	High	Moderate	High	Low	High	High	High	Low	High
14	Unincorporated Archuleta County	1-5 years	1-2	Low	Moderate	High	Low	High	Moderate	Low	Moderate	Moderate	High	Moderate	High	Low	High	High	Moderate	Low	High
15	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	High	Moderate	Moderate	Low	High	Moderate	Low	Low	Moderate
16	Unincorporated Archuleta County	1-5 years	3-5	High	Low	High	Low	Moderate	High	Moderate	High	Moderate	High	High	High	Low	High	High	Moderate	Moderate	Moderate
17	Unincorporated Archuleta County	over 10 years	ore than 5 tim	Moderate	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	High	High	High	Low	High	High	Moderate	Low	Moderate
18	Town of Pagosa Springs	1-5 years	0	Low	Moderate	Moderate	Low	Low	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	Low	Low	Low	Low
19	Unincorporated Archuleta County	5-10 years	1-2	Low	Low	High	Low	Low	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low	High	High	Low	Low	Moderate
20	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Low	Moderate	Moderate	High	Moderate	Low	Moderate	Moderate	High	Moderate	High	Low	High	Low	High	Low	Moderate
21	Unincorporated Archuleta County	5-10 years	ore than 5 tim	Low	Low	High	Low	Moderate	Moderate	High	High	Moderate	High	Low	Moderate	Low	High	High	Low	Low	High
22	Town of Pagosa Springs	1-5 years	1-2	Low	Low	High	Low	Moderate	Moderate	High	Moderate	Moderate	Moderate	Moderate	Moderate	Low	High	High	Low	Low	Moderate
23	Aspen Springs	over 10 years	3-5	Low	Low	High	Low	Low	Moderate	Moderate	Low	Low	Moderate	Low	Moderate	Low	High	Moderate	Low	Low	Moderate
24	Unincorporated Archuleta County	over 10 years	3-5	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	High	Moderate	High	Low	High	High	High	Low	Moderate
25	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Low	High	High	Moderate	Moderate	Low
26	PLPOA	over 10 years	3-5	Moderate	Moderate	High	Moderate	Moderate	High	High	Moderate	Moderate	Moderate	High	High	Low	Moderate	High	Moderate	High	High
27	Unincorporated Archuleta County	over 10 years	3-5	Low	Low	High	Low	Moderate	High	Moderate	High	Moderate	High	High	High	Low	High	Moderate	High	Low	Moderate
28	Town of Pagosa Springs	5-10 years	0	Low	Moderate	High	Low	Moderate	High	Moderate	High	Low	Moderate	Moderate	High	Low	High	Moderate	Moderate	Moderate	Moderate
29	Unincorporated Archuleta County	5-10 years	ore than 5 tim	Low	Low	High	Low	Low	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Low	High	Moderate	Low	Low	Moderate
30	Unincorporated Archuleta County	over 10 years	ore than 5 tim	Low	Moderate	High	Low	Moderate	High	Moderate	High	Moderate	Moderate	High	High	Low	High	Moderate	Moderate	Moderate	High
31	Unincorporated Archuleta County	5-10 years	3-5	Moderate	Moderate	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Moderate	High	Low	High	Low	Moderate	Low	Moderate
32	Unincorporated Archuleta County	1-5 years	1-2	Moderate	Moderate	High	Low	Low	Moderate	Moderate	Moderate	Moderate	High	Moderate	High	Low	High	Moderate	Moderate	Low	Moderate
33	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Low	High	Low	Moderate	High	High	Moderate	Moderate	High	High	Moderate	Low	High	Moderate	Moderate	Low	Low

34	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Low	High	Low	Moderate	Low	Low	Moderate	Moderate	High	High	High	Moderate	High	High	Moderate	Moderate	High
35	Alpha	over 10 years	0	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Low	High	Moderate	Moderate	Moderate	High
36	Unincorporated Archuleta County	over 10 years	0	Low	Low	Moderate	Low	Low	Low	Low	Low	Low	Moderate	Low	Moderate	Low	High	Low	Low	Low	Moderate
37	Unincorporated Archuleta County	over 10 years	0	Moderate	Low	High	Low	Low	Moderate	Low	Moderate	Low	High	Moderate	Moderate	Low	High	Moderate	Low	Low	Low
38	Pagosa,Lakes	5-10 years	I..smoke/asth	Low	Low	High	Low	Moderate	Low	Moderate	Moderate	Low	High	High	Moderate	Low	High	Moderate	Moderate	Low	Low
39	Unincorporated Archuleta County	over 10 years	0	Low	Low	High	Low	Low	Low	Moderate	Moderate	Low	Moderate	Moderate	High	Low	High	Low	Low	Low	Low
40	Town of Pagosa Springs	5-10 years	1-2	Low	Low	High	Low	Low	Moderate	Low	Low	Moderate	High	Low	Moderate	Low	High	Low	Low	Low	Low
41	Town of Pagosa Springs	over 10 years	0	Low	Low	High	Moderate	Low	High	High	Moderate	Moderate	Moderate	Low	Moderate	Low	High	High	Low	Moderate	High
42	Unincorporated Archuleta County	1-5 years	3-5	Low	Moderate	Moderate	Low	Low	Moderate	Moderate	Low	Low	High	High	High	Low	High	Moderate	Moderate	Low	Low
43	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Moderate	High	Low	Moderate	Low	Moderate	Moderate	Moderate	Moderate	High	High	Low	High	Moderate	Moderate	Low	Moderate
44	PLPOA	1-5 years	0	Low	Low	High	Low	Low	Moderate	Moderate	Low	High	High	High	Moderate	Low	High	Low	Low	High	Moderate
45	Unincorporated Archuleta County	1-5 years	1-2	Moderate	Low	High	Low	High	High	Moderate	High	Low	Moderate	Low	High	Low	High	Low	Low	Low	Moderate
46	Pagosa Lakes	1-5 years	0	Low	Low	High	Low	Low	Low	Low	Moderate	Low	High	Low	Low	Low	High	Moderate	Low	Low	Moderate
47	Unincorporated Archuleta County	over 10 years	3-5	High	High	High	Low	Moderate	Moderate	Moderate	Moderate	Low	High	Moderate	Moderate	Low	High	Low	Low	Low	Low
48	Town of Pagosa Springs	1-5 years	3-5	Low	Low	High	Moderate	High	High	Moderate	High	Moderate	Moderate	Moderate	High	Moderate	High	High	High	Low	Moderate
49	Pagosa Lakes subdivision	over 10 years	3-5	Moderate	Low	High	Low	Low	High	Moderate	High	Moderate	High	Moderate	High	Low	High	Low	Low	Low	Moderate
50	Unincorporated Archuleta County	over 10 years	0	Low	Low	High	Moderate	Low	High	Moderate	Low	Moderate	High	Moderate	High	Low	High	Moderate	Moderate	Low	High
51	Town of Pagosa Springs	1-5 years	1-2	Low	Low	Moderate	Low	Low	Moderate	Moderate	High	Moderate	High	Moderate	High	Low	High	Moderate	Moderate	Low	Moderate
52	Unincorporated Archuleta County	1-5 years	1-2	High	Low	Moderate	Low	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	High	Low	High	Low	Low	High	Moderate
53	Unincorporated Archuleta County	5-10 years	1-2	Low	Low	High	Low	Moderate	High	High	Moderate	Moderate	High	Moderate	Moderate	Low	High	Moderate	Low	Low	High
54	Town of Pagosa Springs	1-5 years	0	Low	Low	Low	Low	Low	Low	Low	Low	Low	Moderate	Low	Moderate	Low	Moderate	Low	Low	Low	Low
55	Unincorporated Archuleta County	5-10 years	ore than 5 tim	Moderate	Low	High	Low	Low	Moderate	Moderate	Moderate	Moderate	High	Moderate	High	Low	High	Moderate	Low	Low	Moderate
56	Unincorporated Archuleta County	5-10 years	3-5	Low	Low	High	Low	Low	Moderate	Moderate	Moderate	Low	High	Moderate	Moderate	Low	High	Low	Moderate	Low	High
57	Unincorporated Archuleta County	over 10 years	1-2	Low	Low	High	Moderate	High	High	High	Low	Low	High	Moderate	High	Low	High	Moderate	Low	Low	Moderate
58	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Low	High	Low	Low	Low	Moderate	High	Moderate	High	Moderate	Moderate	Low	High	High	Low	Low	Low
59	Town of Pagosa Springs	over 10 years	0	Moderate	Moderate	High	Low	Low	Moderate	Moderate	Moderate	Low	Moderate	High	High	Low	High	Moderate	Moderate	Low	Moderate
60	Unincorporated Archuleta County	1-5 years	0	Low	Low	Moderate	Low	Low	Low	Moderate	Low	Low	Low	Low	Moderate	Low	High	High	Low	Low	Moderate
61	Unincorporated Archuleta County	5-10 years	3-5	Low	Low	High	Low	Moderate	Moderate	Moderate	Low	Low	High	Low	High	Low	High	High	Low	Low	High
62	Unincorporated Archuleta County	over 10 years	ore than 5 tim	Low	Low	Moderate	Low	Low	Moderate	Low	Low	Low	High	Moderate	Moderate	Low	High	Moderate	Moderate	Low	Low
63	Unincorporated Archuleta County	over 10 years	3-5	Low	Low	High	Low	Moderate	Moderate	Low	Low	Moderate	Moderate	Moderate	Moderate	Low	High	Moderate	Low	Low	High
64	Town of Pagosa Springs	5-10 years	0	Low	Low	High	Low	Moderate	Moderate	Low	Low	Low	Moderate	Moderate	Moderate	Low	High	Low	Moderate	Low	Low
65	Unincorporated Archuleta County	1-5 years	0	Low	Low	High	Low	Moderate	Low	Moderate	Moderate	Moderate	High	Low	Moderate	Low	High	Moderate	Moderate	Low	Moderate
66	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	High	High	Low	High	Low	Low	Low	Moderate
67	Unincorporated Archuleta County	5-10 years	1-2	Moderate	High	High	Low	Moderate	Moderate	Moderate	High	Moderate	Moderate	High	High	Low	High	High	Moderate	Moderate	Moderate
68	Unincorporated Archuleta County	5-10 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Moderate	Low	High	Low	Moderate	Low	High	Moderate	Low	Low	Moderate

69	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Moderate	High	High	Moderate	Moderate	Low	High	High	Moderate	Moderate	High
70	Town of Pagosa Springs	1-5 years	3-5	Moderate	Moderate	High	Low	High	Moderate	High	High	Moderate	High	Moderate	High	Low	High	High	Moderate	Moderate	High
71	Town of Pagosa Springs	over 10 years	3-5	Low	Low	High	Low	Low	Low	Moderate	Moderate	Moderate	High	Low	High	Low	High	Moderate	Moderate	Low	Low
72	plpoa	5-10 years	1-2	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	High	High	High	Low	High	High	Moderate	Moderate	Moderate
73	Town of Pagosa Springs	5-10 years	1-2	Low	Low	High	Low	Moderate	Moderate	Moderate	Low	Low	Low	Low	High	Low	High	High	Low	Low	Low
74	Unincorporated Archuleta County	over 10 years	0	Moderate	Low	High	Low	Low	Moderate	Moderate	Moderate	Moderate	High	High	High	Low	High	High	Moderate	Low	Low
75	Unincorporated Archuleta County	over 10 years	0	Low	Low	High	Low	Low	Moderate	Low	Low	Moderate	Moderate	Low	Moderate	Low	High	Moderate	Low	Low	Low
76	Unincorporated Archuleta County	1-5 years	0	Low	Low	High	Low	Moderate	Low	Low	Moderate	Low	High	Low	Moderate	Low	High	Moderate	Low	Low	Moderate
77	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Moderate	Low	High	High	High	Low	High	High	Moderate	Low	High
78	Unincorporated Archuleta County	5-10 years	0	Moderate	Moderate	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low	High	High	Low	Low	Moderate
79	Unincorporated Archuleta County	over 10 years	3-5	High	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	High	High	High	Low	High	Moderate	Moderate	Moderate	High
80	Unincorporated Archuleta County	1-5 years	1-2	Moderate	Low	High	Low	Moderate	High	Moderate	Moderate	Moderate	High	Moderate	High	Low	High	High	Moderate	Moderate	Moderate
81	Town of Pagosa Springs	1-5 years	1-2	Low	Low	High	Low	Moderate	Moderate	Moderate	Low	Low	Moderate	Moderate	High	Low	High	Low	Low	Low	Moderate
82	Unincorporated Archuleta County	5-10 years	0	Moderate	Low	Moderate	Low	Low	Low	Low	Moderate	Moderate	Moderate	Low	Moderate	Low	High	Moderate	Low	Low	Low
83	Town of Pagosa Springs	5-10 years	1-2	Low	Low	High	Low	Low	Low	Low	Moderate	Moderate	Moderate	Low	Moderate	Low	High	Low	Moderate	Low	Moderate
84	Blue Mountain Ranches POA CR	5-10 years	3-5	Low	Low	High	Low	Moderate	High	Moderate	High	Moderate	High	Moderate	High	Low	High	Moderate	Low	Low	Moderate
85	Town of Pagosa Springs	over 10 years	1-2	Moderate	Low	High	Low	Moderate	High	Moderate	High	Moderate	High	Low	Moderate	Low	High	Low	Low	Low	Low
86	Unincorporated Archuleta County	5-10 years	1-2	Moderate	Low	High	Low	Moderate	Low	Low	Moderate	Low	High	Low	Moderate	Moderate	High	Moderate	Moderate	Low	Low
87	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Low	Low	High	Low	Moderate	Low	High	Low	Low	Low	Low
88	Unincorporated Archuleta County	5-10 years	3-5	Moderate	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	High	High	Moderate	Low	High	Low	Moderate	Low	Moderate
89	Unincorporated Archuleta County	over 10 years	1-2	Low	Low	High	Low	Low	Low	Low	Low	Low	Moderate	Moderate	Moderate	Low	High	Moderate	Moderate	Low	Moderate
90	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Low	Low	Low	High	Low	Moderate	Low	High	Low	Low	Low	Low
91	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Moderate	Moderate	High	Low	High	Low	High	Moderate	Low	Low	Moderate
92	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Moderate	High	Low	Low	Low	Low	Moderate	Low	High	Moderate	Moderate	Low	High	Moderate	Low	Low	Moderate
93	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Moderate	Low	Low	Moderate	Moderate	Moderate	High	High	Low	High	High	Low	Low	Low
94	Town of Pagosa Springs	1-5 years	1-2	Moderate	Moderate	High	Low	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Low	High	Moderate	Low	Low	Moderate
95	Unincorporated Archuleta County	1-5 years	0	Low	Low	High	Low	Low	Low	Low	Moderate	Moderate	High	High	Moderate	Low	High	High	Low	Low	Low
96	Unincorporated Archuleta County	over 10 years	3-5	Moderate	High	High	Low	High	Low	Moderate	High	Low	Moderate	Low	High	Low	High	High	Moderate	Low	Moderate
97	Unincorporated Archuleta County	over 10 years	3-5	Low	Low	Moderate	Low	Low	Moderate	Low	Low	Low	Moderate	Low	Low	Low	High	Moderate	Low	Low	Low
98	Unincorporated Archuleta County	5-10 years	0	Moderate	Low	High	Low	High	High	High	High	Moderate	High	Low	High	Low	High	High	Moderate	High	High
99	Unincorporated Archuleta County	1-5 years	0	Low	Low	High	Low	Moderate	High	Moderate	Low	Low	Moderate	Moderate	Moderate	Low	High	High	Moderate	Low	Moderate
100		1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Low	Low	Low	High	Moderate	High	Low	High	Low	Low	Low	High
101	Unincorporated Archuleta County	5-10 years	1-2	Moderate	Low	High	Low	Moderate	Low	Low	Moderate	Moderate	High	Moderate	High	Low	High	Moderate	Low	Low	High
102	Oak Hill Ranches, think it is	over 10 years	ore than 5 tim	Moderate	Low	High	Low	Low	Low	Low	Low	Low	Moderate	Low	Moderate	Low	High	Low	Low	Low	Moderate
103	Unincorporated Archuleta County	5-10 years	1-2	Low	Low	High	Low	Moderate	Moderate	Low	Low	Low	Moderate	Low	Moderate	Low	High	Moderate	Low	Low	Moderate

104	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Low	Low	High	Low	Low	Low	High	Low	High	Moderate	High
105	Unincorporated Archuleta County	5-10 years	1-2	Low	Low	High	Low	Low	Low	Moderate	Moderate	Moderate	Moderate	High	Moderate	Low	High	Low	Low	Low	Moderate
106	Oak Hills Ranches	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Low	Low	Low	Moderate	Low	Moderate	Low	High	Low	Low	Low	Low
107	Town of Pagosa Springs	1-5 years	5-Mar	Low	Low	High	Low	Low	Moderate	Moderate	Low	Moderate	High	High	High	Low	High	Low	Moderate	Low	Moderate
108	Unincorporated Archuleta County	over 10 years	0	Low	Low	High	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Moderate	High	High	High	Low	High
109	Unincorporated Archuleta County	Less than 1 year	3-5	Moderate	Low	Moderate	Low	Low	Low	Moderate	Moderate	Moderate	Moderate	High	High	Low	High	High	Moderate	Low	Moderate
110	Oak Hill Ranches	1-5 years	1-2	Low	Low	High	Low	Moderate	High	Moderate	Low	Low	High	Low	Moderate	Low	High	Moderate	Low	Moderate	Moderate
111	Unincorporated Archuleta County	over 10 years	0	Low	Low	High	Moderate	Low	Moderate	Moderate	Low	Low	High	High	High	Low	High	Moderate	Moderate	Low	High
112	Unincorporated Archuleta County	over 10 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Low	Low	Moderate	Moderate	High	Low	High	Low	Low	Low	Low
113	Echo Canyon Ranch	Less than 1 year	3-5	Low	Low	High	Low	Low	Moderate	Moderate	Low	Low	Low	Low	Moderate	Low	High	Low	Low	Low	Low
114		5-10 years	1-2	Low	Low	Moderate	Low	Low	Moderate	Moderate	Low	Moderate	Moderate	Moderate	High	Low	High	Moderate	Low	Low	Moderate
115	Echo Canyon Ranch HOA	over 10 years	3-5	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Moderate	Moderate	Low	High	Low	Low	Low	High
116	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	Moderate	Low	Low	Moderate	Moderate	Low	Low	Moderate	Low	Low	Low	High	Low	Low	Low	Low
117	Unincorporated Archuleta County	over 10 years	3-5	Moderate	Low	High	Low	Moderate	Moderate	Low	Moderate	Moderate	Moderate	High	High	Low	High	High	Moderate	Low	Moderate
118	Town of Pagosa Springs	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Moderate	Moderate	High	Low	Moderate	Low	High	Moderate	Moderate	Low	Moderate
119	PLPOA	1-5 years	1-2	Low	Moderate	High	Low	Low	Moderate	Low	Low	Low	Moderate	High	Moderate	Low	High	Low	Low	Low	Moderate
120	Unincorporated Archuleta County	over 10 years	ore than 5 tim	Moderate	Low	Moderate	Low	High	High	High	High	Low	High	Low	High	Low	High	High	Low	Low	Moderate
121	Unincorporated Archuleta County	Less than 1 year	3-5	Moderate	Moderate	High	Moderate	Moderate	Low	Low	Moderate	Moderate	Moderate	High	High	Low	High	Moderate	Moderate	Moderate	High
122	Unincorporated Archuleta County	5-10 years	3-5	Low	Low	High	Low	Moderate	Moderate	Low	Moderate	Low	High	Moderate	Moderate	Low	High	Moderate	Moderate	Moderate	Moderate
123	Oak Hills	1-5 years	1-2	Low	Low	High	Low	Low	High	High	Moderate	Moderate	High	Low	High	Low	High	High	Low	Low	High
124	Town of Pagosa Springs	5-10 years	1-2	High	Low	High	Low	Low	Moderate	Low	Moderate	Low	High	Moderate	High	Low	High	High	Low	Low	Moderate
125	Unincorporated Archuleta County	1-5 years	1-2	Low	Low	High	Low	Low	Moderate	Moderate	Low	Low	High	Low	Moderate	Low	High	Moderate	Low	Low	High
126	Unincorporated Archuleta County	over 10 years	3-5	Moderate	Moderate	High	Moderate	High	Moderate	Moderate	Moderate	Moderate	High	Low	High	Low	Moderate	Moderate	Low	Low	Moderate
127	Unincorporated Archuleta County	over 10 years	1-2	Moderate	Low	High	Low	Low	Low	Low	Low	Low	Moderate	High	Moderate	Low	High	Low	Low	Low	Low
128	PLPOA	1-5 years	ore than 5 tim	Low	Moderate	High	Low	Moderate	Moderate	Moderate	Low	Low	High	High	High	Low	High	High	Moderate	Moderate	Moderate
129	Unincorporated Archuleta County	5-10 years	0	Low	Low	High	Low	Low	Moderate	Low	Low	Low	Moderate	Low	High	Low	High	Low	Low	Low	Low
130	Unincorporated Archuleta County	over 10 years	0	Moderate	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low	Moderate	Low	High	Moderate	Low	Low	Low
131	Unincorporated Archuleta County	over 10 years	0	High	High	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low	High	Low	High	Low	Low	Low	Low
132	Town of Pagosa Springs	5-10 years	0	Low	Low	High	Low	Moderate	Moderate	Moderate	High	Moderate	Moderate	Low	Moderate	Low	High	Moderate	Moderate	Low	Moderate
133	Unincorporated Archuleta County	5-10 years	0	Moderate	Low	High	Low	Low	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Low	High	High	Low	Low	Low
134	Unincorporated Archuleta County	over 10 years	0	Low	Low	High	Low	Moderate	Moderate	High	Low	Low	High	Moderate	Moderate	Low	High	Moderate	Low	Low	High
135	Town of Pagosa Springs	Less than 1 year	0	Moderate	Low	Moderate	Low	Low	Low	Low	Moderate	Low	Moderate	Low	Moderate	Low	High	Low	Low	Low	Low
136	Unincorporated Archuleta County	5-10 years	1-2	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low	Moderate	Low	High	High	Moderate	Low	Low
137	Town of Pagosa Springs	over 10 years	1-2	Moderate	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	Low	Low	Moderate	Moderate
138	Unincorporated Archuleta County	1-5 years	0	Low	Low	High	Low	Moderate	Moderate	Low	Low	Low	High	Moderate	High	Low	High	Low	Low	Low	Low

139	Town of Pagosa Springs	1-5 years	1-2	Moderate	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	High	Moderate	High	Low	High	High	Moderate	Low	Moderate
140	Unincorporated Archuleta County	1-5 years	1-2	Moderate	Low	High	Low	Moderate	Low	Low	Moderate	Low	Moderate	Moderate	High	Low	High	Moderate	Moderate	Moderate	Moderate

ID	Are there any other hazards not listed above that should be considered in Hazard Mitigation Plan?	Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction to which it applies:	The following types of mitigation actions may be considered in Archuleta County. Please indicate the types of mitigation actions that you think should have the highest priority in the Archuleta Co...	Please comment on any other pre-disaster mitigation actions that the planning committee should consider for reducing future losses caused by disasters:	Optional: Provide any additional comments you have which you feel are relevant for the Hazard Mitigation plan update:
1	No		Water Conservation ;		
2	Cyber attacks	Dam Inspections oversight confirmation- Hidden Valley Dam, for example, would impact Downtown Pagosa Springs.	Improve reliability of communications systems ;Dam safety ;Evacuation route development ;Water Conservation ;Education and Discounts on Flood Insurance ;Stormwater Drainage Improvements ;Public Education/Awareness ;Generators for Critical Facilities ;Critical Facilities Protection ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;		
3			Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Public Education/Awareness ;Stormwater Drainage Improvements ;Water Conservation ;Wind mitigation;Evacuation route development ;		
4	Drought	No	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Evacuation route development ;		Have no comments
5	violation of inalienable rights by public servants				
6		Fix the roads!	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Wind mitigation;	Fix the roads so if people need to evacuate quickly they can!	Fixing the roads
7	Disruption of electricity,	Maintenance of county roads in Aspen Springs that the AS Metro doesn't have funds for.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Planning/Zoning ;Critical Facilities Protection ;Generators for Critical Facilities ;Water Conservation ;Evacuation route development ;Subsidence mitigation;Improve reliability of communications systems ;		
8			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Improve reliability of communications systems ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;		
9		Risk of flooding on the lower Blanco River and major roads in places of high flood danger	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Floodprone Property Buyout ;Evacuation route development ;Improve reliability of communications systems ;	Discourage building in areas of high hazard. Flood planes/wetlands/forested areas etc.	
10			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Stream Restoration ;Water Conservation ;Evacuation route development ;	Identify and post avalanche shoots for the public.	
11			Improve reliability of communications systems ;Evacuation route development ;Water Conservation ;Stream Restoration ;Planning/Zoning ;Generators for Critical Facilities ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Public Education/Awareness ;Critical Facilities Protection ;		
12			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);		

13			Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stormwater Drainage Improvements ;Stream Restoration ;Education and Discounts on Flood Insurance ;Water Conservation ;Floodprone Property Buyout ;Evacuation route development ;Dam safety ;Improve reliability of communications systems ;Levee enhancements/improvements;Wind mitigation;Subsidence mitigation;		
14			Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Education and Discounts on Flood Insurance ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;	Logging. Not sure if this is the EOC's responsibility, but help to those that loose heating in the winter, like the shortage of propane. Maybe CSU Extension could create programs for something like that. Education and whatnot.	
15		1. Limited cell phone coverage for emergencies, especially the upper Piedra area where thousands of people recreate from late spring to late fall. 2. Campers, especially in the Turkey Springs area, that could destroy our forest and surrounding homes with a careless fire. Solution: no campfires within 5 miles of residential areas.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;	1. Limited cell phone coverage for emergencies, especially the upper Piedra area where thousands of people recreate from late spring to late fall. 2. Campers, especially in the Turkey Springs area, that could destroy our forest and surrounding homes with a careless fire. Solution: no campfires within 5 miles of residential areas.	Drought, water conservation, fire, and reliable communications should be top priorities.
16	Active shooters (mass shootings)		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Stream Restoration ;Improve reliability of communications systems ;Generators for Critical Facilities ;Planning/Zoning ;Evacuation route development ;Wind mitigation;		
17		Mudslides, fallen trees, snow storms all have blocked access to my home. Road maintenance and response to emergencies on county road is essential to people who live rurally	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
18	No	No	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);		Nonr
19			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Evacuation route development ;		
20	Water supply	Hazmat incedent on puthill	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Public Education/Awareness ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Seismic retrofit to public buildings;Seismic safety for residential buildings;	Water supply	
21		Power failures every time it rains in the downtown area.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Water Conservation ;Wind mitigation;		
22			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Public Education/Awareness ;Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;		
23	Fire escape routes, haza	Aspen Springs safety county code enforcement, fire route	Evacuation route development ;Water Conservation ;Planning/Zoning ;Generators for Critical Facilities ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;	Evacuation routes and fire mitigation, there are properties that have no water. Expand electric to reduce generator use in forested areas of impact.	The signage coming into town needs to be expanded to make visitors and residents aware of fire danger, it starts closer to town than it should, national forest is beyond that.
24	Failing sewer system.	Pawsd water treatment facility out of regulatory standards. Town sewer pumps and systems continuously failing. And will cause an environmental disaster any moment but the planning commission approving additional construction to add the the pending disaster.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;	Maintaining healthy forests by removing beetle kill and other dead foliage to prevent a Marshall or Paradise, CA type wildfire disaster. Build a wastewater treatment facility downtown rather than using a system of failing pumps to move sewage uphill to PAWSD.	

25		Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Public Education/Awareness ;Stream Restoration ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;	
26	Gas shortage.	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Water Conservation ;Evacuation route development ;	
27		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Planning/Zoning ;Stormwater Drainage Improvements ;Stream Restoration ;Water Conservation ;Floodprone Property Buyout ;Public Education/Awareness ;	Be aware of Over development and paving thruout our watershed that will reduce water permeable surfaces and increase flood risks and changes to the lower flood plains and floodways due to channeling the surface water runoff to the rivers and streams creating backups at waterway junctions.
28	no	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;	
29		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Public Education/Awareness ;Water Conservation ;Improve reliability of communications systems ;Wind mitigation;	
30		Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Dam safety ;Improve reliability of communications systems ;Wind mitigation;	
31	Drought, Wildfire, Flood, Avalanche, Winter storms - Archuleta and PS	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Generators for Critical Facilities ;Public Education/Awareness ;Planning/Zoning ;Stormwater Drainage Improvements ;Stream Restoration ;Education and Discounts on Flood Insurance ;Water Conservation ;Evacuation route development ;Dam safety ;Improve reliability of communications systems ;Levee enhancements/improvements;Critical Facilities Protection ;	
32	Extreme drought/ water shortages Wildfires	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Planning/Zoning ;Generators for Critical Facilities ;Water Conservation ;Public Education/Awareness ;Evacuation route development ;Dam safety ;	
33	Wildfire! Instead of a community wide mitigation effort, I am concerned that a hodge lodge of mitigation by particular property owners will doom the community should a wildfire breakout occur. Wyndham is horrible handling their “greenbelts”. Efforts to transfer those properties to PLPOA for property land management have failed - the County needs to lean on Wyndham to get that done!	Evacuation route development ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Subsidence mitigation;	Inter-governmental agreements and on-going protocol review are vital to quick and effective mitigation efforts and effective response. Who is responsible?

34			Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;Generators for Critical Facilities ;Critical Facilities Protection ;Public Education/Awareness ;Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
35	David Michael Coffee	Traffic and congested streets	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Stormwater Drainage Improvements ;Stream Restoration ;Education and Discounts on Flood Insurance ;Water Conservation ;Floodprone Property Buyout ;Evacuation route development ;Improve reliability of communications systems ;		
36	Lack of power and/or wa	NO	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Improve reliability of communications systems ;	Support fuel mitigation work in Archuleta County such as is being done in La Plata County!	
37			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stormwater Drainage Improvements ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
38	Crime rising everywhere	Only concern is drought and major forest fire, Also traffic..dread huge development as don't think Pagosa could handle impact. Need a professional city planer IMHO	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;	Traffic..sewage...good water...really need professional city planner or Pagosa will become a patchwork hodgepodge mess imho.	Pagosa is growing fast and does not seem as organized as I would hope. I sort of dread the future growth with horrible infrastructure.....roads are terrible, sewage could become a disaster without serious improvement and planning. Housing for workers..not just out of town wealthy second home owners
39			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Public Education/Awareness ;Stream Restoration ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;		
40			Indoor/Outdoor Warning systems ;Water Conservation ;Improve reliability of communications systems ;		
41		Yes to many people here from Out of town		To many people in this town to sustain our water and sewer..	
42		Wild fire mitigation of national forest lands.	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Public Education/Awareness ;Improve reliability of communications systems ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;		
43	Pot Holes		Critical Facilities Protection ;Indoor/Outdoor Warning systems ;Generators for Critical Facilities ;Evacuation route development ;		
44	Guns combined with extreme right wing conspiracy theories.		Water Conservation ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);		
45			Generators for Critical Facilities ;Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Stream Restoration ;Water Conservation ;Improve reliability of communications systems ;		
46	Roads are a horrible hazard like huge potholes everywhere		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Planning/Zoning ;Public Education/Awareness ;Stormwater Drainage Improvements ;Education and Discounts on Flood Insurance ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
47			Generators for Critical Facilities ;Water Conservation ;Improve reliability of communications systems ;Stream Restoration ;		

48			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Public Education/Awareness ;Stormwater Drainage Improvements ;Stream Restoration ;Water Conservation ;Evacuation route development ;		
49			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Generators for Critical Facilities ;Critical Facilities Protection ;Planning/Zoning ;Public Education/Awareness ;Stormwater Drainage Improvements ;Stream Restoration ;Education and Discounts on Flood Insurance ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
50			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Water Conservation ;Improve reliability of communications systems ;Evacuation route development ;Stormwater Drainage Improvements ;Critical Facilities Protection ;		
51	Road Maintenance (potl	Pagosa Proper-Power outages from storms, road maintenance (filling in potholes, etc).	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Indoor/Outdoor Warning systems ;	Backup plans for power outages from storms/extreme weather	
52	Roads		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Generators for Critical Facilities ;Planning/Zoning ;Stream Restoration ;Education and Discounts on Flood Insurance ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;	Roads	
53	Insufficient exit routes for evacuation		Evacuation route development ;Planning/Zoning ;Critical Facilities Protection ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Water Conservation ;		Limitations on population increases
54	No	No	Public Education/Awareness ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);		
55	Unknown	Fire mitigation,	Improve reliability of communications systems ;Evacuation route development ;Water Conservation ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	Water conservation. Fire mitigation.	
56		I propose working with partners such as the Forest Service, Firewise, HOAs, grants, etc. to perform wildland fire hazard reduction around neighborhoods that abut the National Forest, such as the Loma Linda subdivision. Many homeowners in our subdivision perform fire mitigation on our properties regularly, but we are surrounded by dense forest. An immense public benefit would be derived from building and maintaining fuel breaks, fire roads (truck/tractor trails), helispots, water cisterns and similar items between neighborhoods and the Forest. Proposed Standards: Ensure that fire defense systems are adequate to break broad expanses of vegetative fuels into manageable parcels, provide rapid and safe access for manpower and equipment for the quick suppression of fires, and provide facilities to replenish water supplies for fire trucks and helicopters. Here is further information:	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Generators for Critical Facilities ;Public Education/Awareness ;Evacuation route development ;Improve reliability of communications systems ;	Public education should include specific instructions to visitors and new residents about fire danger.	

57		County….continued fire mitigation around incorporated areas. Also, and perhaps I'm not aware, but emergency broadcast communications via cell and land lines.	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Evacuation route development ;Improve reliability of communications systems ;Water Conservation ;	Identification of private non-governmental agents that could be essential partners in mitigation as well as emergency response and business continuity.	
58			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Education and Discounts on Flood Insurance ;Water Conservation ;Floodprone Property Buyout ;Evacuation route development ;Improve reliability of communications systems ;Subsidence mitigation;		
59	Roads	Town limits needed turn lanes off main roads	Indoor/Outdoor Warning systems ;Generators for Critical Facilities ;Stormwater Drainage Improvements ;Education and Discounts on Flood Insurance ;Stream Restoration ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;Water Conservation ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	Tree trimming & cutting of weeds & grasses along main roads. Only Lewis Street, Hermosa Street & 8th street seems to be getting all the improvements for those property owners. The rest of town streets look like heck, downed tree branches, overgrown grasses, no sidewalks!!□	Bring county roads up to standards, fill the potholes.
60			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);		
61		Crazy amounts of traffic creates a situation in which it could be difficult for emergency vehicles to get thru. :(	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Planning/Zoning ;Stream Restoration ;Water Conservation ;Wind mitigation;		
62			Improve reliability of communications systems ;Water Conservation ;Stream Restoration ;Stormwater Drainage Improvements ;Public Education/Awareness ;Planning/Zoning ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);		
63			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Water Conservation ;Improve reliability of communications systems ;Evacuation route development ;Critical Facilities Protection ;		
64			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Planning/Zoning ;Public Education/Awareness ;Water Conservation ;Improve reliability of communications systems ;		
65			Water Conservation ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;		
66	land fill polution		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Public Education/Awareness ;Stream Restoration ;Water Conservation ;Evacuation route development ;		
67			Planning/Zoning ;Stormwater Drainage Improvements ;Stream Restoration ;Water Conservation ;Evacuation route development ;Critical Facilities Protection ;Generators for Critical Facilities ;		
68			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Water Conservation ;Improve reliability of communications systems ;Wind mitigation;		

69	County-evacuation plans for wildfire	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;		
70	Big concerns over roofing. First, I wonder how hail damage is evaluated here. I have experienced 2 events in town over the last month or so and have no idea how it affected our roofs. One had nickel sized hail. At this point no roofer will even respond to requests for shingle repair from snow damage let alone our request for ice mitigation solutions so I haven't even brought up a review for hail damage	Indoor/Outdoor Warning systems ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Critical Facilities Protection ;Stormwater Drainage Improvements ;Public Education/Awareness ;Planning/Zoning ;Education and Discounts on Flood Insurance ;Water Conservation ;Evacuation route development ;Dam safety ;Improve reliability of communications systems ;Levee enhancements/improvements;Wind mitigation;		
71	Winds that have knocked down trees landing on our home, wildland fire forcing Forest closure affecting our business, avalanche killing a good friend, pandemic affecting work/life, our well running out of water, winds resulting in dust and subsequent rapid run off resulting in dry climate, fires and again a dry well.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Generators for Critical Facilities ;Public Education/Awareness ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Wind mitigation;Subsidence mitigation;	Better communication for emergency agencies in our rural areas...	
72		Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Improve reliability of communications systems ;	Dealing with militant groups	
73		Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stormwater Drainage Improvements ;		
74		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Improve reliability of communications systems ;Wind mitigation;		
75		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Water Conservation ;Evacuation route development ;		
76		Critical Facilities Protection ;Planning/Zoning ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
77		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
78		Public Education/Awareness ;Water Conservation ;		
79	Archuleta County has a substantial Emergency Management budget to deal with incidents after the fact, but invests nothing in wildfire preparedness. Since this is our greatest natural hazard, why not spend money to prevent and prepare for the inevitable wildfire.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Public Education/Awareness ;Improve reliability of communications systems ;		
80		Public Education/Awareness ;Stream Restoration ;Evacuation route development ;Improve reliability of communications systems ;Water Conservation ;Stormwater Drainage Improvements ;Planning/Zoning ;		
81		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Water Conservation ;		
82	Forest maintenance as it relates not wildfires.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;Public Education/Awareness ;Stream Restoration ;Improve reliability of communications systems ;		
83		Water Conservation ;Improve reliability of communications systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	WAP's wildfire mitigation concerns.	Funding of WAP by county contributions which have been missing in the past. Please consider supporting WAP financially.

84	Lack of help on forest mi	We need more help with mitigation in the Upper Blanco Basin Please!!!	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Public Education/Awareness ;Stormwater Drainage Improvements ;Stream Restoration ;Evacuation route development ;Improve reliability of communications systems ;Subsidence mitigation;Water Conservation ;	Please include Wildfire Adapted Partnership in your County Budget as they are doing most of the education and planning for mitigation in the areas outside of Pagosa City limits. Thank you for getting this ball rolling. So badly needed right now.	Again, I beg you to Please include Wildfire Adapted Partnership in your County Budget as they are doing most of the education and planning for mitigation in the areas outside of Pagosa City limits. Thank you for getting this ball rolling. So badly needed right now.
85	No		Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Stream Restoration ;Water Conservation ;		
86	Running out of water	no	Generators for Critical Facilities ;Public Education/Awareness ;Water Conservation ;		
87	Economic collapse and t	Wildfire mitigation. One fire in habited area would displace hundreds, if not thousands of county residents and severely disrupt everyday staples of life. This is an Archuleta County problem as tax revenue would be severely shorted.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Water Conservation ;Evacuation route development ;	NIMS training, identification of evacuation rally points and places to house displaced citizens, basic needs planning (food, water, hygiene) and stored supplies for not if, but when.	Drought resulting in water shortages and high fire danger and then more importantly, how to serve displaced individuals and families.
88			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
89			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Public Education/Awareness ;Stream Restoration ;Improve reliability of communications systems ;		
90		As you can see, I noted lightening, drought, and wildland fire as high risk for our area. I believe that the county needs to be more involved in fire prevention and education within the county, and make this a priority.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Evacuation route development ;Planning/Zoning ;		Wildfire mitigation--the county needs to do more and be more involved. This is the biggest hazard that homeowners in the county face.
91	Wildfire is the greatest t	Again, wildfire preparedness should be at the top of the list for natural disasters.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
92		Wild land fire threat is great and increasing! Archuleta County Unincorporated areas.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Generators for Critical Facilities ;Stream Restoration ;Education and Discounts on Flood Insurance ;Evacuation route development ;Dam safety ;Improve reliability of communications systems ;	Woodland fire mitigation	
93	Short term rentals - The	The Land Fill, A gravel Pit/source, Water and other infrastructure is not keeping up with growth. We need improvements in cell service as well as internet service.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Evacuation route development ;Improve reliability of communications systems ;Water Conservation ;	Work with the Forest Service to put in fire breaks and mitigation around neighborhoods or between private property and Forest service property	As an example, Lome Linda subdivision has about 50% of the lots or homes backing to National Forest. A fire break on the Forest Service side needs to be put in place. Many neighbors would participate in creating this fire break if the Forest Service would provide permission and direction, i.e. show us where to cut etc....
94			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Planning/Zoning ;Education and Discounts on Flood Insurance ;Generators for Critical Facilities ;		

95		I think a great idea would be to have the forest service, fire department, Wildfire Adapted Partnership, HOAs, etc. work together to put in fire breaks along the perimeters of subdivisions and neighborhoods so that a wildland fire would not immediately go into these neighborhoods. I live in Loma Linda and many of our residents are duly performing mitigation on their own property on a regular basis, though more grants toward this work would be helpful. We have quite a bit of national forest abutting our neighborhood and a fire break would do wonders in helping should a fire start, especially if one were to start on Eight Mile Mesa. I know there are many other neighborhoods abutting the national forest and it seems that it should be a priority to put in fire breaks along these neighborhoods. With Archuleta County and most of Colorado being in a drought situation, I think all that can be done ahead of time to	Evacuation route development ;Indoor/Outdoor Warning systems ;Planning/Zoning ;Public Education/Awareness ;Water Conservation ;Subsidence mitigation;	I don't know if this is pre disaster mitigation, but I think education to the public about water conservation should be a priority. Many tourists come to enjoy our area but do not understand the dangers we face daily as permanent residents. STRs, hotels, bed and breakfasts, etc should be at the very least required to post information on our drought and fire hazards and have those visiting take care to conserve water when they can- short showers, no fires if they do not have water near to put out, etc. I have heard that there are part timers who use tons of water when they are here to water their landscapes, an unnecessary use of water which contributes to unnecessary water loss. Again, the highest priority should be working together to create fire breaks around existing neighborhoods that abut national forest land	
96	Egress accessibility durir	If a mass evacuation is needed we are limited to Hwy 160 East and West, and Hwy 84; Archuleta County	Evacuation route development ;Water Conservation ;Public Education/Awareness ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;Critical Facilities Protection ;Generators for Critical Facilities ;Improve reliability of communications systems ;		Post fire ban guidelines where tourists are more likely to see them as they generally don't know what they are.
97		Wildfire mitigation plans and joint-evaluations by variety of emergency services is needed (ie. multiple LaPlata County departments are working together to mitigate against wildfires). Emergency planning requires monetary support and committment from the County--where most residents reside. Currently, $0, 0 attention and 0 time is spent on wildfire preparedness, most likely the #1 threat to infracstructure and lives in Archuleta County.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Evacuation route development ;Planning/Zoning ;	1. Evacuation plans. How do you save people when wildfires occur. 2. Cooperative mitigation amongst emergency services of dead trees/overgrowth. 3. Education of- and regulation of fire activity, especially since most of our population during wildfire season is vacationers.	I really question that tornadoes, dam breaks, earthquakes or volcano concerns exist in our area. Lightening is prevalant, and when combined with dead and overgrown trees, we are faced with wildfires. Please help WAP to do the job of educating and mitigating our County.
98			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Generators for Critical Facilities ;Critical Facilities Protection ;Planning/Zoning ;Stormwater Drainage Improvements ;Stream Restoration ;Water Conservation ;Floodprone Property Buyout ;		
99	Egress. We live in an are	As noted before. Egress in areas that have single road entry.	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Public Education/Awareness ;Water Conservation ;		
100	Pine beetle blight and fi	Lightning strikes in Summer monsoon season in the Blanco Basin, specifically the Blue mountain ranches area.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Water Conservation ;Evacuation route development ;	Brush and tree clearing along Blanco Basin roads (326, Bear Run, Crossroads Dr, Blue Mt. Place, to allow fire truck access. Also tree clearing along power lines in the Basin!	Clearing and identification of shelter in place locations in the Blanco Basin if state route 326 is blocked due to fire. Currently rt. 326 is the only exit out of the Blanco Basin in case of a fire.
101	Yes, tourists...and hoard	Apathy displayed by STRs and local residents in the Holiday Acres area... Some do not want to do anything...and if a fire comes, they'll just leave or move.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Public Education/Awareness ;Evacuation route development ;Subsidence mitigation;Indoor/Outdoor Warning systems ;Improve reliability of communications systems ;	County personnel to clear roadway of brush that can promote the spread of wildfires from careless disposal of lit cigarettes and cigars.	Items published in the local newspaper and the preview, to make all residents aware of the hazards we face.

102	Fire Mitigation and alert	Oak Hill Ranch is above Aspen Springs. We do not have an evacuation plan, we do not know if fire engines can actually get here and what they would do if they got here. Can they go down the roads? Should we widen the road in certain areas, How long does it take for them to get here? Who do we call if we see a fire here? Can we really evacuate? How do we know that people in their houses have been notified? Where and how do we evacuate. Shouldn't we have help to understand how to do this? Even practice? Are there firefighters or others in Forest Management that need practice sessions, we would allow them (want them) up here to practice, take down trees if nee	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	Funding for Fire mitigation and alert and practice systems for evacuations	More Funding for fire mitigation - alerts to people when funding becomes available... I did not know about Helping Hands funding when it came this year and missed the deadline.
103	The impact of wildfire o	Wildfire hazard, not only in the WUI, but throughout the County as well as on USFS lands as it pertains to housing, air quality, water quantity and quality, and public safety. This is a very serious condition that exists throughout the County and is in much need of considerably more planning and funding.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Public Education/Awareness ;Water Conservation ;Stream Restoration ;Improve reliability of communications systems ;Planning/Zoning ;	Incorporating wildfire mitigation REQUIREMENTS into Land Use Development Code throughout the County and Town. Creating a full-time position within the County to deal with such duties.	Increased education throughout the Community to enhance understanding of the relationship between watershed health and our community's long-term economic, social, and environmental health.
104	Overbuilding without ad	Inadequate maintenance on county and town roads causing damage to automobiles and possible accidents. Many potholes deep and wide. Not enforcing codes.	Planning/Zoning ;Water Conservation ;		
105	Potential for fire in PLPC	See answer above.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Water Conservation ;	Archuleta County should buy chipper trucks that travel around the county and turn cut branches into chips that can be used for landscaping.	
106		Our community has extremely limited options for egress in the case of a wildfire. We really need the county to help mitigate the risk.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;	All fire mitigation including pruning and brush removal. Also, eminent domain in the case of emergency to allow rapid egress and exception from liability for property damage.	
107		Wildfire awareness and prevention.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Public Education/Awareness ;Stream Restoration ;Evacuation route development ;		
108	Re-planting with grasses and shrups		Water Conservation ;	less stupid people	
109		Fire is my biggest concern, esp after the Plumtaw fire this spring.	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Subsidence mitigation;Wind mitigation;	The county needs to contribute to WAP. It's surprising, and concerning, that it doesn't.	
110	Power outage		Stream Restoration ;Improve reliability of communications systems ;	Water sources management. All HOA and community roads required to be plowed for access in case of house or lot fires when owners are away. Access could prevent fires from spreading.	
111			Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Improve reliability of communications systems ;Subsidence mitigation;		
112			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	We need more help with wildfires	
113			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Stream Restoration ;Subsidence mitigation;		
114	Fire mitigation	Fire mitigation	Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;	Fire mitigation	City and county wide education and coordination

115	Archuleta County must t	La Plata County and the town of Durango have a co-operative agreement to coordinate wildfire mitigation projects and education. Archuleta County and the town of Pagosa Springs should do the same. Don't wait for a disaster to occur.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Public Education/Awareness ;Improve reliability of communications systems ;	Education & community involvement	Apply for federal and state grant monies to help with financing mitigation programs
116	no	no	Planning/Zoning ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	more forest management	
117			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Critical Facilities Protection ;Planning/Zoning ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
118		Wildfire, road access/escape from Aspen Six/Oak Hill Ranches (there is only one public exit for the entire community. The BLM service road exits have not been maintained and the Sheriff's department has prohibited us from using them.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Public Education/Awareness ;Stream Restoration ;Evacuation route development ;Improve reliability of communications systems ;	Wildfire is the most likely disaster. Also, tree removal due to bark beetle/drought	
119		There many homes in PLPOA that have trees and tree branches literally touching the walls and roofs. Archuleta county needs to be upfront with issuing mitigation requirements, before we have a wildfire sweep through our community.	Water Conservation ;Public Education/Awareness ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	Better public education on the hazards we face as a community. Many of our neighbors are of the opinion that a serious wildfire will not happen them. It is only after they loose their homes that they will complain to the county commissioners on why they didn't do something about before hand. Everyone needs to do their part as community members and the leadership should be from the top down not bottom up. The County Commissioners need to show some back bone and show leadship in mitigating the wildfire threat we face.	
120		Inadequate culvert sizes under county roads which cause flooding of property	Stormwater Drainage Improvements ;Water Conservation ;		
121			Indoor/Outdoor Warning systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Public Education/Awareness ;Stormwater Drainage Improvements ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;		
122			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Indoor/Outdoor Warning systems ;Critical Facilities Protection ;Generators for Critical Facilities ;Planning/Zoning ;Stormwater Drainage Improvements ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;Public Education/Awareness ;	Codes for fire mitigation, including fire resistant building codes and storage of flammable materials near your structures or neighboring structures.	Air pollution caused by burning and dust from roads
123	We have a single road (F	Evacuation will be tough. Also our HOA is tight on funds & we need more mitigation along our single means of evacuation (Ranchland)	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Evacuation route development ;	Funds to clear our single road out: Ranchland As well as clearing Crocked Road for Aspen 6 which is the continuation of that evacuation route People who are not in the Forest AG program do not clear their land so we could but or neighbors can be chocking with dry, brush.	
124			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Public Education/Awareness ;Water Conservation ;Indoor/Outdoor Warning systems ;Stream Restoration ;		

125		Even after the Plumtaw Fire, I hear nothing from officials about fire mitigation at residences or any kind of evacuation planning. Look at the traffic on 160! What happens if people need to evacuate. Where are shelters, and how will they be supplied with water and power?	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Public Education/Awareness ;Stream Restoration ;Water Conservation ;Evacuation route development ;Improve reliability of communications systems ;	There were a lot of things on the list in Q7 that should be done. Who has the lead in coordinating action on mitigation and in the event of a hazard situation? Is there a coordinating committee and do they practice with table-top exercises and drills. What about medical capacity? Where is that integrated into planning?	Leadership should be visible on these issues outside times of crisis.
126			Critical Facilities Protection ;Generators for Critical Facilities ;Stormwater Drainage Improvements ;Water Conservation ;Dam safety ;Levee enhancements/improvements;Seismic retrofit to public buildings;	The 100 year flood is overdue. This should be on the top of the list for the planning committee. The last time the flood hit, any thing close to the rivers was distroyed.	
127		Forest fire mitigation/preparedness is the single most important hazard issue, and the County government seems unconcerned and unprepared for it.	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Planning/Zoning ;Evacuation route development ;Improve reliability of communications systems ;		A hazard mitigation plan must recognize that fire originating on the national forest will likely enter the urban area a Pagosa Springs in the future. The County should be devising area-specific plans and routes for evacuation, and the fire district should be planning for protection of homes when the fire reaches the edge of urban development.
128			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Generators for Critical Facilities ;Water Conservation ;Stream Restoration ;Evacuation route development ;Dam safety ;Planning/Zoning ;	With the wildfire in Paradise, CA many did not have alternate evacuation routes and there are many homes with that situation in this county. The planning committee should look at the big picture with all the evacuation routes and the future development to not overload any one route. It would also be very helpful for the building department to fully adapt fire resistant measures for all new construction/renovations above and beyond the standard building code.	The wildfire this spring near 4 mile falls was a wake up call - a lot of different skills were needed to contain the small fire. A hearty thank you to all that had worked on this preparation and implementation. What was learned from this real life exercise? what can our county do to prepare for a larger incident? Also regarding the pandemic, which has significantly altered my lifestyle, we as a county did not get hit hard and I am thankful for that. The hospital seemed prepared and responsive to testing/vaccines and being able to give treatment/airlift/transfer as needed - that is appreciated!
129	no		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Water Conservation ;Evacuation route development ;		
130			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Generators for Critical Facilities ;Water Conservation ;	Fire mitigation in high risk areas closer to homes.	
131			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Generators for Critical Facilities ;Planning/Zoning ;		
132			Water Conservation ;Stormwater Drainage Improvements ;Planning/Zoning ;Generators for Critical Facilities ;Critical Facilities Protection ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Indoor/Outdoor Warning systems ;Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;		
133			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);		ARCHULETA County should help the Wildlife Adapted Partnership that works very hard without funding from the county. Wildfires are a real possibility in our area as evidenced by the fire this season.
134	wildfire preparedness	wildfire preparedness	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);	wildfire preparedness	
135	Wildfire planning		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Improve reliability of communications systems ;	The County needs more significant funding directed toward wildfire preparedness, this is largest threat to area	
136	Water Shortage and Qua	Wildfires, Water Resources and Quality, Fire Resistant Building Materials, Food Supply and Quality, Emergency Preparedness. Then there is Workforce Housing and Early Childhood Care and Learning.	Improve reliability of communications systems ;Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Critical Facilities Protection ;Public Education/Awareness ;Water Conservation ;	When the disasters comes, the preparedness and the ability to act and rebuild fast are key to the community.	The first few things we are most likely going to have to deal with in our community are fire, water, and food. When this is needed we'll need shelter, then water and food.

137			Indoor/Outdoor Warning systems ;Generators for Critical Facilities ;Stormwater Drainage Improvements ;Education and Discounts on Flood Insurance ;Evacuation route development ;Critical Facilities Protection ;		
138	No	No	Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Generators for Critical Facilities ;Stream Restoration ;Water Conservation ;Floodprone Property Buyout ;	None	None
139	Broken sewer lines in town		Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Public Education/Awareness ;Water Conservation ;		
140			Wildfire Fuels Treatment projects (i.e. mechanical, prescribed burning, thinning, etc.);Continued Participation in the National Flood Insurance Program (NFIP). The NFIP is managed by FEMA and enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. ;Stormwater Drainage Improvements ;Water Conservation ;		

Overall Rating

ID	Please provide comments on the draft 2023 Archuleta County Hazard Mitigation Plan here:	Select affiliation (select	What jurisdiction do you	WSP Review and Suggested Change to Plan or Resp	Progess Notes
1	I certainly HOPE there is a plan for collecting hazardous waste, like we used to have.	Member of the Public	Unincorporated Archulet	Outisde of scope of this plan; no change	DONE
2	We are all told that Lithium Batteries that are found in most Mobile Phones, Laptop Computers and other electronic devices are Not supposed to be disposed of in Household Waste. They cause fires in the trash trucks and the landfill. But as far as I know, there is No Provision in Archuleta County to properly dispose of these materials. This issue should be addressed in this Hazard Mitigation Plan and the County should have a local disposal facility of some sort.	Member of the Public	Town of Pagosa Springs	Change to HMP: Concern for batterires potential ignition source will be noted in Wildfire section, and Hazardous Materials section.	DONE - wildfire section under "ignitions" in the hazard/problem section. -hazmat section under county landfill fires in past occurences
3	Thank you for this comprehensive update of our county's hazard mitigation plan. Here are my list of questions, concerns and additional information needed. 1.When will the county start an education and outreach to prepare for potential local disasters? 2.When will the town of Pagosa Springs have a wildfire protection plan? 3.What is the plan if Jackson Mountain (a hazard in the hazard plan) slides into the river, the river is dammed and then releases all the held water? The town will be under water? What is the plan for evacuation and restoration? 4.Is the resiliency planner someone who will help direct the work needed to be done for individual home owners once a disaster has passed and find and use local, state and federal relief funds? If not, who will? 5.Will the county pay to remove all the debris once a fire has swept through a subdivision so we can rebuild? 6.When will the Town of Pagosa Springs require that all who rent floating tubes for the river that they also have to rent life jackets so more people do not die in the river doing so? 7.Once a disaster has passed who in the county will lead the effort to secure federal funds to rebuild private homes etc./ 8.Our county does not seem to not have the staff needed to manage a disaster and the work that needs to be done afterwards. 9.If homeowners need to evacuate, and can camp - where will the county want us do so? Will water, trash and port-a-poddys be available? 10.Please email me the subdivision wildfire risk map that includes the Pagosa Vista subdivision to bevkresz1@gmail.com Beverly Compton 47 Brook Drive, Pagosa Springs	Member of the Public	Unincorporated Archulet	1 Addressed in Action AC-5 with annual implementation; 2. There is not a speific action for this but does the County and Town feel it is covered in the 2019 CWPP and in mitigation actions AC-11 and P-4 3. Concern for Jackson Mountain is documented in the plan and there has been a study specific to the East Fork Landslide which has a higher probability for a landslide dam. THere would likely be time to address this issue if it occurred to avoid catastrophic failure. No change in HMP. 4. No resiliency planner position exists but this is suggested already in the plan as a capability improvement. No change in HMP. 5. Suggest County prepare a response. No change to HMP. 6. Suggest the Town consider a response; no change to HMP. 7. Suggest County prepare a response. No change to HMP. 8. A resiliency planner is suggested alraedy in the plan as a capability improvement, along with other trainings and increasing public eduction and preparedness. No change to HMP. 9.Suggest County prepare a response. No change to HMP. 10. Suggest County prepare a response. No change to HMP.	1. DONE, 2. DONE 3. DONE 4. DONE, 5. DONE, 6. DONE, 7. DONE, 8. DONE, 9. DONE, 10. DONE
4	I'm writing to encourage more support for property owners to mitigate for wildland fire and to develop an emergency exit route. I read the plan, specifically AC-4, AC-18, PFPD 2 (2,4). The Loma Linda HOA has been trying to get some help and coordination with the Forest Service regarding mitigation creating fuel breaks surrounding the Loma Linda neighborhood. Individual residents participate in mitigation with HOA matching and WAP/Firewise matching for chipping when available. A larger effort in the forest surrounding the neighborhood is something the plan could facilitate. Another area of concern in our neighborhood is evacuation route (AC-4) as currently we have only one way in/out of our neighborhood. Previous efforts to work with neighboring Echo Canyon Ranch were reportedly hampered but there are new members on the HOA board who are optimistic that our communities can work together to develop an emergency exit route, especially if the County, WAP, USFS, NRCS could help facilitate. Thank you.	Member of the Public	Unincorporated Archulet	Will note this in summary of HMP public comments as "One comment expressed support for property owners to mitigate for wildland fire and to develop an emergency exit route, specifically some of the related mitigation actions in Section 5.3.2 (AC-4, AC-18, PFPD 2), and recommended partner organizations help coordinate efforts with homeowners associations."	DONE - under the 10-step planning process, planning step 2 involving the public; County OEM noted that traffic volume and evacuation planning will be addressed with a new software called Zonehaven that will be livein March 2023.
5	identifies others that are more political than real (e.g. 2 paragraphs on ecoterrorism at Wolf Creek over the potential condo development at the ski area p 197). Real threats have been identified by top law enforcement officials as white supremacists and in an Oct, 2022 report from the FBI identify the following 5 threat categories: Racially or ethnically motivated violet extremism Anti-Government or Anti-authority Violent Extremism Animal Rights/Environmental Extremism Abortion-related Violent Extremism All other domestic terrorism threats (e.g. related to religion, gender or sexual orientation) On the real threat side, increased probability of forest fires is mentioned but not the knock on effects of long term disruption of electrical supply to the Town and PAWSD. Do we have the backup generator capacity to keep all sewer pumps in our lift stations operating for instance? Does PAWSD have the capacity to continue to treat and pump water using backup power only for an extended period of time. To treat sewage using only backup power? Cyber attacks affecting the operating systems in town - water, sewer, electrical should be addressed. And in the category of low probability/high consequence event - an accident involving toxic chemicals/gasoline on Hwy 160 in the middle of town. A threat assessment would normally look at the traffic volume of such shipments by type/chemical and plan mitigation measures accordingly.	Government-Local	Town of Pagosa Springs	Recommend some edits to Chapter 4 Immnient Threat/Terrorism section including: 1. adding the suggested threat categories per FBI report; 2. noting the potential for power disruption in the Critical Facilities subsection, as well as in the same subsection in Cyber-attacks hazard vulnerability. 3. Regarding the final comment - I beleive this concern is noted in the People and Property subsections of Hazardou Materials Incident Vulnerability. We can note in the plan that a Hazardous Materials Commodity Flow study was suggested by a member of the public. .	1. DONE - in hazard/problem description, 2. DONE - in critical facilities in both sections, 3. The Hwy 160 comment is addressed in both people and property, 3. DONE - addressed under the 10-step planning process, planning step 2 involving the public

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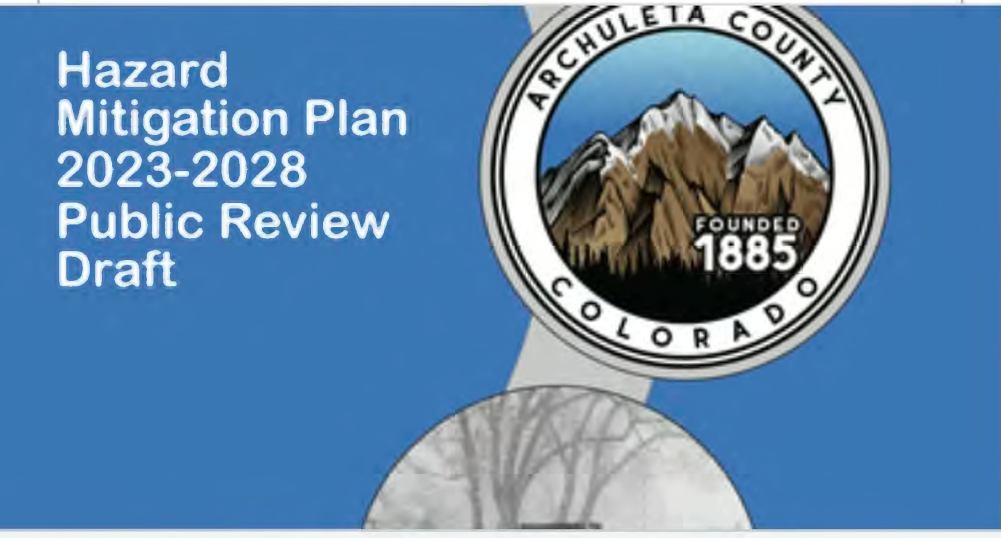

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Archuleta County has released the DRAFT version of the county's Hazard Mitigation Plan for public review. Click on the link to learn more about what the county is doing to minimize the impacts of floods, dam failures, wildfires, hazardous materials incidents and other hazards. There is also a link to the public comment form.

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Promo...

You can find this friendly fella at Yamaguchi Park. Learn more about the Town's Public Art Program online. LEARN MORE

Review the County's Hazard Mitigation Plan

A draft of the County's updated Hazard Mitigation Plan is available for public review and comment. Feedback will be accepted through Friday, February 17. LEARN MORE

UPCOMING EVENTS

Planning Commission Meeting

Tuesday, February 14 at 5:30 p.m.

Town Hall - 551 Hot Springs Blvd

AA mail.google.com

Archuleta County, CO Sheriff's Office
Feb 9 ·

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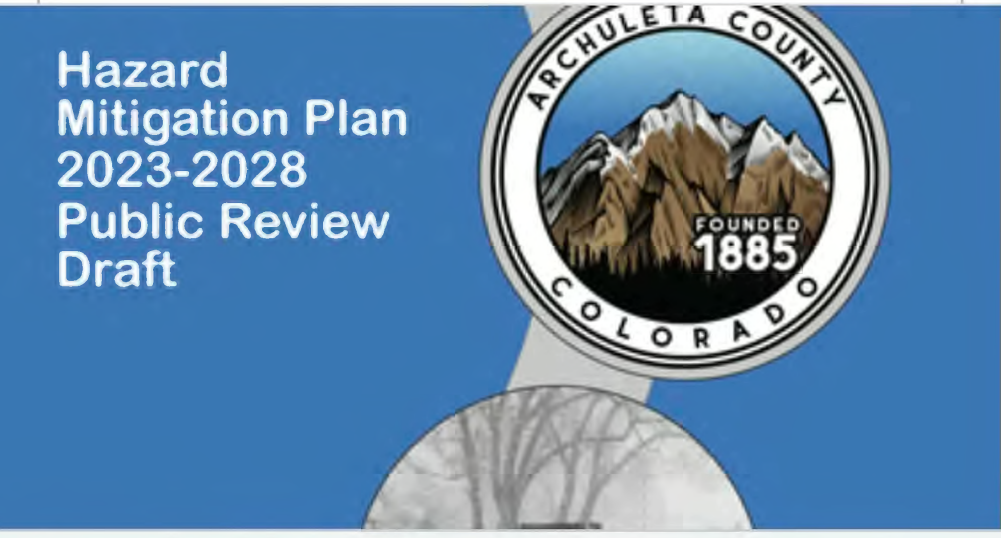

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APPENDIX E: PLAN ADOPTION AND APPROVAL

Note: This appendix provides documentation of the required record of adoption which will be incorporated when available. When the plan is adopted in 2023 a scanned version of the adoption resolutions will be inserted for each participating jurisdiction: Archuleta County, the City of Pagosa Springs, Pagosa Area Water and Sanitation District, and the Pagosa Area Fire Protection District. A sample adoption resolution is provided here. The final FEMA approval packed will be included for future reference regarding the five-year expiration date and suggestions for improvement in the next update.

Mitigation Plan Adoption Sample Resolution

Resolution # _____

Adopting the 2023 Archuleta County Hazard Mitigation Plan

Whereas, *(name of county or community) recognizes the threat that natural hazards pose to people and property within our community; and*

Whereas, *undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and*

Whereas, *an adopted Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and*

Whereas, *(name of county or community) resides within the Planning Area, and fully participated in the mitigation planning process to prepare this Hazard Mitigation Plan; and*

Now, therefore, be it resolved, *that the (name of board or council), hereby adopts the Archuleta County Multi-Hazard Mitigation Plan, as an official plan; and*

Be it further resolved, *(name of county or community) will submit this Adoption Resolution to the Colorado Division of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials to enable the Plan's final approval. While content related to the (name of county or community) may require revisions to meet the plan approval requirements, changes occurring after adoption will not require (name of county or community) to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions at or before the end of the next five year update cycle.*

*Passed: _____(date)_*

_____

Certifying Official

2000 S. Colorado Boulevard, Suite 2-1000
Denver, CO 80222