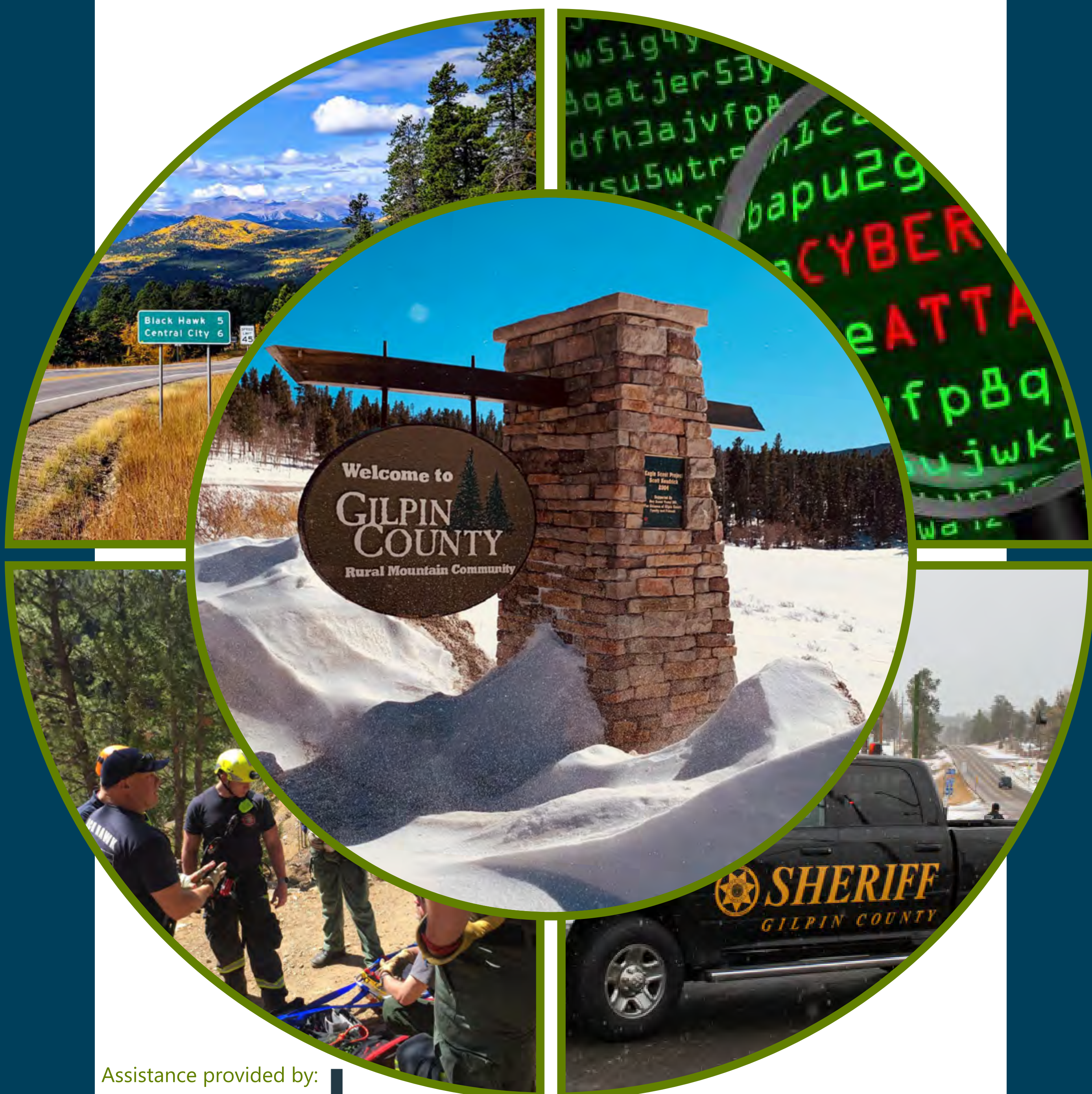
2023 Gilpin County Hazard Mitigation Plan



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1 Introduction

1.1 Executive Summary

The following jurisdictions have prepared and adopted this 2023 update to the Gilpin County Hazard Mitigation Plan (HMP):

- Gilpin County.
- City of Black Hawk.
- City of Central City.
- Timberline Fire Protection District.

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from disasters or hazardous events. Studies have found that hazard mitigation is extremely cost-effective, with every dollar spent on mitigation saving an average of $6 in avoided future losses. The Federal Emergency Management Agency (FEMA) requires that HMPs be updated every five years for the jurisdictions to be eligible for federal mitigation assistance. All sections of the 2016 Gilpin County HMP were reviewed and updated to address natural and human-caused hazards for the purpose of saving lives and reducing losses from future disasters or hazard events.

The 2023 Gilpin County HMP (also referred to as "Plan") will serve as a blueprint for coordinating and implementing hazard mitigation policies, programs, and projects in Gilpin County. It provides a list of mitigation goals and related actions that may assist the participating jurisdictions in reducing risk and preventing loss from future hazard events. The impacts of hazards can often be lessened or even avoided if appropriate actions are taken before events occur. By reducing exposure to known hazard risks, communities will save lives and property and minimize the social, economic, and environmental disruptions that commonly follow hazard events.

The goals of the 2023 Gilpin County HMP are:

- **Goal 1: Protection of people, property, and natural, cultural, and environmental resources.**
- **Goal 2: Increase awareness of natural hazards and their mitigation.**
- **Goal 3: Coordinate and integrate hazard mitigation activities.**

This Plan was also developed to maintain Gilpin County's and participating jurisdictions' eligibility for federal disaster assistance, specifically the FEMA Hazard Mitigation Assistance (HMA) grants including the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), and Building Resilient Infrastructure and Communities (BRIC) grant program, as well as the Rehabilitation of High Hazard Potential Dam (HHPD) grant program.

Chapter 1 contains the Plan Introduction and this Executive Summary.

Chapter 2 Community Profile describes the planning area, consisting of Gilpin County and the participating jurisdictions listed above, with updated information on demographics, social vulnerability, and changes in development. It includes an assessment of programs and policies currently in place across the County to reduce hazard impacts or that could be used to implement hazard mitigation activities, and identifies opportunities to enhance those capabilities.

Chapter 3 Planning Process describes the process followed to update the Plan. A broad range of public and private stakeholders, including agencies, local businesses, nonprofits, and other interested parties were invited to participate. Public input was sought throughout the planning process including online surveys and public review of the draft Plan.

Chapter 4 Hazard Identification and Risk Assessment identifies the natural and man-made hazards of greatest concern to the County and describes the risk from those hazards. The information generated through the risk assessment helps communities to prioritize and focus their efforts on those hazards of greatest concern and those assets or areas facing the greatest risk(s). The best available information on the impacts of changing weather conditions was taken into account for each hazard. The hazards profiled in the 2023 Plan are listed in Table 1-1.

Chapter 5 Mitigation Strategy describes what the County and jurisdictions will do to reduce their vulnerability to the hazards identified in Chapter 4. It presents the goals and objectives of the mitigation program and details a broad range of targeted mitigation actions to reduce losses from hazard events. The plan update identified 54 mitigation actions for implementation by individual planning partners.

Chapter 6 Plan Implementation and Maintenance details how the Plan will be implemented, monitored, evaluated, and updated, as well as how the mitigation program will be integrated into other planning mechanisms.

It is important that local decision-makers stay involved in mitigation planning to provide new ideas and insight for future updates to the Gilpin County HMP. As a long-term goal, the HMP and the mitigation strategies identified within will be fully integrated into daily decisions and routines of local government. This will continue to require dedication and hard work, and to this end, this Plan update continues efforts to further strengthen the resiliency of Gilpin County.

Table 1-1 Hazard Summaries

Avalanche	Risk	• There have been no recorded fatalities or injuries from avalanches in Gilpin County. • Backcountry recreationalists, road crews, and motorists are the most at risk to avalanche dangers. • Human-caused avalanches are most common cause of events.
Gilpin County	Low	
Black Hawk	Low	
Central City	Low	
Timberline Fire	Low	
Dam Failure	Risk	• Colorado has recorded over 130 dam failures since 1890, but none in Gilpin County. • While a dam failure is very low probability, a failure at Chase Gulch Dam could potentially impact 67 structures, including 34 residences, as well as 28 critical facilities in Black Hawk and along Hwy 119.
Gilpin County	Low	
Black Hawk	Low	
Central City	Low	
Timberline Fire	Low	
Dense Fog	Risk	• Dense fog in Gilpin County mostly occurs in the spring and fall months. • There have been no reported incidents causing death or injury in the county. • Transportation lifelines are the most vulnerable critical facility sector due to the risk for traffic incidents and road closures. • Emergency service response times can be impacted by dense fog.
Gilpin County	Medium	
Black Hawk	Low	
Central City	Low	
Timberline Fire	Medium	
Drought	Risk	• Drought vulnerability may increase as demand for water from different sectors increases and as the County plans for economic development around the use of water resources. • Climate change may result in an increase in the frequency and severity of drought which could lead to impacts to the recreation and tourism industry in the County.
Gilpin County	High	
Black Hawk	Low	
Central City	High	
Timberline Fire	Medium	
Earthquake	Risk	• A magnitude 6.3 or larger earthquake has a 1% probability of occurring each year somewhere in Colorado. • A damaging earthquake in Gilpin County is unlikely, but could cause millions of
Gilpin County	Low	
Black Hawk	Low	

Central City	Low	dollars in damages. • The cost of retrofitting buildings to meet earthquake standards may be cost-prohibitive, but low-cost measures can reduce property loss and prevent injury.
Timberline Fire	Low	
Erosion & Deposition		• Riverine erosion can reduce water quality and impact aquatic habitat as well as impacting private property and critical infrastructure. • Human activities greatly influence the rate and extent of erosion and deposition; impacts should be evaluated before proceeding with construction and related activities.
Gilpin County	Medium	
Black Hawk	Low	
Central City	Medium	
Timberline Fire	Medium	
Expansive Soils	Risk	• There is no record of significant damage from expansive soils in Gilpin County.
Gilpin County	Low	
Black Hawk	Low	
Central City	Low	
Timberline Fire	Low	
Extreme Heat	Risk	• Extreme heat events are unlikely throughout the County, and the magnitude of heat events is low.
Gilpin County	Medium	
Black Hawk	Low	
Central City	Low	
Timberline Fire	Medium	
Flood	Risk	• An estimated 123 people in the County are exposed to a 1% annual chance flood, along with 65 structures with an estimated $22.97 million in potential property losses. Most of the risk is in the City of Black Hawk. • Flooding can be exacerbated by other hazards such as wildfires, and may cause other hazards such as erosion and landslides. • Continued compliance with the National Flood Insurance Program (NFIP) and the promotion of flood insurance for private property owners should continue.
Gilpin County	Medium	
Black Hawk	Medium	
Central City	Medium	
Timberline Fire	Medium	
Hail	Risk	• Gilpin County averages 1 hailstorm per year. • The most common recorded hailstone size is 1"; the largest hailstone recorded in the County was 2". • There have been no reported injuries; most damages are covered by insurance.
Gilpin County	Low	
Black Hawk	Low	
Central City	Medium	
Timberline Fire	Low	
Landslide, Mud/Debris Flow, Rockfall		• Landslides, debris flows, and rockfalls do occur with some regularity in Gilpin County. The direct effect on the populace is low, but there is potential for severe injury or death from rockfall. • The secondary effect of closed roads is a more likely consequence. • 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.
Gilpin County	Low	
Black Hawk	Low	
Central City	Medium	
Timberline Fire	Low	
Lightning	Risk	• Lightning is a regular occurrence in Gilpin County, especially during the summer months. • There has been one reported injury from lightning since 1996, and no reported property damage. • Lightning strikes are a common cause of wildfires. • An estimated 136 residents in the County rely on electricity-dependent medical equipment to live independently, making them vulnerable to lightning that may cause power outages.
Gilpin County	High	
Black Hawk	Low	
Central City	Medium	
Timberline Fire	High	
Severe Wind	Risk	• Gilpin County experiences an average of 8 severe wind events per year. • Most severe wind events cause few injuries or damage, but since 1996 the County has seen 10 people injured and over $16M in damages; almost $14M of those
Gilpin County	High	
Black Hawk	High	

Central City Timberline Fire	High High	damages were from one storm in April 1999. • An estimated 136 residents in the County rely on electricity-dependent medical equipment to live independently, making them vulnerable to power outages that may result from severe windstorms.
Subsidence Gilpin County Black Hawk Central City Timberline Fire	Risk Low Medium Medium Low	• In Gilpin County the primary risk of land subsidence is from abandoned mines. Abandoned mine information is incomplete; there are likely to be hazardous areas in addition to known locations. • Some housing developments have had subsidence hazard investigations completed before development. This practice should be expanded. • Homeowners within an undermined area that were built before 1989 are eligible to participate in the Mine Subsidence Protection Program, a federal program operated by the Division of Minerals and Geology.
Tornado Gilpin County Black Hawk Central City Timberline Fire	Risk Low Low Low Low	• There have been no recorded tornadoes in Gilpin County since 1950. • All property is potentially vulnerable during tornado events, but mobile homes are disproportionately at risk due to the design of the homes. 2.4% of total housing in the County are mobile homes. • An estimated 136 residents in the County rely on electricity-dependent medical equipment to live independently, making them vulnerable to power outages that may result from tornadoes.
Wildfire Gilpin County Black Hawk Central City Timberline Fire	Risk High Medium High High	• There have been no large wildfire events (10+ acres) recorded in Gilpin County, but the risk remains high. • Roughly 8,000 Gilpin residents live in areas at risk from wildfires. • A total of 3,960 buildings are exposed to wildfire risk, with a total value of approximately $6.1 billion. • Both the natural and human-caused conditions that contribute to the wildland fire hazard are tending to exacerbate over time. • The continued migration of inhabitants to remote areas of the County increases the probability of human-caused ignitions from vehicles, grills, campfires, and electrical devices. • Revisions to Colorado Revised Statutes exempted properties divided into parcels of 35 acres or more from the statutory definition of a subdivision, restricting the County's ability to enforce County regulations and mitigation requirements. • Wildfires can also cause a range of secondary hazards, such as contamination of reservoirs, destabilized slopes and landslides, increased erosion, and flooding.
Winter Storm Gilpin County Black Hawk Central City Timberline Fire	Risk High High High High	• The County has experienced 646 severe winter weather events in the past 24 years. • Most winter storms have not resulted in reported damages, but those that do can be significant. • The most common impact is road closures, which can isolate residents and strand tourists and motorists.
Active Threat Gilpin County Black Hawk Central City Timberline Fire	Risk High High High High	• While the number of terrorist attacks on US soil has been declining since the 1970s, active shooter incidents have risen sharply in the last 20 years. • Businesses, schools, and open spaces are the most common locations of active shooter incidents. • Psychological effects of the incident on victims, responders, and the general public are in some cases more severe than the physical impacts and may last for years.

	Risk	
Cyber Attack	Risk	• Ransomware attacks on government servers have increased sharply in recent years. • The average successful ransomware attack costs $81 million and can take 287 days to recover from. • Cyberattacks against critical infrastructure are rare, but can have potentially devastating consequences.
Gilpin County	High	
Black Hawk	High	
Central City	High	
Timberline Fire	High	
Pandemic	Risk	• Pandemics affecting the US occur roughly once every 20 years but cannot be reliably predicted. • Effects on property are typically minimal, although quarantines could result in short-term closures. Critical facilities may have difficulty maintaining operations due to staffing shortages. • Lost productivity due to illness and potential business closures could potentially have severe economic impacts. Social distancing requirements and fear of public gatherings could significantly reduce in-person commerce. • Local economy was significantly impacted by social distancing and quarantine requirements during Covid-19. There is an increased vulnerability to the County with dependence on gaming industry and tourism.
Gilpin County	Medium	
Black Hawk	Medium	
Central City	Medium	
Timberline Fire	Medium	

1.2 Purpose

Hazard mitigation is defined as taking long- and short-term measures to alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. The responsibility for hazard mitigation lies with many, including private property owners; business and industry; and local, state, and federal government.

The Federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390) required state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Prior to 2000, federal disaster funding focused on disaster relief and recovery, with limited funding for hazard mitigation planning. The DMA increased the emphasis on planning for disasters before they occur.

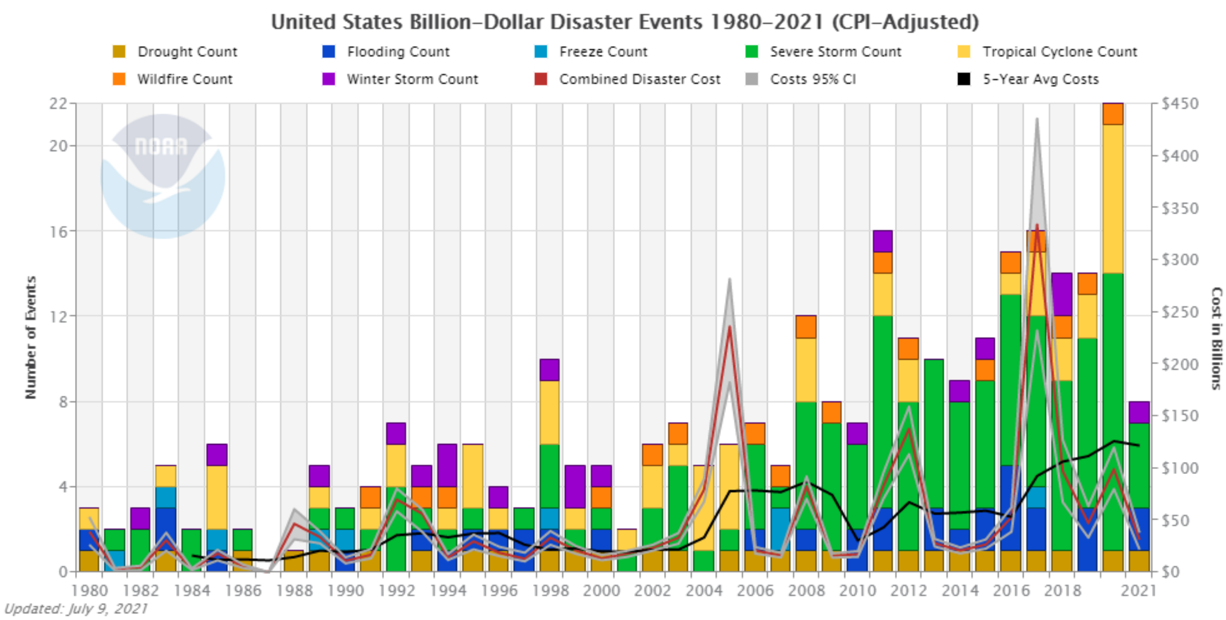
Gilpin County and the participating jurisdictions have prepared this multi-hazard mitigation plan to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision-makers direct mitigation activities and resources. The DMA encourages state and local authorities to work together on pre-disaster planning. It promotes "sustainable hazard mitigation," which includes the sound management of natural resources and the recognition that hazards and mitigation must be understood in the largest possible social and economic context. The planning network called for by the DMA helps local governments articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk reduction projects. This hazard mitigation plan was prepared for Gilpin County and the participating jurisdictions – Black Hawk, Central City, and the Timberline Fire Protection District – to reduce risks from natural disasters and to comply with the DMA.

All citizens and businesses of Gilpin County are the ultimate beneficiaries of this hazard mitigation plan. The plan reduces risk for those who live in, work in, and visit the County. It provides a viable planning framework for all foreseeable natural hazards that may impact the County. Participation in development of the plan by key stakeholders in the County helps ensure that outcomes will be mutually beneficial. The resources and background information in the plan are applicable countywide, and the plan's goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships.

1.3 Background and Scope

Each year in the United States, disasters take the lives of hundreds of people, injure thousands more, and do extensive damage to public and private property. 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, 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, 1980-2021



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

	ADOPT CODE	ABOVE CODE	BUILDING RETROFIT	LIFELINE RETROFIT	FEDERAL GRANTS
Overall Benefit-Cost Ratio	11:1	4:1	4:1	4:1	6:1
Cost ($ billion)	$1/year	$4/year	$520	$0.6	$27
Benefit ($ billion)	$13/year	$16/year	$2200	$2.5	$160
Riverine Flood	6:1	5:1	6:1	8:1	7:1
Hurricane Surge	not applicable	7:1	not applicable	not applicable	not applicable
Wind	10:1	5:1	6:1	7:1	5:1
Earthquake	12:1	4:1	13:1	3:1	3:1
Wildland-Urban Interface Fire	not applicable	4:1	2:1	not applicable	3:1

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

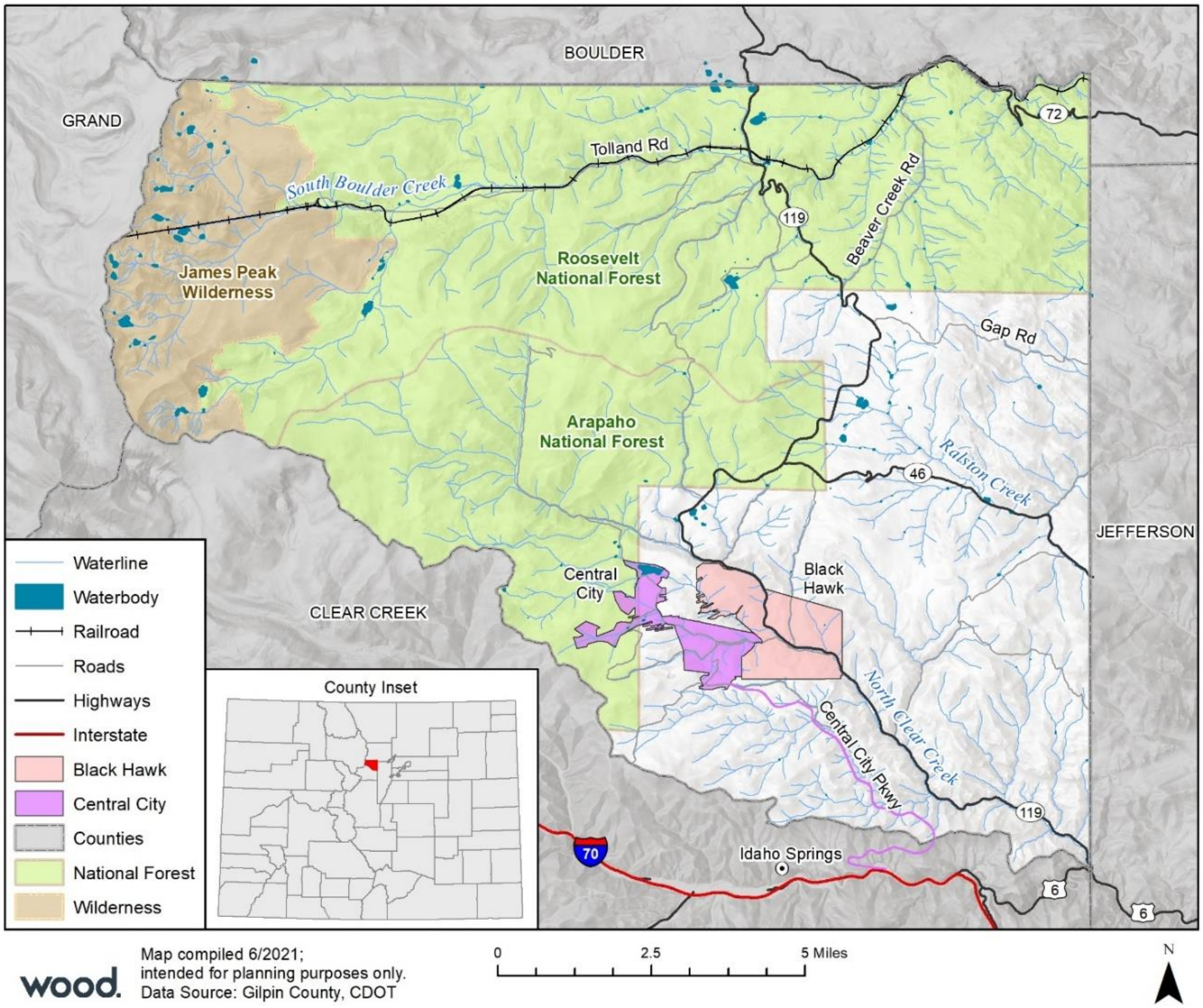
This Plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390, also known as the DMA) and its implementing regulations, which establish the requirements local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain 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 Gilpin County, starting with participation in the 2011 Denver Regional Council of Governments (DRCOG) HMP. Gilpin County developed its first stand-alone HMP in 2016, and has updated it for 2023. This Plan is a comprehensive update to the 2016 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 Gilpin County planning area is committed to reducing future disaster impacts and maintaining eligibility for federal funding.

2 Community Profile

Gilpin County covers approximately 150 square miles in north central Colorado. Gilpin County was formed in 1861 when Colorado was still a territory and is the second smallest county in Colorado. The County was named after Colonel William Gilpin, the first Governor of the Territory of Colorado.

Figure 2-1 Gilpin County and Participating Communities



Gilpin County is surrounded by Jefferson County to the east, Boulder County to the north, Grand County to the west, and Clear Creek County to the south. National protected areas within the County include Arapaho-Roosevelt National Forest, James Peak Wilderness, Golden Gate Canyon State Park, and portions of Bureau of Land Management lands. The County encompasses the mountain communities of Central City, Black Hawk, Nevadaville, Rollinsville, and Russel Gulch.

Gilpin County has a history of mining, mostly of gold. Tourist attractions include casinos at Black Hawk and Central City, camping at Golden Gate Canyon State Park and other outdoor activities such as biking and fishing.

According to the 2020 Census, Gilpin County has a population of 5,808; the County ranks 48th out of Colorado's 64 counties by population. Approximately 84% of the population (4,902), live in unincorporated areas of the County. There are two incorporated communities in Gilpin County: Central City and Black Hawk. Central City is the largest incorporated community with a 2020 population of 779 and is the County seat. The smaller City of Black Hawk had a 2020 population of 127 residents. Both cities draw significant tourist populations, with an estimated 40,000-70,000 people per day visiting the two cities.

A small portion of the jurisdictional limits of Central City, which includes the Central City Parkway, extends into adjacent Clear Creek County connecting with Interstate 70. Other major transportation routes in the County include State Highway 119 and State Highway 46.

2.1 Historical Overview

Gilpin County was founded when gold was discovered in a gulch near Central City in 1859. Within two weeks of gold being discovered, the population of Central City grew to 10,000. Soon after, Central City was the leading mining center in Colorado. It became known as "The Richest Square Mile on Earth". In 1874, a fire destroyed most of the buildings in town. They were later rebuilt and most still stand today.

The grand opening of the Opera House in 1878 started a tradition of community theater, ranging from opera to vaudeville. Buffalo Bill performed there as well at P. T. Barnum's circus. Over the years there have been many famous people who visited Central City. Many movies have been filmed here, including "The Duchess and the Dirtwater Fox", and portions of the TV mini-series "Centennial" and "Dream West", as well as several Perry Mason episodes. Cowboy Tom Mix filmed several movies here also.

Marie Curie used pitchblende mined in an area south of the Glory Hole mine for her radium studies in Paris. Public health practitioner Dr. Florence Sabin lived in the mining camp and was the first female physician to graduate from John Hopkins University. Baby Doe Tabor, wife of the silver magnate Horace Tabor, once lived in Central City and Black Hawk.

Black Hawk and Central City are adjacent to each other and located in the southern portion of Gilpin County. Black Hawk is located along the north fork of Clear Creek and Gregory Gulch. Black Hawk and Central City were both established in 1859. Black Hawk and Central City form the federally designated Central City/Black Hawk Historic District.

In May 1859, the discovery of gold in Gregory Gulch by its namesake, John H. Gregory, brought thousands of prospectors and miners into the area, combing the hills for more gold veins. The Bobtail lode was discovered the following month. Hardrock mining boomed for a few years, but then declined in the mid-1860s as the miners exhausted the shallow parts of the veins that contained free gold and found that their amalgamation mills could not recover gold from the deeper sulfide ores.

Nathaniel P. Hill built Colorado's first successful ore smelter in Black Hawk in 1868. Hill's smelter could recover gold from the sulfide ores, an achievement that saved hardrock mining in Black Hawk, Central City, and Idaho Springs from ruin. Other smelters were built nearby. Black Hawk's advantageous location on North Clear Creek made it the center of ore processing for the area, and it became known as the "City of Mills."

The population of Central City and Black Hawk fell to a few hundred by the 1950s. Casino gambling was introduced in both towns in the early 1990s. Black Hawk now has 18 casinos and Central City currently has six casinos. Ease of access from Interstate 70 has fueled this boom. Tax from the gambling revenue provides funding for the State Historical Fund, administered by the Colorado Office of Archaeology and Historic Preservation.

2.2 Climate

Being located in the Rocky Mountains, weather can vary significantly throughout the County. Gilpin County average temperature is 38.98 degrees Fahrenheit (°F). In summer, the day temperature typically ranges from 60 to 80 °F with an average of 245 days of sunshine. In winter, the day temperature typically ranges from 20 to 45 °F with an average annual snowfall ranging from 77 inches in lower lying areas to 124 inches in areas of higher elevation. Table 2-1 contains temperature summaries for the City of Black Hawk which were carried over from the 2016 Gilpin County HMP due to a lack of more current climate data.

Table 2-2 below was also included to summarize temperature data for nearby Georgetown, Colorado in adjacent Clear Creek County. Figure 6-2 graphs the monthly temperature averages and extremes. The record high temperature in Black Hawk was 90°F, recorded on June 26, 1994. The record low temperature was -30°F, recorded on February 5, 1982. In general, temperatures are lower in areas of the County at higher elevations.

Table 2-1 Gilpin County Temperature Summary

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Record High Temperature	58	58	65	76	82	90	89	88	84	77	67	58
Average Max. Temperature	35	37	44	51	61	71	76	73	66	55	42	34
Average Min. Temperature	10	10	17	24	32	38	44	43	35	26	17	10
Record Low Temperature	-23	-30	-22	-10	3	20	27	25	7	-5	-18	-27

All Temperatures are reported in degrees Fahrenheit
Source: The Weather Channel (weather.com) for Black Hawk, CO

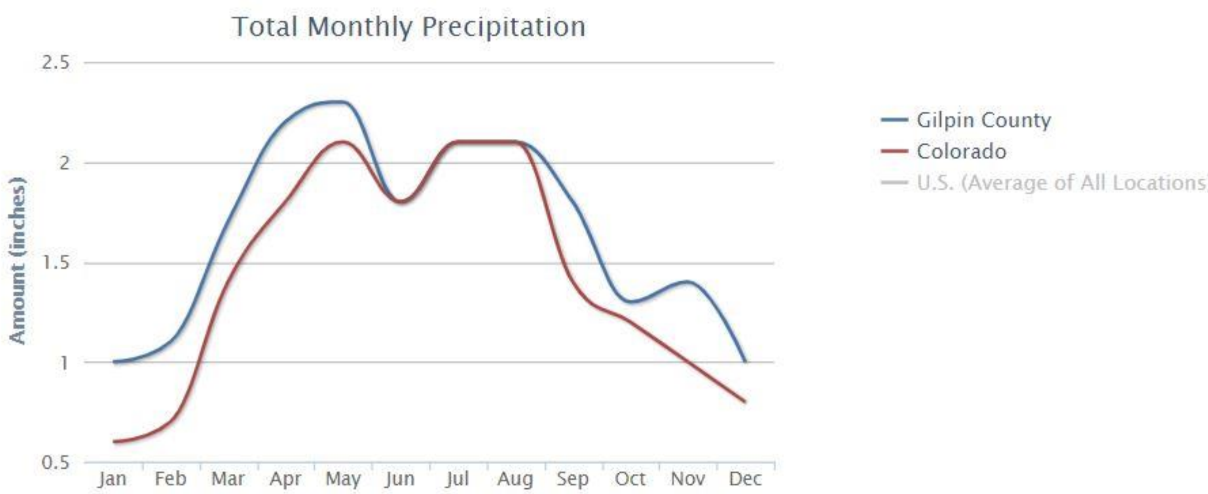
Table 2-2 Temperature Summary for Georgetown Station

Period of record	1893-2020
Winter[a] Average Minimum Temperature	15.9°F
Winter[a] Mean Temperature	26.5°F
Summer[a] Average Maximum Temperature	75.1°F
Summer[a] Mean Temperature	60.5°F
Maximum Temperature	92°F; June 23, 1954
Minimum Temperature	-28°F; January 4, 1972
Average Annual Number of Days >90°F	0.2
Average Annual Number of Days <32°F	87.2

a. Winter: December, January, February; Summer: June, July, August
°F degrees Fahrenheit
Source: High Plains Regional Climate Center (https://hprcc.unl.edu/stationtool/index.php)

The average annual precipitation in Gilpin County is 20.7 inches, and is highest during May averaging 2.3 inches. Figure 2-2 shows the average monthly precipitation in Gilpin County. Severe thunderstorms occur mostly in the summer, contributing a significant portion of the County's precipitation. Based on information from NOAA, Colorado receives an average of 520,833 cloud-to-ground lightning strikes per year.

Figure 2-2 Annual Monthly Precipitation, Gilpin County



Source: USA. Com database, http://www.usa.com/gilpin-county-co-weather.htm

2.3 Land Use and Geology

71% of Gilpin County (68,278 acres) is forested, followed by 19% shrubland (18,272 acres) and 7% grassland (6,732 acres). Only 1% of the County (962 acres) is urbanized. Federal lands (USFS, BLM) make up 44.6% of the County (42,887 acres), with state lands making up another 10% (9,672 acres). 4.1% of the County (3,908 acres) is farmland.

Mining districts can be found throughout Gilpin County because it is the second highest gold producing county in Colorado. The geology in Gilpin County includes Precambrian bedrock of the Idaho Springs Formation cut by Boulder Creek Granite with Tertiary intrusions of quartz monzonite and bentonite porphyries. Fissure fillings include pyritic gold. The most remarkable ore deposit in the area is in the Evergreen Mine which mined copper. Chalcopyrite and barite were the copper ore minerals and were found in adjacent to monzonite porphyry dikes.

2.4 Demographics

Information on current and historic population levels and future population projections is needed for making informed decisions about future planning. Population directly relates to land needs such as housing, industry, stores, public facilities and services, and transportation. Population changes are useful socio- economic indicators, as a growing population generally indicates a growing economy, and a decreasing population signifies economic decline.

The 2020 US Census estimated the Gilpin County population at 5,808. Table 2-3 shows planning area population data from 1990 through 2020. The total Gilpin County population increased 26.4% from 1990 to 2000 and increased by 38.9% from 2000 to 2020.

Large numbers of tourists visit Gilpin County each year to recreate in natural areas and visit the casinos in Black Hawk and Central City. It is estimated that between 100,000 and 150,000 tourists visit the two cities on any given weekend. The Colorado State Patrol estimated nearly 2 million vehicles visiting Black Hawk and Central City in 2021.

Table 2-3 Gilpin County Population

	Total Population			
	1990	2000	2010	2020
City of Black Hawk	227	118	118	127
City of Central City	336	517	669	779
Unincorporated Areas[1]	2,515	3,378	3,036	4,902
County Total	**3,078**	**4,181**	**4,681**	**5,808**

Source: United States Census Bureau; Colorado State Demographer, 2020
[1]Includes Non-participating Communities

84% of County residents live in unincorporated areas of the County. While this population experienced slight decline (-10.1%) between 2000-2010, it has increased over the past decade by 61.5%.

Select US Census demographic and social characteristics for Gilpin County are shown in Table 2-4.

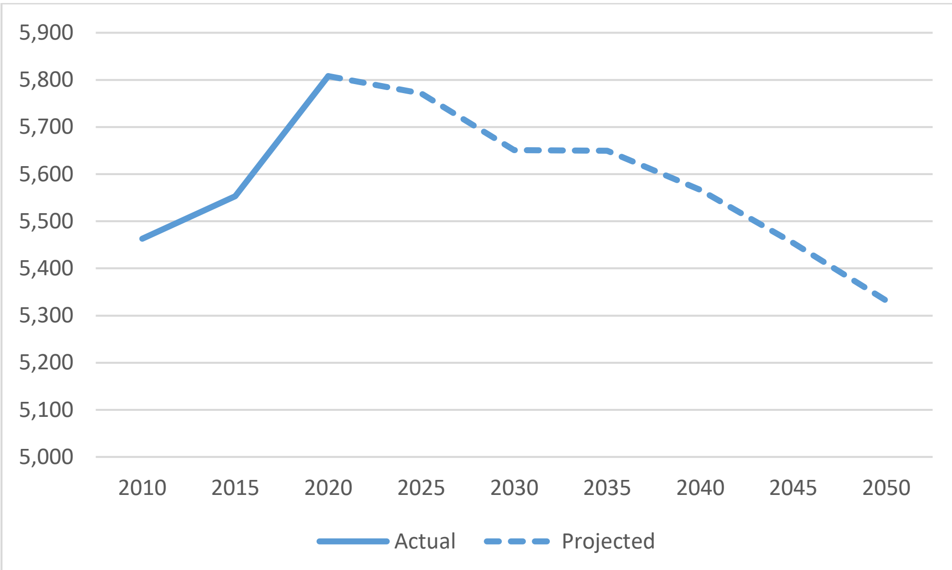
Table 2-4 Gilpin County Demographic and Social Characteristics (2020)

	Gilpin County	City of Black Hawk	City of Central City
Gender/Age (% of Total Population)			
Male	50.6%	57.3%	46.4%
Female	49.4%	42.7%	53.6%
Under 5 years	2.4%	4.5%	4.8%
65 years and over	17.9%	15.5%	19.9%
Race/Ethnicity (% of Total Population)			
White	85.3%	73.2%	75.4%
American Indian/Alaska Native	0.6%	0.0%	0.9%
Asian/Pacific Islander	1.5%	1.1%	5.6%
Black or African American	0.6%	1.6%	1.7%
Two or More Races	4.9%	5.5%	6.8%
Hispanic or Latino (of any race)[1]	6.5%	15.7%	9.5%
Education (% of Total Population, 25+ years)			
High school graduate or higher	98.5%	85.0%	97.3%

Source: US Census Bureau, 2015-2019 5-Year American Community Survey, https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2019/; Colorado State Demographer
[1]The US Census Bureau considers the Hispanic/Latino designation an ethnicity, not a race. The population self-identified as "Hispanic/Latino" is also represented within the categories in the "Race" demographic.

Figure 2-3 shows 5-year population changes in Gilpin County from 2000 to 2020, as well as forecasted growth through the year 2050. The Colorado State Demography Office expects Gilpin County to lose approximately 500 residents (8% of current population) over the next 30 years. This may be offset to some extent by recently increased development in unincorporated areas.

Figure 2-3 Gilpin County Population 2000-2050



Source: Colorado State Demography Office, 2021

2.5 Social Vulnerability

Local vulnerability to disasters depends on more than the relationship between a place and its exposure to hazards. Social and economic factors – including race, age, income, renter status, or institutionalized living – directly affect a community's ability to prepare for, respond to, and recover from hazards and disasters. The concept of social vulnerability helps explain why communities often experience a hazard event differently, even when they experience the same degree of physical impacts or property loss.

The term vulnerability should be used to describe the communities more vulnerable to a risk or hazard, such as high vulnerability due to wildfires or floods based upon geography, topography, hydrology, or weather. Referencing people themselves directly with the term vulnerability causes individual community members to be seen with a deficit lens, leaving the impression that the vulnerability is a result of the lack of responsibility and/or adequate planning of the individual. Instead, vulnerability only occurs when the system that the individual is part of fails to provide equitable accessibility to resources or services, known as access and functional needs, for the individual to survive, respond to, and recover from an event. Barriers that may be exacerbated by certain social and economic factors – including race, age, income, renter status, or institutionalized living – directly affect a community's ability to prepare for, respond to, and recover from hazards and disasters.

This social vulnerability assessment is designed to improve local decision making, hazard prioritization, and emergency management activities. By incorporating social vulnerability into the risk assessments of individual hazards, local communities can identify more vulnerable areas and tailor their mitigation actions to accommodate all members of their community, including the most sensitive groups.

The Centers for Disease Control and Prevention (CDC) have developed a social vulnerability index (SVI) as a way to measure the resilience of communities when confronted by external stresses such as natural or human-caused disasters or disease outbreaks. The SVI is broken down at the census tract level and provides insight into particularly vulnerable populations to assist emergency planners and public health officials identify communities more likely to require additional support before, during, and after a hazardous event. The SVI looks at 15 factors, which are aggregated into four main themes: socioeconomic status, household composition & disability, minority status & language, and housing & transportation. Table 2-5 shows countywide estimates for those four themes and 15 factors, along with relative rankings showing how Gilpin County compares to other counties in Colorado and nationally. The rankings show the percentage of counties that Gilpin County is more vulnerable than, i.e. – high numbers are worse.

Table 2-5 Gilpin County Social Vulnerability Characteristics

Theme	Variable	Rank Compared to Colorado Counties	Rank Compared to US Counties	Vulnerability
Socioeconomic status		**0%**	**0%**	**Low**
	Below poverty	2%	0%	Low
	Unemployment	10%	7%	Low
	Income	3%	1%	Low
	No high school diploma	5%	0%	Low
Household composition and disability		**2%**	**0%**	**Low**
	Age 65 or older	30%	18%	Low
	Age 17 or younger	16%	3%	Low
	Disability	19%	3%	Low
	Single-parent households	0%	1%	Low
Minority status and language		**14%**	**28%**	**Below Average**
	Minority	22%	44%	Below Average
	Speaking English "less than well"	6%	15%	Low
Housing and transportation		**19%**	**15%**	**Low**
	Multi-unit structures	57%	73%	Above Average
	Mobile homes	10%	9%	Low
	Crowding	8%	10%	Low
	No vehicle	52%	32%	Below Average
	Group quarters	48%	44%	Below Average
Overall Social Vulnerability		**2%**	**0%**	**Low**

Source: US Centers for Disease Control and Prevention, *https://www.atsdr.cdc.gov/placeandhealth/svi/index.html*

The data shows that Gilpin County's social vulnerability is very low overall compared to both the State and the Nation; overall Gilpin County has the 2nd lowest social vulnerability of any Colorado county. The County has relatively higher levels of vulnerability in the following categories:

- Multi-unit housing (defined as more than ten units per structure), which can be more difficult to evacuate during emergencies.
- Percentage of people over the age of 65, who may be more affected by disasters.
- Percentage of racial minority populations, who have historically been hardest hit by disasters and may have less access to resources.
- Percentage of population living in "group quarters," whose occupants are less likely to be able to respond effectively to disaster.

- Percentage of households without a vehicle, which makes accessing resources and evacuating difficult.

It should be noted that even though the County may have relatively few people in a category compared to other counties, there are still people in that category who may be disproportionately impacted by disasters and may need extra consideration or assistance.

The CDC tracks SVI by census tract. Due to low population density, there is only one designated census tract in Gilpin County. Because of this, it is not possible to break down how social vulnerability varies across the County. Some categories may be assumed to be higher in the incorporated cities, such as multi-unit structures and group quarters.

Additional information on the CDC's SVI can be found at https://svi.cdc.gov.

Another social vulnerability not captured in the CDC data is the lack of broadband service in certain areas of the County. The lack of broadband services, or in some cases high speed internet services, can make it challenging to inform people in these areas of emergency situations or community outreach related to hazards in general.

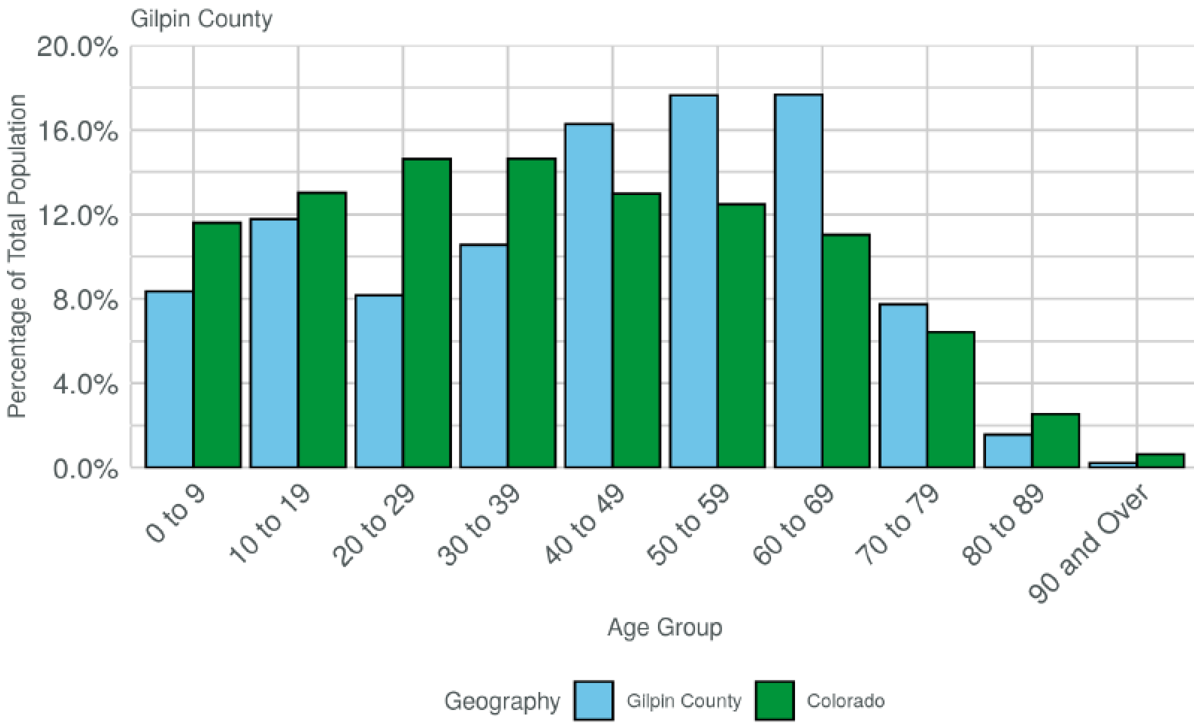
2.5.1 Age Distribution

As a group, the elderly are more apt to lack the physical and economic resources necessary for response to hazard events and are more likely to suffer health-related consequences, making recovery slower. They are more likely to be vision, hearing, or mobility impaired, and more likely to experience mental impairment or dementia. Additionally, the elderly are more likely to live in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators. These facilities are typically identified as critical facilities by emergency managers because they require extra notice to implement evacuation. Elderly residents living in their own homes may have more difficulty evacuating their homes and could be stranded in dangerous situations. This population group is more likely to need special medical attention, which may not be readily available during natural disasters due to isolation caused by the event. Specific planning attention for the elderly is an important consideration given the current aging of the national population.

Children under 14 are also vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from hazards.

The overall age distribution for the planning area is illustrated in Figure 2-4. Based on US Census data estimates, 17.9% of the planning area's population is 65 or older. US Census data does not provide information regarding disabilities specifically in the planning area's over-65 population. Overall, 9.6% of the County's population has a disability. US Census estimates for 2019 indicate that 4.9% of Gilpin County lives below the poverty line.

Figure 2-4 Gilpin County Age Distribution - 2019



Source: State Demography Office, 2021

2.5.2 Disabled Populations

The 2019 US Census American Community Survey (ACS) estimates indicated that there are approximately 40 million non-institutionalized Americans living with disabilities. This equates to about 12.6% of the total civilian non-institutionalized population. People with disabilities are more likely to have difficulty responding to a hazard event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of the population with a disability will allow emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs. According to the 2019 American Community Survey 5-year Estimates, 9.6% of the population in the planning area lives with some form of disability.

2.5.3 Ethnic Population

Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during a disaster event. Post-disaster recovery can be less effective for ethnic populations and is often characterized by cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability. According to the US Census, the ethnic composition of the planning area is predominantly white, at about 91.6%. The largest minority population is Hispanic or Latino at 8.4%.

According to the 2019 ACS 5-year estimates, the planning area has a 4.5% foreign-born population. Other than English, the most commonly spoken language in the planning area is Spanish. The census estimates 1.2% of the residents speak English “less than very well.”

2.6 Economy

Select 2019 economic characteristics estimated for Gilpin County by the US Census Bureau are shown in Table 2-6.

Table 2-6 Gilpin County Select Economic Characteristics

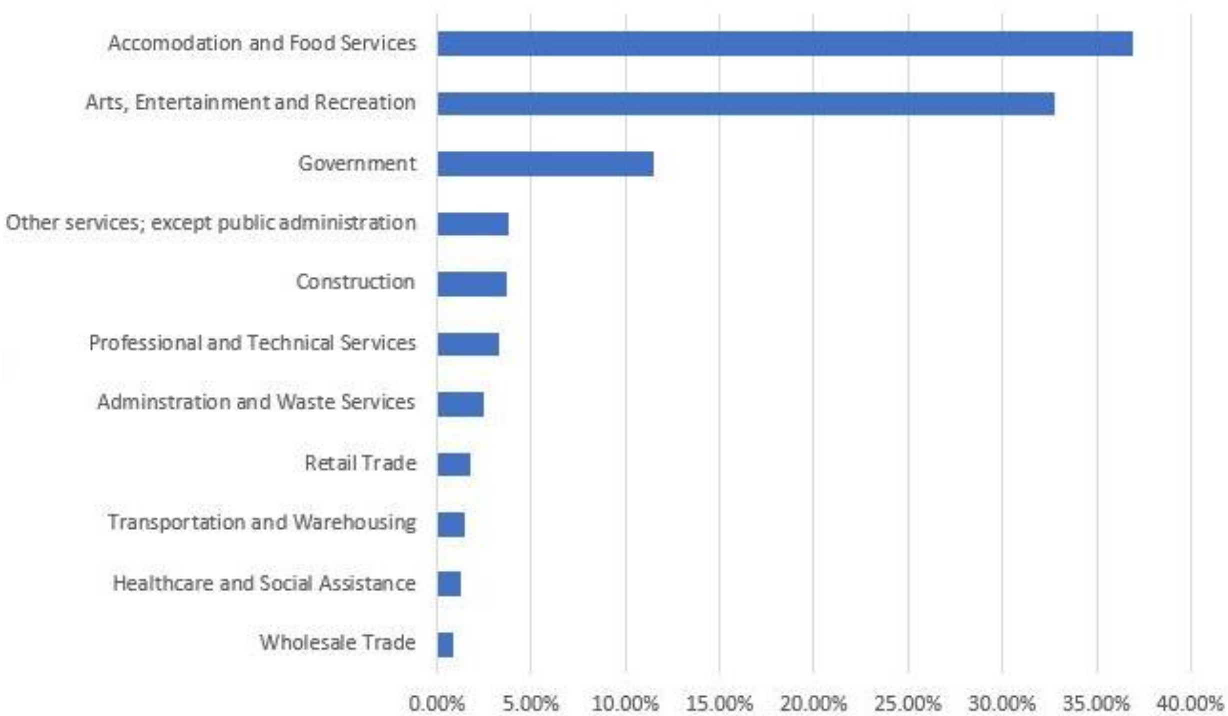
	Gilpin County	City of Black Hawk	City of Central City
Families Below Poverty Level	2.3%	36.7%	0.0%
Individuals Below Poverty Level	4.9%	25.5%	4.3%
Median Home Value	$353,400	$242,300	$291,700
Median Household Income	$76,429	N/A	$52,580
Per Capita Income	$49,641	$26,111	$35,280
Population >16 Years Old in Labor Force	73.9%	70%	73%
Population Employed	72.7%	70%	69.2%

Source: US Census Bureau, ACS 5-Year Estimates 2014-2019

2.6.1 Occupations and Industries

According to the State Demography Office, in 2019 the County's economy is largely based in the accommodation and food services (36.9%), arts, entertainment, and recreation (32.8%), and government (11.5%) industry sectors. Figure 2-5 shows the distribution of industry types in Gilpin County, based on the share of total employment.

Figure 2-5 Percent of Total Employment by Industry in Gilpin County



Source: Colorado Department of Local Affairs, State Demography Office, 2019 Community Demographic Profiles

2.7 Housing

In the United States, individual households are expected to use private resources to prepare for, respond to, and recover from disasters to some extent. This means that households living in poverty are automatically disadvantaged when confronting hazards. Additionally, poorer residents typically occupy more poorly built and inadequately maintained housing. Mobile or modular homes, for example, are more susceptible to damage in earthquakes and floods than other types of housing. Mobile homes represent 2.4% of the total housing stock in Gilpin County.

Table 2-7 shows select housing characteristics from the ACS five-year estimates for 2019 for the planning area. The number of total housing units in the County has increased by 4% since 2015; however, Black Hawk and Central City have lost 17% and 10% of their housing units during the same time period, reflecting a shift to more development in the unincorporated County. Additionally, the County has seen an increase in properties being used for short term rentals, which may introduce more vulnerable populations to the County in the form of tourists who are unfamiliar with the area and its hazards.

Table 2-7 Gilpin County Select Housing Characteristics

	Gilpin County	City of Black Hawk	City of Central City
Total Housing Units	3,799	62	533
# Occupied Housing Units	2,802	53	435
Vacancy Rate	26.2%	14.5%	18.4%
% Owner-Occupied	79.6%	41.5%	33.1%
% Renter-Occupied	20.4%	58.5%	66.9%
Average # of Persons per Household	1.99	2.02	1.59
% of Rental Households paying 35% or more of income on housing	39.0%	32.3%	31.6%

Source: US Census Bureau, ACS 5-Year Estimates 2014-2019

2.8 Changes in Development

The County has experienced significant growth over the past 10 years, as described in Sections 2.4 and 2.7. The City of Black Hawk annexed 220 acres into the city in 2020. However, as shown in Figure 2-3 the County is expected to lose population over the next 10-30 years.

The municipal planning partners have adopted plans that govern land use decision and policy making in their jurisdictions. Decisions on land use will be governed by these programs. This plan will work together with these programs to support wise land use in the future by providing vital information on the risk associated with natural hazards in the planning area.

It is the goal that all municipal planning partners will incorporate this hazard mitigation plan update in their comprehensive plans (if applicable) by reference. This will help ensure that future development trends can be established with the benefits of the information on risk and vulnerability to natural hazards identified in this plan.

2.9 Government

2.9.1 Gilpin County

The Gilpin County government is made up of the following offices and departments:

- Assessor/Property Records,
- Clerk and Recorder,
- Community Development,
- County Commissioners,
- County Coroner,
- County Manager,
- Colorado State University (CSU) Extension,
- Office of Emergency Management,
- Finance,
- Gilpin/Jefferson County District Attorney,
- Human Resources,
- Human Services,
- Library,
- Maintenance,
- Parks & Recreation,
- Public Health,
- Public Works,
- Sheriff's Office,
- Treasurer, and
- Veteran Services.

2.9.2 City of Black Hawk

The City of Black Hawk is governed by a Mayor, City Manager, and City Council and includes the following departments:

- Administration,
- City Clerk,
- City Manager,
- Community Planning & Development,
- Finance Department,
- Fire Department,
- Municipal Court,
- Police Department,
- Public Works,
- Risk Management, and
- Water Department.

2.9.3 City of Central City

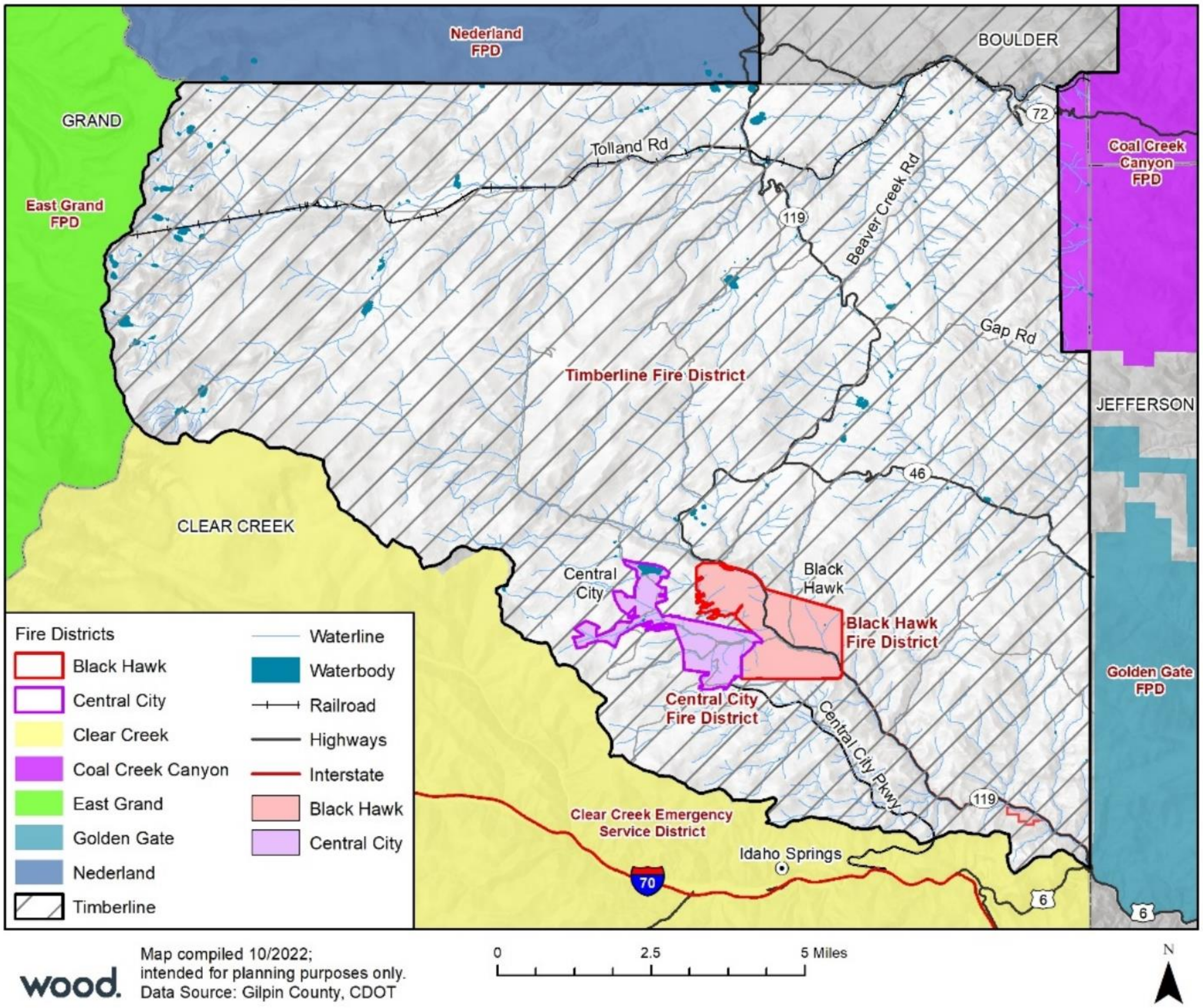
The City of Central City is governed by a Mayor, City Manager, and City Council and is made up of the following offices and departments:

- Executive Department,
- Finance/Human Resources,
- Community Development,
- Public Works/ADA Coordinator,
- Law Enforcement,
- Water, and
- Fire.

2.9.4 Timberline Fire Protection District

The Timberline Fire Protection District spans both Gilpin and Boulder Counties. The District spans the Peak to Peak Scenic Byway (Highway 119) between the gaming destination cities of Black Hawk/Central City and Nederland. The District is a rural area covering approximately 173 square miles with an estimated population of 5,500 residents. The District has nine stations with more than 21 pieces of apparatus and more than 50 volunteer firefighters. The District currently employs a full-time Fire Chief, Administrative Chief, Recruitment and Retention/Training Chief, Maintenance Captain, three Shift Lieutenants, and two Firefighters. Emergency water supplies in the Timberline Fire Protection District are primarily static sources such as cisterns and draft sites that access ponds, lakes, or creeks.

Figure 2-6 Timberline Fire District



2.10 Capability 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.

2.10.1 Legal and Regulatory 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 Gilpin County.

Table 2-8 Gilpin County Regulatory Mitigation Capabilities Matrix

Plan or Regulatory Tool	Gilpin County	City of Black Hawk	City of Central City	Timberline FPD
Comprehensive/master plan	Yes	Yes	Yes	In Progress
Zoning ordinance	Yes	Yes	Yes	NA
Subdivision ordinance	No	Yes	Yes	NA

Plan or Regulatory Tool	Gilpin County	City of Black Hawk	City of Central City	Timberline FPD
Growth management ordinance	No	Yes	Yes	NA
Floodplain ordinance	Yes	Yes	Yes	NA
Other special purpose ordinance (stormwater, steep slope, wildfire)	No	Yes	Yes	NA
Building code	Yes (IBC/IRC 2015)	Yes (IBC 2012)	Yes (IBC 2015)	NA
BCEGS Rating (1-10)	No	No	No	NA
Fire Department ISO Rating	5 (Timberline FPD)	3	6	5
Erosion or sediment control program	No	No	Yes	NA
Stormwater management	No	Yes (Black Hawk/Central City Sanitation District)	Yes (Black Hawk/Central City Sanitation District)	NA
Site plan review requirements	Yes	Yes	Yes	NA
Capital improvement plan	Yes	No	Yes	No
Economic development plan	No	Yes	Yes	NA
Local Emergency Operations Plan	Yes	Yes	Yes	No
Floodplain Management Plan	No	No	No	NA
Community Wildfire Protection Plan (CWPP)	Yes (2012)	Yes (2012)	Yes (2012)	Yes (2012)
Other special plans	Yes	No	No	No
National Flood Insurance Program (NFIP)	Yes (1986)	Yes (1984)	Yes (2010)	NA
Community Rating System (CRS)	No	No	No	NA
Flood insurance study or other engineering study for streams	Yes (2022)	Yes	Yes	NA
Elevation certificates	Yes	No	Yes	NA

The Gilpin County Community Wildfire Protection Plan (CWPP) was last updated in 2013 and is slated to be updated in 2022-2023.

2.10.2 Administrative and Technical Capabilities

Table 2-9 identifies the County personnel responsible for activities related to mitigation and loss prevention in Gilpin County.

Table 2-9 Gilpin County Administrative/Technical Mitigation Capabilities Matrix

Administrative/Technical Resources	Gilpin County	City of Black Hawk	City of Central City	Timberline FPD
Planner/engineer with knowledge of land development/land management practices	No	Yes	Yes	NA
Planner/engineer/scientist with an understanding of natural hazards	Yes*	No	No	No
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No	Yes	Yes*	NA

Administrative/Technical Resources	Gilpin County	City of Black Hawk	City of Central City	Timberline FPD
Resiliency Planner	No	No	No	No
Transportation Planner	No	No	No	NA
Personnel skilled in Geographic Information System (GIS)	Yes*	Yes	Yes*	No
Full-time building official	Yes	Yes	Yes*	NA
Floodplain manager	Yes	Yes	Yes	NA
Emergency manager	Yes	Yes	Yes	No
Grant writer	No	No	No	Yes
Other personnel	Yes	No	No	No
GIS Data Resources	Yes	Yes	Yes (County)	No
Warning Systems/Services (Reverse 9-11, etc.)	Yes	Yes	Yes	Yes

* Jurisdiction retains a contractor to meet these needs

2.10.3 Financial Capabilities

Table 2-10 identifies financial tools or resources that Gilpin County and its jurisdictions have used (or could use) to help fund mitigation activities.

Table 2-10 Gilpin County Financial Mitigation Capabilities Matrix

Administrative/Technical Resources	Gilpin County	City of Black Hawk	City of Central City	Timberline FPD
Community Development Block Grants	Yes	Yes	Yes	NA
Capital Improvements Project Funding	Yes	Yes	Yes	No
Authority to Levy Taxes for Specific Purposes	Yes (with voter approval)	Yes	Yes	Yes (with voter approval)
Fees for water, sewer, gas, or electric services	No	Yes	Yes	NA
Impact fees for new development	No	Yes	No	Yes
Incur debt through general obligation bonds	Yes (with voter approval)	Yes	No	Yes (with voter approval)
Incur debt through special tax bonds	Yes (with voter approval)	Yes	No	NA
Incur debt through private activities	Yes (with voter approval)	No	No	Yes (TABOR restricted)
Withhold spending in hazard-prone areas	Yes (with voter approval)	No	No	NA

In May 2020, the Gilpin County Board of County Commissioners approved a Resolution authorizing Timberline Fire Protection District to collect impact fees, based on an Impact Fee Study commissioned by the District.

2.10.4 Education and Outreach Capabilities

Table 2-11 lists additional education and outreach capabilities, such as specific programs, which Gilpin County and its jurisdictions utilize to implement hazard mitigation activities.

Table 2-11 Gilpin County Education and Outreach Capabilities

Administrative/ Technical Resources	Gilpin County	City of Black Hawk	City of Central City	Timberline FPD
Past or ongoing public education that address mitigation	Yes – Gilpin Emergency Preparedness Guide	Yes - Fire safety and wildfire mitigation education programs administered by the Black Hawk Fire Department	Yes – use of the County's Emergency Preparedness packet and mailers regarding water usage.	Slash pile burning guide
Local Citizen Groups That Communicate Hazard Risks	No	No	No	No
Firewise	No	No	Yes	No
StormReady	No	No	No	No

2.10.5 State and Regional Partnerships

Colorado Division of Homeland Security and Emergency Management

The Colorado Division of Homeland Security and Emergency Management, part of the Department of Public Safety, is comprised of three offices:

- Office of Emergency Management,
- Office of Grants Management, and
- Office of Prevention and Security/Colorado Information Analysis Center.

Division of Homeland Security and Emergency Management's (DHSEM) mission is: "To lead and support Colorado's effort to prevent, protect, mitigate, respond to and recover from all hazards events." The Division vision is: "A prepared, safe and resilient Colorado."

Colorado Division of Fire Protection & Control

The Colorado Division of Fire Prevention and Control (DFPC) was created in July 2012 as an effort to consolidate state fire functions. The vision of DFPC is "To be the Nation's premier state fire organization by acting with foresight, providing bold leadership, enhancing our partnerships, and exemplifying the highest level of professionalism in fire prevention and protection, while building a safe and supportive work environment for our employees."

Colorado Water Conservation Board

The Colorado Water Conservation Board (CWCB) is an agency of the State of Colorado. The CWCB Flood Protection Program is directed to review and approve statewide floodplain studies and designations prior to adoption by local governments. The CWCB is also responsible for the coordination of the NFIP in Colorado and for providing assistance to local communities in meeting NFIP requirements. This includes CWCB prepared or partnered local floodplain studies.

Colorado Geological Survey

The Colorado Geological Survey (CGS) is a non-regulatory state government agency within the Colorado School of Mines. The mission of CGS is to help reduce the impact of geologic hazards on the citizens of Colorado, to promote responsible economic development of mineral and energy resources, provide geologic insight into water resources, provide avalanche safety training and forecasting, and to provide geologic advice and information to a variety of constituencies.

Colorado State Forest Service

The mission of the Colorado State Forest Service is to provide for the stewardship of forest resources and to reduce related risks to life, property, and the environment for the benefit of present and future generations. Its fire preparedness and response strategic priority is to provide leadership in wildland fire protection for state and private lands in Colorado and reduce wildfire-related loss of life, property, and critical resources.

Colorado Parks & Wildlife

Colorado Parks & Wildlife (CPW) is a nationally recognized leader in conservation, outdoor recreation, and wildlife management. The agency manages 41 state parks, all of Colorado's wildlife, more than 350 state wildlife areas and a host of recreational programs. CPW issues hunting and fishing licenses, conducts research to improve wildlife management activities, protects high priority wildlife habitat through acquisitions and partnerships, provides technical assistance to private and other public landowners concerning wildlife and habitat management and develops programs to understand, protect and recover threatened and endangered species.

Colorado Division of Gaming

The Colorado Division of Gaming is a division of the Department of Revenue and is responsible for the regulation and enforcement of limited gaming in Colorado. Limited gaming in Colorado means "casino-style gambling that is limited to:

- $100 maximum wager
- Slot machines, blackjack, poker, craps and roulette
- Historical districts in the towns of Black Hawk, Central City and Cripple Creek
- Tribal reservation lands in Southwest Colorado
- 35% of a building's total space or 50% of a building floor

The gaming industry plays a large role in Gilpin County and the Cities of Black Hawk and Central City, and supports a significant sector of the county's economy.

Denver Regional Council of Governments

The DRCOG is a planning organization where local governments in Adams, Arapahoe, Boulder, Broomfield, Denver, Clear Creek, Douglas, Gilpin, and Jefferson Counties collaborate to establish guidelines, set policy, and allocate funding in the areas of:

- Transportation and Personal Mobility
- Growth and Development
- Aging and Disability Resources

DRCOG endures today as one of the nation's three oldest councils of governments. Representatives of the region's counties, cities and towns work together to make life better. They are guided by the Metro Vision regional growth and development plan, which defines goals and actions needed to ensure the region remains a great place to live, work and play. For more than 50 years, the cities and counties of the Denver region have worked together as DRCOG to further a shared vision of the future of the metro area and to make life better for residents. That vision has taken various forms over the years. The current version, referred to as Metro Vision, is founded on six core principles which local communities developed in collaboration with the region's business, civic and environmental leaders and formally adopted in 1992. The six core principles of Metro Vision are:

- To protect and enhance the region's quality of life,
- To be aspirational and long-range in focus,
- Offer direction for local implementation,
- Respect local plans,
- Encourage communities to work together, and
- Plan is dynamic and flexible.

Other

NOCO Places 2050: Gilpin is part of a five-county region working with three land management agencies on recreational land management and conservation practices to collaborate on ways to address the challenges the mountains and foothills in this region are facing from high visitation.

Gilpin has also recently started participating in the two watershed coalitions to increase collaboration and resiliency.

2.11 Summary of Capabilities Assessment

The capabilities assessment identifies the plans, regulations, personnel, and funding mechanisms available to the County and planning partners to impact and mitigate the effects of natural hazards. Gilpin County as well as the participating communities strive to find a balance between regulatory authority and private property owners' rights.

Gilpin County has many plans and programs in place to directly and indirectly address emergency management and the implementation of a proactive hazard mitigation plan. These plans include the Gilpin County Master Plan, the Gilpin County Emergency Operations Plan, and a floodplain map. While the County does have a zoning ordinance and has adopted the International Building Code, Gilpin County does not have a subdivision ordinance, stormwater management plan, or erosion control plan. The County also does not have an economic development plan.

The County Director of Emergency Management has the primary responsibility for the implementation of the hazard mitigation plan. It takes cooperation and coordination on the part of all County and community departments to successfully implement the mitigation plan. The County has a Public Works and Health Department, Community Development Department, and other departments to coordinate the planning, mitigation, and response to natural hazard events. In addition, the County has a Building Division and has completed an emergency operations plan. In addition to the traditional FEMA funding mechanisms, the County has limited ability to obtain funds for hazard mitigation projects through grants, taxes, and fees.

The Cities of Black Hawk and Central City have comprehensive plans, municipal codes, and regulations that direct development within their municipalities. Both planning partners have adopted the International Building Code and have codes and ordinances in place that restrict the development of land within hazard areas, such as floodplains. These plans and codes provide a framework for future ordinances and programs to further mitigate natural hazard events. Both cities have identified emergency managers, but emergency management is also coordinated with the Gilpin County Office of Emergency Management. Both cities have limited financial resources to fund mitigation actions through grants, taxes, or fees.

2.11.1 Opportunities for Capability Enhancement

The 2023 HMP update provided the County and participating jurisdictions an opportunity to review and update the capabilities currently in place to mitigate hazards. While Gilpin County has many hazard mitigation capabilities, there are opportunities to strengthen the abilities of the County and the municipal planning partners to proactively mitigate natural hazards in the community. Specific opportunities could include the update or development of the following plans, which should also cross reference this hazard mitigation plan (see also Subsection 6.3):

- Develop a countywide Economic Development Plan.
- Update Capital Improvement Plans (Gilpin County, Black Hawk).
- Review and update floodplain regulations/ordinances when new maps become effective and are adopted.
- Develop additional planning mechanisms such as Stormwater Master plans.
- Update Comprehensive Plans to include clear linkages to the hazard mitigation plan and consideration of hazards in land use planning.
- Create zoning regulations requiring defensible space in areas of high wildfire risk.
- Develop a detailed wildfire mitigation strategy and implement permanent wildfire mitigation programs.
- Update the County CWPP
- Conduct a cyber security threat assessment and implement standard cyber security measures.
- Become StormReady® certified communities.

3 Planning Process

DMA 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:
An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
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
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 Gilpin County

Gilpin County the Cities of Black Hawk and Central City participated in previous regional hazard mitigation plans as part of DRCOG 2011 Natural Hazard Mitigation Plan. In 2016, the County and Cities opted to develop a separate plan to focus on the hazards and risks specific to the County overall and to better develop mitigation actions to address them. To achieve this, Gilpin County developed the first Gilpin County HMP in 2016.

The plan underwent a comprehensive update in 2023 to comply with the five-year update cycle required by the DMA 2000. The planning process and update of this plan was initiated in mid-2021 under the coordination of the Gilpin County Office of Emergency Management. A consultant team from Wood Environment & Infrastructure Solutions, Inc. (Wood) was hired to help facilitate the planning process and prepare the final updated Plan. This plan update was developed to focus on the goals and objectives and the hazards pertaining to Gilpin County. The updated HMP complies with FEMA guidance for Local Hazard Mitigation Plans in the DMA of 2000 and FEMA's 2013 Local Hazard Mitigation Planning Handbook.

3.1.1 What's New in the Plan Update

This HMP update involved a comprehensive review and update of each section of the 2016 plan and includes an assessment of the progress in evaluating, monitoring, and implementing the mitigation strategy outlined in the initial 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.

During the 2023 update process, the Hazard Mitigation Planning Committee (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 Wood analyzed each section using FEMA's local plan update guidance to ensure that the plan met the latest requirements. Upon review the HMPC and Wood determined that nearly every section of the plan would need some updates to align with the latest FEMA planning guidance and requirements. The overall format and structure of the plan changed to align the plan with modern hazard mitigation planning practices and to simplify the document from 21 chapters to six. The Risk Assessment in Chapter 4 was substantially revised to incorporate recent events and reflect recent development trends with an updated GIS-based risk assessment. Information within has been updated throughout the plan where appropriate. The mitigation strategy in Chapter 5 has been updated to reflect current priorities and mitigation actions moving forward from the 2016 plan.

3.2 Local Government Participation

Gilpin County's HMP is a multi-jurisdictional plan that geographically covers everything within Gilpin County, as described further in Chapter 2 Community Profile and Capability Assessment. The following jurisdictions with the authority to regulate development participated in the planning process and are seeking FEMA approval of this plan. All jurisdictions that participated in the 2016 Plan participated again in the 2023 Plan, with the addition of the Timberline Fire Protection District as a new jurisdiction:

- Gilpin County,
- City of Black Hawk,
- City of Central City, and
- Timberline Fire Protection District.

The 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 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 Gilpin County Hazard Mitigation Plan's HMPC, participation was defined as:

- 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.

3.3 Planning Process

Gilpin County and Wood worked together to establish the planning process for Gilpin 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:

- Organize Resources,
- Assess Risks,
- Develop the Mitigation Plan, and
- 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, Wood integrated a more detailed 10-step planning process used for FEMA's CRS and FMA programs. Thus, the modified 10-step process used for this plan meets the funding eligibility requirements of the HMA grants (including HMGP, BRIC grant, HHPD grant, and FMA grant), CRS, and the flood control projects authorized by the US Army Corps of

Engineers (USACE). Table 3-1 summarizes the four-phase DMA process, the detailed CRS planning steps and work plan used to develop the plan and the nine handbook planning tasks from FEMA's 2013 Local Mitigation Planning Handbook. The sections that follow describe each planning step in more detail.

Table 3-1 Mitigation Planning Process Used to Update the Plan

FEMA's 4-Phase DMA Process	Modified 10-Step CRS Process	FEMA Local Mitigation Planning Handbook Tasks
1) Organize Resources		
201.6(c)(1)	1) Organize the Planning Effort	1: Determine the planning area and resources
201.6(b)(1)	2) Involve the Public	2: Build the planning team - 44 CFR 201.6 (C)(1)
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies	3: Create an outreach strategy - 44 CFR 201.6(b)(1)
		4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3)
2) Assess Risks		
201.6(c)(2)(i)	4) Identify the Hazards	5: Conduct a risk assessment - 44 CFR 201.6 (C)(2)(i) 44 CFR 201.6(C)(2)(ii)&(iii)
201.6(c)(2)(ii)	5) Assess the Risks	
3) Develop the Mitigation Plan		
201.6(c)(3)(i)	6) Set Goals	6: Develop a mitigation strategy - 44 CFR 201.6(c)(3)(i); 44 CFR 201(c)(3)(ii) and 44 CFR 201.6(c)(3)(iii)
201.6(c)(3)(ii)	7) Review Possible Activities	
201.6(c)(3)(iii)	8) Draft an Action Plan	
4) Implement the Plan and Monitor Progress		
201.6(c)(5)	9) Adopt the Plan	7: Review and adopt the plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan	8: Keep the plan current
		9: Create a safe and resilient community - 44 CFR 201.6(c)(4)

3.3.1 Phase 1: Organize the Resources

Planning Step 1: Organize the Planning Effort

Wood worked with the Gilpin County Office of Emergency Management (OEM) to establish the framework and organization for the update of this Plan. Wood and OEM 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, municipal, and special district agencies participated on the HMPC and the development of the plan:

Gilpin County

- Office of Emergency Management
- County Commissioners
- County Manager's Office
- Office of Community Development
- Planning Commission
- Sheriff's Office
- Ambulance Authority

- E-911
- Public Works
- Gilpin County School District
- CSU Extension

City of Black Hawk

- Fire Chief
- Emergency Manager
- Chief of Police

City of Central City

- Fire Chief

Timberline Fire District

- Deputy Chief

Local, State, and Federal Agencies

- FEMA Region VIII
- Colorado DHSEM
- Colorado Forest Restoration Initiative
- Division of Reclamation Mining and Safety
- National Weather Service
- Colorado DRMS
- Trout Unlimited
- Colorado State Patrol
- Colorado Division of Gaming
- United Power Electric Cooperative
- United States Forest Service
- Xcel Energy

Neighboring Jurisdictions

- Boulder County OEM
- Clear Creek County OEM
- Grand County OEM
- Jefferson County OEM

A list of specific HMPC representatives is included in Appendix B. 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 virtual meetings, phone conversations, and email correspondence. Three planning meetings with the HMPC were held during the plan's development between June and September 2021. The meeting schedule and topics are listed in the following table. The kickoff meeting was held virtually, but the remaining meetings were conducted in person. The sign-in sheets and agendas for each of the meetings are included in Appendix D.

Table 3-2 Schedule of Meetings

HMPC Meeting	Meeting Topic	Meeting Date
1	Kickoff Meeting	June 14, 2021
2	Risk Assessment Summary/Goals Development	August 17, 2021
3	Mitigation Strategy Development	September 28, 2021

HMPC Meeting #1 – Kickoff Meeting

During the kickoff meeting, Wood presented information on the scope and purpose of the plan, participation requirements of HMPC members, and the proposed project work plan and schedule. A plan for public involvement (Step 2) and coordination with other agencies and departments (Step 3) was discussed. Wood also introduced the hazard identification requirements and data. The HMPC discussed past events and impacts and future probability for each of the hazards required by FEMA for consideration in a local hazard mitigation plan. Each jurisdiction provided updates through a data collection workbook created by Wood and mitigation action trackers or provided information directly to Wood for incorporation into the plan update.

HMPC Meeting # 2 – Risk Assessment Summary/Goals Development

On August 17, 2021, the HMPC convened to review and discuss the results of the risk and vulnerability assessment update. Nineteen members of the HMPC and stakeholders were present for the discussion. Wood presented preliminary risk assessment results for natural and human-caused hazards. The group went through each hazard together and discussed the results as well as shared any local insight to inform the Hazard Identification and Risk Assessment (HIRA) update. A survey was developed by Wood and shared with the Planning Team after the meeting, that asked the members to rank each natural hazard and asked to rank the human-caused hazards that should be included in the plan update. The survey also asked the Planning Team to review the 2016 mitigation goals and determine if they were still valid, comprehensive, and reflect current priorities and updated risk assessments. Refer to the meeting summary in Appendix B for notes related to each hazard discussed and results from the post meeting survey.

HMPC Meeting #3 – Mitigation Strategy Development

The HMPC met again on September 28, 2021 with 19 HMPC members participating to discuss updating the mitigation action plan from 2016 and finalize the goals and objectives for this planning process. The group reviewed the public survey results and noted the differences between hazard ratings for the jurisdictions and the public's perception of risks to the various hazards. The group discussed the criteria for mitigation action selection and prioritization using a worksheet provided by Wood (refer to Appendix B). The meeting ended with a review of the next steps and planning process schedule. Wood provided the Planning Team with a link to an online form to submit new mitigation actions. During the Planning Team review of the full plan, each member was provided a handout on prioritizing new mitigation actions and asked to focus on prioritizing each new mitigation action proposed.

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 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, posted to the County's website.

Figure 3-1 Example of Survey Posting on Social Media

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 163 individuals. Responses indicated that the public perceives the most significant hazards to be wildfire, winter storms, severe wind, and drought.

Figure 3-2 below displays the results from Question 4, 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 public feels the highest priority action items should include wildfire fuels treatment projects (143 responses), evacuation route development (88), wind hazard mitigation (78), public education/awareness (73), improve reliability of communication systems (69 responses), generators for critical facilities (66 responses), and water conservation (64). Full results of the public survey are provided in Appendix F. This information was discussed with the HMPC to use when evaluating hazard risks and considering mitigation actions.

Figure 3-2 Survey Responses on the Types of Mitigation Actions That Should Have the Highest Priority in Gilpin County

The public was given an opportunity to review and comment on the draft plan in March 2022. Gilpin County made the draft plan available on the County website. A public input comment form was available with the online plan. The plan was advertised by the County through Facebook, Twitter, and the County website. The public was given a two-week period to review and provide comments. In total 8 individuals responded to the online public input form. Their comments largely centered around consistency with wildfire risk ratings throughout the plan.

Planning Step 3: Coordinate with Other Departments

There are numerous organizations whose goals and interests' interface with hazard mitigation in Gilpin County. Coordination with these organizations and other community planning efforts is vital to the success of this Plan 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. An opportunity for neighboring communities, as well as local and regional agencies involved in hazard mitigation activities, was provided through invitations to meetings, or phone and email communication during the process; they were also given an opportunity to review and comment on the plan prior to finalization. The following agencies were reached out to during the planning process. Some were present at HMPC meetings (indicated by an asterisk) and/or supplied information to the HMPC that was used to inform the risk assessment. Neighboring jurisdictions were asked to comment on the plan prior to its finalization.

State and Federal Agencies

- Colorado Department of Natural Resources – Dam Safety.
- Colorado Department of Homeland Security and Emergency Management*.
- Colorado Department of Transportation.
- Colorado State Patrol – Golden Incident and Resources Management.
- US Forest Service*.
- National Weather Service Boulder*.
- US Environmental Protection Agency – Response and Planning.
- Colorado State University Extension*.
- Colorado Division of Fire Prevention & Control.

Neighboring Jurisdictions

- Boulder County.
- Clear Creek County*.
- Grand County.
- Jefferson County*.

Special Districts/Private Businesses/Community Organizations

- United Power*.
- Trout Unlimited*.
- Xcel Energy*.
- Mile High Flood District.

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. Gilpin 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. Table 3-3 below provides a summary of the key existing plans, studies, and reports that were reviewed during the update process. Information on how they informed the update are noted where applicable.

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

Plan, Study, Report Name	How Plan, Study or Report Informed the HMPC`
Gilpin County CWPP (2012)	Reviewed information on past wildfires and wildfire risk to inform the risk assessment.
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.

Plan, Study, Report Name	How Plan, Study or Report Informed the HMPC`
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 Flood Mitigation Plan (2018 Update)	Reviewed information on past flood events and risk analysis for the planning area to inform the risk assessment.
Updated Flood Insurance Study Draft (2020) for Gilpin County and Incorporated Areas	Provided updated flood risk data for specific hazard areas located within the County and allowed the County to meet the minimum NFIP and CWCB regulations.
Comprehensive/Master Plans: Gilpin County (2020/2017), City of Black Hawk (2017), City of Central City (2020)	Informed the Community Profile and capability assessments.
Timberline Fire Protection District: By-Laws; Service Plan; Policies, Procedures and Rules of Conduct	Informed the Community Profile and capability assessments.
Upper Clear Creek Watershed Plan 2021 Update	Informed the risk assessment.
2017 Colorado Wildfire Risk Assessment Summary Report: Gilpin County	Informed the risk assessment, wildfire section.
US Department of Agriculture (USDA) Risk Management Agency Crop Indemnity Reports (2007-2020)	Provided data related to crop losses due to drought and hail.

Integration of 2016 Plan into Other Planning Mechanisms

Gilpin County Comprehensive Plan

The Gilpin County Comprehensive Plan was last updated in 2020; although the 2016 HMP was completed at the time of this update, hazard mitigation was only mentioned once in the plan – in a discussion of tradeoffs in the vision section. Hazard mitigation, or hazards generally for that matter, are not mentioned in the Comprehensive Plan.

Central City Comprehensive Plan

Central City incorporates "hazard safety" as a piece of the vision for the community laid out in the comprehensive plan. Additionally, the plan includes a "Hazards, Fire Protection, Law Enforcement, and Emergency Medical Services" section under Chapter 3 – Revenues, Core Services, and Infrastructure. Within this section, there are multiple elements of Goal RCSI.8 that address hazard mitigation:

- Strategy B: Work with regional partners to implement the recently updated Gilpin County CWPP and the City of Central City Disaster Recovery and Resiliency Master Plan.
- Strategy E: Adopt Wildland-Urban Interface (WUI) regulations and building codes for new subdivisions and development on vacant land to mitigate wildfire danger.
- Strategy H: Research options for adopting buildings codes related to mitigating geological hazards.

3.3.2 Phase 2: Assess Risks

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

Chapter 4: Risk Assessment is the result of a comprehensive effort to identify and document all the hazards that have, or could, impact the planning area. This section was updated to reflect recent hazard events and current assets within the county and jurisdictions. Where data permitted, 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

Wood facilitated a brainstorming and discussion session with the HMPC during their second meeting to update the goals and objectives from the 2016 plan. During the third HMPC meeting Wood 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 2016 plan. Some new mitigation actions resulted from this process that were added to the plan for 2023. This process and its results are described in greater detail in Chapter 5.

Planning Step 8: Draft and 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, Wood 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. Wood integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the CODHSEM 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 6. 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, which also includes a strategy for continued public involvement.

4 Risk Assessment

DMA 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 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. The risk assessment shall include: *(i) A description of the type, 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.* *(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:* *(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.* *(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.* *(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.* *(iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

4.1 Hazard Identification

This section of the Gilpin County Hazard Mitigation Plan describes the local HIRA summary undertaken by the County and participating jurisdictions. 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 hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazardous events.

A key step to mitigate disaster losses is to develop a comprehensive understanding of the community's hazards, vulnerabilities, and risks. The following terms are used throughout the Plan to facilitate comparisons between communities.

- **Hazard:** Event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, other types of harm or loss. A hazard may be naturally occurring (flood, tornado, etc.) or it may be human-caused (active threat, hazmat, etc.).
- **Vulnerability:** Degree of susceptibility to physical injury, harm, damage, or economic loss; depends on an asset's construction, contents, and economic value of its functions.
- **Risk:** The potential for damage, loss, or other impacts created by the interaction of hazards with vulnerabilities.

The relationship between hazards, vulnerabilities, and risk is depicted in Figure 4-1. The risk assessment evaluates potential loss from hazards by assessing the vulnerability of the County's population, built environment, critical facilities, and other assets. Environmental and social impacts are also taken into consideration wherever possible. This risk assessment covers the entire geographical area of Gilpin County. Since this is a multi-jurisdictional plan, the Planning Team also evaluated how the hazards and risks vary from jurisdiction to jurisdiction.

Figure 4-1 Risk Graphic

4.1.1 Disaster Declaration History

Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government. However, no specific dollar loss threshold has been established for these declarations. A federal disaster declaration puts federal recovery programs into motion to help disaster victims, businesses, and public entities. Some of the programs are matched by state programs. Since 1969 Gilpin County has experienced seven events for which federal disaster declarations were issued, as shown in Table 4-1.

Review of these events helps identify targets for risk reduction and ways to increase a community's capability to avoid large-scale events in the future. Still, many natural hazard events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in establishing recurrence intervals for hazards of concern. More detailed event tables can be found in the individual hazard profile sections.

Table 4-1 Federal Disaster Declarations in Gilpin County

Declaration	Description	Incident Date
DR-261	Severe Storms and Flooding	05/19/1969
DR-1421	Wildfires	06/19/2002
EM-3185	Snow	04/09/2003
EM-3224	Hurricane Katrina Evacuation	09/05/2005
EM-3270	Snow	12/18-22/2006
DR-4145	Severe Storms, Flooding, Landslides and Mudslides	09/14/2013
EM-3436 DR-4498	COVID-19 Pandemic	3/13/2020 3/28/2020

Source: FEMA. DR = Major Disaster Declaration; EM = Emergency Declaration

The US Department of Agriculture's (USDA) Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans (EM) to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility requirement trigger. Table 4-2 lists the nine USDA Secretarial disaster declarations that included Gilpin County from the years 2012-2021.

Table 4-2 USDA Secretarial Disaster Declarations in Gilpin County 2012-2021

Disaster Number	Crop Disaster Year	Cause
S3260	2012	Drought, excessive heat, high winds
S3548	2013	Drought
S4365	2018	Severe hail and high winds
S4386	2018	Drought
S4408	2018	Drought
S4481	2019	Drought
S4775	2020	Drought
S4798	2020	Drought
S4917	2021	Drought

Source: US Department of Agriculture

4.1.2 Identified Hazards of Concern

For this plan update, the Planning Team considered the full range of hazards that could impact the planning area and then listed hazards that present the greatest concern. The process incorporated review of state and local hazard planning documents, as well as information on the frequency, magnitude, and costs associated with hazards that have impacted or could impact the planning area. Anecdotal information regarding natural hazards and the perceived vulnerability of the planning area's assets to them was also used.

Historical data, catastrophic potential, relevance to the jurisdiction, and the probability and potential magnitude of future occurrences were all used to identify and prioritize the list of hazards most relevant to Gilpin County. Hazard data was obtained from various federal, state, and local sources such as FEMA, the Colorado Geological Survey (CGS), the Colorado Dam Safety Division, the NOAA's National Center for Environmental Information (NCEI), the United States Geological Survey (USGS), and others. Local and national news reports were also used to research historic events. Together, these sources were examined to assess the significance of these hazards to the County. The hazards selected for inclusion 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 hazards profiled in the 2016 Plan were reviewed, and the Planning Team decided to keep all hazards from the 2016 Plan for 2023. The Planning Team also reviewed the hazards listed in the 2018 Colorado State Hazard Mitigation Plan. Dense fog, which was added to the State HMP in 2018, is a regular occurrence in Gilpin County, so the Planning Team elected to have it studied for the 2023 Gilpin County Plan. They also considered several human-caused or technological hazards, and elected to add three: active threat, cyber-attack, and pandemic. Three other natural hazards from the 2018 State HMP were discussed, but the Planning Team determined they do not present sufficient risk in Gilpin County to justify inclusion:

- Animal Disease Outbreak
- Pest Infestation

- Radon/CO/Methane/Other Seeps.

The Planning Team also discussed how best to incorporate the impacts of climate change into the Plan, and determined not to profile climate change as a separate hazard but rather to include a section on climate change impacts in each hazard profile.

Based on this review, this Plan addresses the following hazards of concern:

- Active Threat
- Avalanche
- Cyber Attack
- Dam Failure
- Dense Fog
- Drought
- Earthquake
- Erosion and Deposition
- Expansive Soil
- Extreme Heat
- Flood
- Hail
- Landslide, Mud/Debris Flow, Rockfall
- Lightning
- Pandemic
- Severe Wind
- Space Weather
- Subsidence
- Tornado
- Wildfire
- Winter Storm

Several of these hazards were profiled together because of their common occurrence or damage assessments, such as drought and extreme heat, and hail, lightning, and severe winds.

4.1.3 Risk Assessment Methodology

A risk ranking was performed for the hazards of concern listed above. This risk ranking assesses the probability of each hazard's occurrence as well as its likely impact on the people, property, and economy of the planning area. The risk ranking was conducted by the Planning Team based on the hazard risk assessment presented during the second Planning Team meeting, community survey results, and personal and professional experience with hazards in the planning area. The results are used in establishing mitigation priorities.

Hazard Profiles

Each hazard was profiled as follows:

- **Description:** General description of the hazard and associated problems, followed by details on the hazard specific to Gilpin County.
- **Past Events:** Overview history of the hazard's occurrences, compiled from multiple data sources, to include information provided by the Planning Team and the public. Significant incidents are profiled in greater detail and include scope, severity, and magnitude, and known impacts.
- **Location:** Discusses what parts of the County are most likely to be affected by the hazard.
- **Magnitude/Severity:** Summarizes the anticipated magnitude and severity of a hazard event based largely on previous occurrences and specific aspects of the planning area. Speed of onset and duration are also factored in.
- **Probability of Future Occurrence:** Estimates the likelihood or probability of future occurrences of 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:** Describes the likely impacts of the hazard on people, property, critical infrastructure, government services, the economy, and historical, cultural, and natural resources.
- **Development Trends:** Summarizes how projected trends in land use, and development have the potential to increase or decrease the impact of the hazard.
- **Risk Summary:** Summarizes the key pieces of information for each hazard.

Vulnerability Assessment

With Gilpin County's hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that the significant hazards would have on the County. The vulnerability assessment quantifies, to the extent feasible, assets at risk to natural hazards and estimates potential losses. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

The vulnerability assessment was conducted based on the significance of the hazard utilizing best available data. This assessment is an attempt to quantify assets at risk, by jurisdiction where possible, to further define populations, buildings, and infrastructure at risk to natural hazards. The information presented is for planning level assessments only. Data to support the vulnerability assessment was collected and compiled from the following sources:

- Current County and municipal GIS data (hazards, base layers, critical facilities and assessor's data),
- 2020 US Census, 2020 American Community Survey, and 2019 CO Department of Local Affairs (DOLA) data,
- 2021 Homeland Infrastructure Foundation-Level Data (HIFLD) data,
- Written descriptions of inventory and risks provided by participating jurisdictions,
- A refined flood loss estimation by jurisdiction with the use of geospatial analysis for both 1% and 0.2% annual chance flooding,
- Modeling of earthquake loss potential with Hazus-MH using a 2,500-year probabilistic scenario,
- Existing plans and studies, and applicable regulations, and
- Personal interviews with Planning Team members, hazard experts, and County and municipal staff.

The scope of the vulnerability assessment is to describe the risks to the County as a whole. The vulnerability assessment first describes the assets in Gilpin 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. Next, where data was available, hazards are evaluated in more detail and potential losses are estimated. Data from each jurisdiction was also evaluated and is integrated throughout this analysis. The methods to assess vulnerability presented here include an updated analysis from the 2016 Gilpin County Hazard Mitigation Plan. This includes a detailed risk assessment for all hazards based on advanced methods and updated hazard and inventory data. Thus this 2023 Plan should be considered the baseline for measuring changes in vulnerability during future updates, recognizing that vulnerability information should become more refined as data sources and methodologies improve over time.

Hazard Rankings

Hazards then were ranked based on the following factors:

- **Spatial Extent:** How much of the planning area is potentially at risk from the hazard?
  - Extensive: 50-100% of planning area.
  - Significant: 10-50% of planning area.
  - Limited: Less than 10% of planning area.

- **Potential Severity:** What are the likely impacts of the hazard?
  - Catastrophic: Multiple deaths, shutdown of facilities for 30 days or more, >50% of property is severely damaged.
  - Critical: Multiple severe injuries, shutdown of facilities for at least 2 weeks, >25% of property is severely damaged.

- Moderate: Some injuries, shutdown of critical facilities for more than one week, >10% of property is severely damaged.
- Minor: Minor injuries, minimal quality-of-life impact, interruption of facilities and services for 24 hours or less, less than 10% of property is severely damaged.

- **Frequency of Occurrence:** How often is the hazard likely to occur?
  - Highly Likely: Near 100% probability each year.
  - Likely: Between 10 and 100% probability per year or at least one chance in ten years.
  - Occasional: Between 1 and 10% probability per year or at least one chance in next 100 years.
  - Unlikely: Less than 1% probability in next 100 years.

- **Overall Significance:** Based on a combination of the previous three factors.
  - High: widespread potential impact.
  - Medium: moderate potential impact.
  - Low: minimal potential impact.

4.1.4 Climate Change

The 2023 Gilpin County Hazard Mitigation Plan update takes into account considerations of how changing climate conditions may impact the frequency, intensity, and distribution of specific hazards within the County. Because many impacts of climate induced hazards cross county boundaries, some of the discussion looks at impacts on a regional scale. Rather than identify and profile climate change as a standalone hazard in itself, this plan examines how climate change is expected to influence the severity, frequency, or impacts of the various individual hazards which are profiled, based on the best available science. As climate science evolves, future mitigation plan updates may consider including climate change projections in the risk rankings and vulnerability assessments of the hazards included in the Plan.

Climate includes patterns of temperature, precipitation, humidity, wind and seasons. Climate plays a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. "Climate change" refers to changes over a long period of time. It is generally perceived that climate change has had and will continue to have measurable impacts on the occurrence and severity of natural hazards around the world. Impacts include the following:

- Snow cover losses will continue, and declining snowpack will continue to affect snow-dependent water supplies and stream flow levels around the world.
- The risk of drought and the frequency, intensity, and duration of heat waves are expected to continue to increase, as are the frequency, size, and intensity of wildfires.
- More extreme precipitation events will continue to be likely, increasing the risk of flooding.
- The Earth's average temperature is expected to continue to increase.

In 2018, the US Global Change Research Program released the Fourth National Climate Assessment (NCA4), the authoritative and comprehensive report on climate change and its impacts in the United States. Not only did the report confirm that climate change continues to affect Americans in every region of the US, the report identifies increased heat, drought, insect outbreaks, wildfire, and flooding as key climate-related concerns for the southwest region of the US, which includes Colorado. The following is a summary of climate change impacts from the Fourth National Climate Assessment.

Recent warming in the southwest region is among the most rapid in the nation and is significantly greater than the global average, and the period since 1950 has been hotter than any comparable long period in at least 600 years. Summer temperatures across the state are expected to warm more than winter temperatures and projections suggest that typical summer months will be as warm as (or warmer than) the hottest 10% of summers that occurred between 1950 and 1999. Under the higher emissions scenario (RCP8.5) climate models predict an increase of 8.6°F in the southwest regional annual average temperature by 2100.

Projected increases in temperatures in the southwest region are also projected to increase probabilities of natural events such as wildfires, drought, and extreme precipitation. These temperature changes have great potential to directly affect public health through increased risk of heat stress and infrastructure through increased risk of disruptions of electric power generation. Water supplies are also vulnerable to impacts of higher temperatures. While water supplies generally change year-to-year due to variabilities in water use and precipitation, higher temperatures are projected to increase evapotranspiration, reducing the effectiveness of precipitation in replenishing surface water and soil moisture. This will have direct impacts on crop yields and productivity of key regional crops and livestock a major risk for the agricultural industry and food security nationwide.

The impacts of climate induced hazards already pose a threat to people and property in the southwest region of the United States, including Gilpin County. Vulnerable populations, in particular those who are low-income, children, elderly, disabled and minorities will likely be impacted by the effects of climate induced hazards disproportionately than other populations (refer to Chapter 2 for more information on social vulnerability in the County). Together, these impacts represent a slow-onset disaster that is likely to manifest and change over time. Current projections predict even more rapid changes in the near future, which are likely to affect many of the natural hazards that Gilpin County has historically dealt with. According to HMPC the County is already experiencing some hazards with more frequency and intensity than in years past, such as drought, flooding, wildfire and extreme heat.

4.1.5 Hazard Significance Summary

Table 4-3 summarizes the risk across the planning area associated with each hazard based on the criteria listed in Subsection 4.1.3. The individual ratings are based on or interpolated from the analysis of the hazards in the sections that follow. During the 2023 Plan update, the individual ratings and significance of the hazards was revisited and updated. Public concern was also considered from an online survey and public review of the draft Plan.

Table 4-3 Hazard Risk Summary

Hazard	Gilpin County	City of Black Hawk	City of Central City	Timberline Fire Protection District
Winter Storm	High	High	High	High
Severe Wind	High	High	High	High
Active Threat	High	High	High	High
Cyber Attack	High	High	High	High
Wildfire	High	Medium	High	High
Drought	High	Low	High	Medium
Lightning	High	Low	Medium	High
Flood	Medium	Medium	Medium	Medium
Pandemic	Medium	Medium	Medium	Medium
Erosion and Deposition	Medium	Low	Medium	Medium
Dense Fog	Medium	Low	Low	Medium
Extreme Heat	Medium	Low	Low	Medium
Subsidence	Low	Medium	Medium	Low
Landslide, Mud/Debris Flow, Rockfall	Low	Low	Medium	Low
Hail	Low	Low	Medium	Low
Avalanche	Low	Low	Low	Low
Dam Failure	Low	Low	Low	Low
Earthquake	Low	Low	Low	Low
Expansive Soils	Low	Low	Low	Low
Tornado	Low	Low	Low	Low

Spatial Extent
Extensive: 50-100% of planning area
Significant: 10-50% of planning area
Limited: Less than 10% of planning area

Potential Severity
Catastrophic: Multiple deaths, shutdown of facilities for 30 days or more, >50% of property is severely damaged
Critical: Multiple severe injuries, shutdown of facilities for at least 2 weeks, >25% of property is severely damaged
Moderate: Some injuries, shutdown of critical facilities for more than one week, >10% of property is severely damaged
Minor: Minor injuries, minimal quality-of-life impact, interruption of facilities and services for 24 hours or less, less than 10% of property is severely damaged.

Frequency of Occurrence
Highly Likely: Near 100% probability each year.
Likely: Between 10 and 100% probability per year or at least one chance in ten years.
Occasional: Between 1 and 10% probability per year or at least one chance in next 100 years.
Unlikely: Less than 1% probability in next 100 years.

Significance
High: widespread potential impact
Medium: moderate potential impact
Low: minimal potential impact

4.2 Assets at Risk

4.2.1 General Property

General property exposure to hazards is based on Gilpin County's parcel data containing assessor information such as total number of parcels, improvement values, and parcel types by jurisdiction. Only those parcels with improvement values greater than $0, were used for analysis; non-developed or non-improved parcels were excluded for the purposes of conducting the vulnerability assessment.

Counts and values are based on the latest County assessor's data (as of January 2021), which was provided in GIS and tabular (spreadsheet) formats. Improvement values and parcel type attributes were joined to the parcel geometries in GIS, to enable spatial analysis and mapping. Values for building contents were estimated as a percent of the improvement value based on parcel type using standard FEMA Hazus: 50% of the improvement value for residential structures (including mobile homes), 150% for industrial and 100% for the other property types. Finally, total values were aggregated by adding the improvement and content values for parcels in each jurisdiction. Table 4-4 shows there are a total of 4,574 buildings with a combined value of $3.26 billion potentially at risk across Gilpin County.

Table 4-4 Total Property Exposure by Jurisdiction

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Black Hawk	Commercial	33	38	$741,364,960	$741,364,960	$1,482,729,920
	Exempt	26	38	$4,877,190	$4,877,190	$9,754,380
	Residential	57	65	$12,762,940	$6,381,470	$19,144,410
	Total	**116**	**141**	**$759,005,090**	**$752,623,620**	**$1,511,628,710**
Central City	Commercial	45	49	$39,877,220	$39,877,220	$79,754,440
	Exempt	45	50	$5,780,680	$5,780,680	$11,561,360
	Natural Resource	1	1	$2,520	$2,520	$5,040
	Residential	302	333	$84,603,400	$42,301,700	$126,905,100
	Improved Vacant	2	2	$10,370	$10,370	$20,740
	Total	**395**	**435**	**$130,274,190**	**$87,972,490**	**$218,246,680**
Unincorporated	Agricultural	10	11	$2,691,200	$2,691,200	$5,382,400
	Commercial	37	69	$10,671,470	$10,671,470	$21,342,940
	Exempt	36	88	$46,916,980	$46,916,980	$93,833,960
	Industrial	12	17	$1,840,420	$2,760,630	$4,601,050
	Natural Resource	71	80	$9,463,390	$9,463,390	$18,926,780
	Residential	2,839	3,732	$907,365,000	$453,682,500	$1,361,047,500
	State Assessed	1	1	$10,461,390	$10,461,390	$20,922,780
	Total	**3,006**	**3,998**	**$989,409,850**	**$536,647,560**	**$1,526,057,410**
	Grand Total	**3,517**	**4,574**	**$1,878,689,130**	**$1,377,243,670**	**$3,255,932,800**

Source: Wood Analysis of Gilpin County Assessor's Data

Table 4-5 breaks down property exposure by property type. The below information shows that residential parcels account for 91% of improved parcels countywide and represent 46% of the total value of properties in Gilpin County.

Table 4-5 Property Exposure by Property Type

Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value
Agricultural	10	11	$2,691,200	$2,691,200	$5,382,400
Commercial	115	156	$791,913,650	$791,913,650	$1,583,827,300
Exempt	107	176	$57,574,850	$57,574,850	$115,149,700
Improved Vacant	2	2	$10,370	$10,370	$20,740
Industrial	12	17	$1,840,420	$2,760,630	$4,601,050
Natural Resource	72	81	$9,465,910	$9,465,910	$18,931,820
Residential	3,198	4,130	$1,004,731,340	$502,365,670	$1,507,097,010
State Assessed	1	1	$10,461,390	$10,461,390	$20,922,780

Source: Wood Analysis of Gilpin County Assessor's Data

For hazards with a geospatial component and where data was available, the parcel layer was overlaid with building footprints and compared to hazard layers to determine the parcels exposed to the hazards. The hazards that had enough geospatial data to conduct this parcel level hazard analysis were Dam Failure/Incidents, Flood, Landslide, and Wildfire.

4.2.2 People

Population estimates were calculated for hazards with a geospatial component and for which data was available for GIS-based parcel analysis. These were based on taking average household size data from the State Demographer's Office and comparing that to the total number of residential parcels. Average population per residential parcel was calculated as:

- Black Hawk: 2.02
- Central City: 1.94
- Unincorporated County: 2.23

This value was then multiplied by the number of residential parcels that overlap with a hazard layer to get an estimate of the population exposed to that hazard. For more details on economic assets, development trends, and other population and demographic information refer to Chapter 2 Community Profile.

4.2.3 Critical Facilities and Infrastructure

A critical facility is one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA Lifeline categories are the US Department of Homeland Security's recommended way to standardize the classification of critical facilities and infrastructure which 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.

To develop a comprehensive list of critical facilities in Gilpin County, several data sources were compiled including GIS databases of critical facilities and infrastructure from the County, and the 2021 HIFLD data. This data was then reviewed and fact-checked by the Planning Team to ensure accuracy. The inventory of critical facilities identified in Gilpin County is summarized in Table 4-6 and mapped in Figure 4-3. Table 4-7 further breaks down these facilities by type. A handful of facilities in neighboring counties were included due to their proximity to the Gilpin County line.

Timberline Fire Protection District's critical facilities consist of ten fire stations: eight in Gilpin County, and two in Boulder County. These stations are included in the numbers for the unincorporated county in the following tables.

Specific information on facilities, names, and other key details by participating communities may be accessed by permission of the jurisdiction or infrastructure owner.

Figure 4-2 Lifeline Categories

Source: FEMA

Table 4-6 Gilpin County Critical Facilities Summary

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Black Hawk	18	0	18	1	0	5	8	**50**
Central City	13	0	14	1	0	7	3	**38**
Unincorporated County	67	5	10	2	1	24	53	**162**
Total	**98**	**5**	**42**	**4**	**1**	**36**	**64**	**250**

Source: Wood Analysis of Gilpin County and HIFLD data

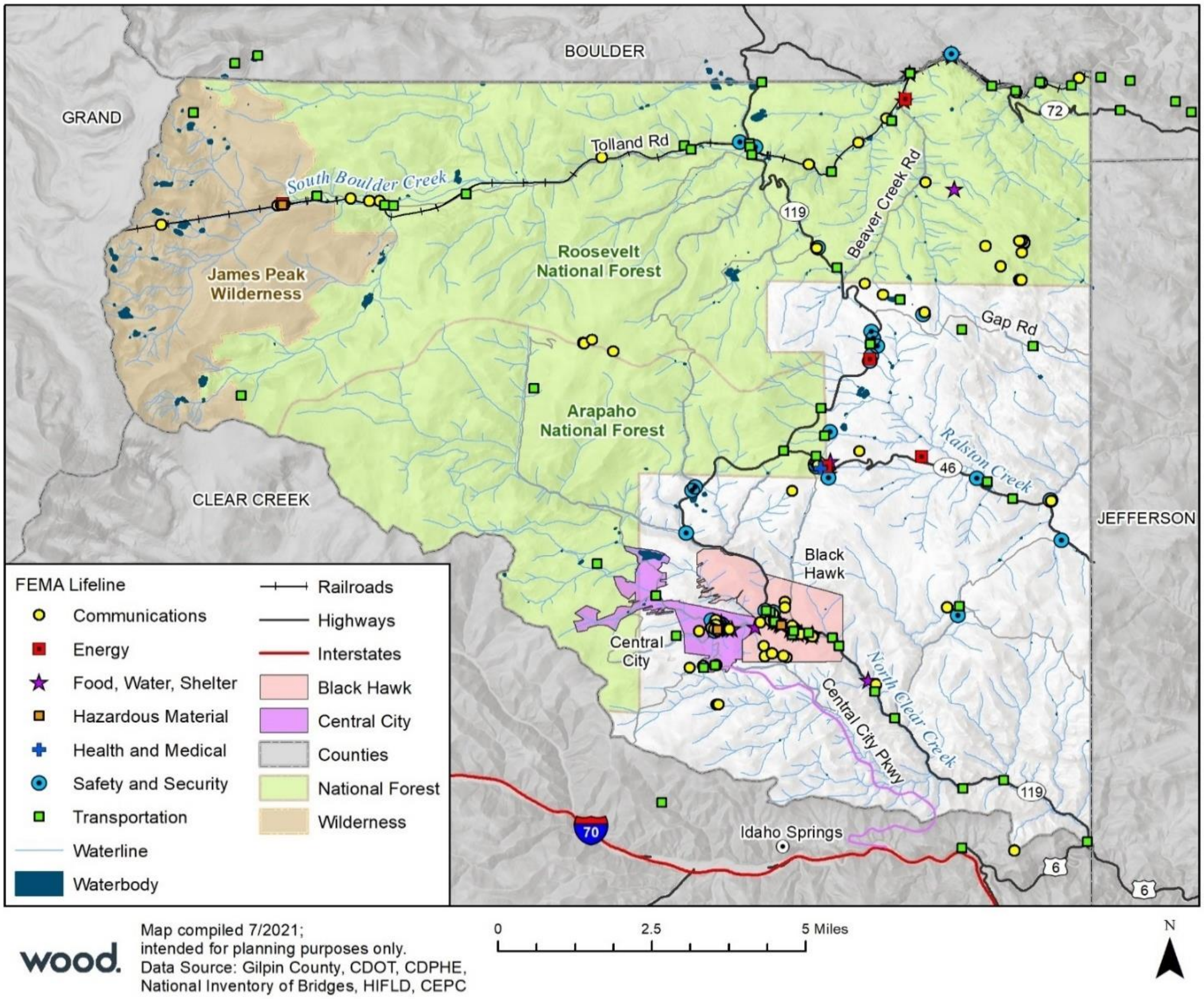
Table 4-7 Gilpin County Critical Facilities by Type and Jurisdiction

FEMA Lifeline	Jurisdiction	Facility Type	Count
Communications	Black Hawk	Land Mobile Private Tower	16
		Microwave Service Tower	2
	Central City	Cellular Tower	1
		Land Mobile Private Tower	9
		Microwave Service Tower	1
		Paging Tower	2
	Gilpin County	Cellular Tower	2
		FM Tower	1
		Land Mobile Private Tower	52
		Microwave Service Tower	11
		Paging Tower	1
		Total	**98**
Energy	Gilpin County	Electric Substation	3
		Gas Station	1
		Industrial Facility	1
	Black Hawk	Gas Station	1
		Total	**6**
Food, Water, Shelter	Black Hawk	Casino	18
	Central City	Casino	8
		Hotel / Motel	1
		House of Worship	4
		Lodging	1
	Gilpin County	Fair / Exhibition / Rodeo Grounds	2
		Fire Suppression Water Source	1
		Hotel / Motel	2
		House of Worship	1
		Water Supply or Treatment Facility	1
	Boulder County	Fire Suppression Water Source	3
		Total	**42**
Hazardous Material	Black Hawk	Tier II	1
	Central City	Tier II	1
	Gilpin County	Tier II	2
		Total	**4**
Health and Medical	Gilpin County	Public Health Office	1
		Total	**1**
Safety and Security	Black Hawk	Black Hawk Municipal Court	1
		Fire Station / EMS Station	1
		Law Enforcement	1
		Municipal Government Facility	1
		Post Office	1
	Central City	Fire Station / EMS Station	1
		Law Enforcement	2
		Post Office	1
		The Old Courthouse	1
		Trash Transfer Station	1
		Visitor / Information Center	1
	Gilpin County	Community / Recreation Center	1
		County Government Facility	1
		Day Care Facility	1

FEMA Lifeline	Jurisdiction	Facility Type	Count
		Fire Station / EMS Station	8
		Gilpin County Public Works Dept	1
		Law Enforcement	2
		Library	1
		Post Office	1
		School	1
		State Government Facility	2
		The Justice Center	1
		Visitor / Information Center	2
	Boulder County	Fire Station / EMS Station	2
		Total	**36**
Transportation	Black Hawk	Bridge Non-Scour Fair Condition	6
		Bridge Non-Scour Good Condition	2
	Central City	Bridge Non-Scour Good Condition	1
		Helispot	2
	Gilpin County	Bridge Non-Scour Fair Condition	8
		Bridge Non-Scour Good Condition	1
		Bridge Scour Fair Condition	1
		Helispot	26
		Tunnel: Railroad	4
	Boulder County	Helispot	4
		Tunnel: Railroad	7
	Clear Creek County	Helispot	2
		Total	**64**
		Grand Total	**251**

Source: Wood Analysis of Gilpin County and HIFLD data

Figure 4-3 Gilpin County Critical Facilities



4.2.4 Historic, Cultural and Natural Resources

Assessing the vulnerability of Gilpin County to disasters also involves inventorying the natural, historic, 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 and laws for reconstruction, restoration, rehabilitation, and/or replacement are often specific for these types of designated resources (e.g., under the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act).
- 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.

Historic and Cultural Resources

A historic property not only includes buildings or other types of structures such as bridges and dams but can also refer to prehistoric or Native American sites, roads, byways, historic landscapes, and such other features. Historic properties and cultural resources are also valuable economic assets that increase property values and attract businesses and tourists. Far from being at odds with economic development, preservation of these assets is often an important catalyst for economic development (e.g., historic downtown revitalization programs leading to growth in heritage tourism).

Some key information on historic assets and properties in Gilpin County was obtained from the National Register of Historic Places (NRHP). The NRHP database, administered by the National Park Service, is the Nation's official list of cultural resources worthy of preservation, and the NRHP overall is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archaeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture.

Colorado has a similar historical resource record version, called the Colorado State Register of Historic Properties (CSRHP). This database contains 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 NRHP are automatically placed in the Colorado State Register.

There are eight historic resources in Gilpin County listed in the NRHP, and an additional six listed in the CSRHP, as summarized in Table 4-8.

Table 4-8 Historic and Cultural Properties in Gilpin County

Historic Place Name	Location	Year Listed	Data Source
Bain Cabin	Rollinsville	2018	NRHP
Central City Opera House	Central City	1973	NRHP
Central City-Black Hawk Historic District	Central City	1966	NRHP
Frontenac and Aduddell Mine Complex	Russell Gulch	2020	NRHP
Russell Gulch Independent Order of Odd Fellows Hall No. 47-Wagner & Askew	Russell Gulch	2011	NRHP
Teller House	Central City	1973	NRHP
Winks Panorama	Pinecliffe	1980	NRHP
Winks Panorama (Boundary Increase)	Pinecliffe	2014	NRHP
Bain Cabin	Rollinsville vic.	2018	CSRHP
Bootleggers' Cabin	Golden Gate Canyon State Park	1995	CSRHP
Central City Opera House	Central City	1973	CSRHP
Central City-Black Hawk Historic District	Central City & Black Hawk	1961	CSRHP
Frazer's Barn	Golden Gate Canyon State Park	1995	CSRHP
Harvey House	Central City	1996	CSRHP

Source: National Park Service, History Colorado

The NEPA and National Historic Preservation Act (NHPA) define any property over 50 years of age as a historic resource 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 and the NHPA regarding this key age period. In addition, by law under the NHPA, "members of the public have a voice when federal actions will affect properties that qualify for the NRHP, the nation's official list of historic properties" (A Citizen's Guide to Section 106 Review, 2016).

Structural mitigation projects are considered alterations for the purpose of these NEPA/NHPA regulations, if regarding historical properties and places.

In addition to the properties listed above, the downtown historic districts as well as numerous mines/mills throughout the County are rich with history and cultural significance. Table 4-9 below lists properties throughout the county that are locally classified as historic landmarks and culturally significant sites. These historic assets are also important to the local economy as a draw for visitors and tourists. They can also be prone to hazards including wildfire and earthquake.

Table 4-9 Gilpin County Local Landmarks and Districts

Historic Place Name	Location	Designation	Date Listed
Apex Store Front	5674 Apex Valley Road	HR 06-02 Local Landmark	12/19/2006
Thorn Lake School	122 Gap Road	HR 06-01 Local Landmark	4/3/2007
Russell Gulch I.O.O.F	81 Russel Gulch Road	HR 09-01 Local Landmark	8/4/2009
Nevadaville Masonic Temple	1043 Nevadaville Road	HR 10-01 Local Landmark	8/3/2010
Snowcrest/Ol' Timer	1763 Lump Gulch Road	HR 10-02 Local Landmark	10/5/2010
Guest House	1069 Nevadaville Road	HR 11-01 Local Landmark	4/12/2011
Dieter Cabin	327 Dieter Drive	HR 11-02 Local Landmark	6/28/2011
Reseigh House	1091 Nevadaville Road	HR 11-03 Local Landmark	12/6/2011
McCool-Hess-Barney Family Cabin	104 Red Tail Road	HR 18-01 Local Landmark	2/20/2018
Barney Family Cabin	114 Red Tail Road	HR 18-01 Local Landmark	2/20/2018
Frontenac Mine Headframe	Pewabic Mountain Road	HR 19-01 Local Landmark	6/25/2019
Zephyr View Cabin	31 Pitts Place	LM-20-1 Local Landmark	11/17/2020

Source: Gilpin County

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 wetland areas can protect sensitive habitat as well as attenuate and store floodwaters.

Nearly 44% of Gilpin County is forest area owned and managed by the US Forest Service. This includes Arapaho National Forest, Roosevelt National Forest, and the James Peak Wilderness. While these areas do not have a lot of structures or critical facilities, they are still vulnerable to hazards particularly wildfire.

Wetlands are a valuable natural resource for communities due to their benefits to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands provide natural floodplain protection by reducing flood peaks and slowly releasing 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 is vital (Wetland Functions and Values, 2016).

Threatened & 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 (endangered and threatened 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 a third category of plants and animals at risk, but these have been proposed as endangered or threatened but are not currently listed.

According to the US Fish and Wildlife Service (USFW) Environmental Conservation Online System (ECOS), there were 16 federally endangered, threatened, or candidate/proposed/ under/other status review species in Gilpin County (as of October 2020). These are listed in Table 4-10. Resolved Taxon refers to species for which a Not Warranted 12 month finding or Not Substantial 90-day finding has been published in the Federal Register, or which has been removed from the candidate list.

Table 4-10 Threatened & Endangered Species in Gilpin County

Group	Common Name	Scientific Name	Status
Amphibians	Northern leopard frog	*Rana pipiens*	Resolved Taxon
Amphibians	Boreal toad	*Anaxyrus boreas boreas*	Resolved Taxon
Birds	Whooping crane*	*Grus americana*	Experimental Population, Non-Essential
Birds	American peregrine falcon	*Falco peregrinus anatum*	Recovery
Birds	Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Birds	Swainson's hawk	*Buteo swainsoni*	Resolved Taxon
Birds	Southern white-tailed ptarmigan	*Lagopus leucura altipetens*	Resolved Taxon
Flowering Plants	Western prairie fringed orchid*	*Platanthera praeclara*	Threatened
Insects	Monarch butterfly	*Danaus plexippus*	Candidate
Mammals	Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Threatened
Mammals	American pika	*Ochotona princeps*	Resolved Taxon
Mammals	Long-legged myotis	*Myotis volans*	Species of Concern
Mammals	Little brown bat	*Myotis lucifugus*	Under Review
Mammals	North American wolverine	*Gulo gulo luscus*	Resolved Taxon
Mammals	Long-eared myotis	*Myotis evotis*	Species of Concern
Mammals	Canada lynx	*Lynx canadensis*	Threatened

Source: US Fish & Wildlife Service ECOS

*These species do not occur in Colorado, however water resources which originate in Colorado can suffer depletions which affect the viability of downstream species such as these.

4.3 Avalanche

AVALANCHE HAZARD RANKING	
Gilpin County	Low
City of Black Hawk	Low
City of Central City	Low
Timberline Fire Protection District	Low

4.3.1 Description

Avalanches can occur whenever a sufficient depth of snow is deposited on slopes steeper than approximately 20 degrees, with the most dangerous coming from slopes in the 35- to 40- degree range. Avalanche-prone areas can be identified with some accuracy, since they typically follow the same paths year after year, leaving scarring on the paths. However, unusual weather conditions can produce new paths or cause avalanches to extend beyond their normal paths.

In the spring, warming of the snowpack occurs from below (from the warmer ground) and above (from warm air, rain, and other sources). Warming can be enhanced near rocks or trees that transfer heat to the snowpack. The effects of a snowpack becoming weak may be enhanced in steeper terrain where the snowpack is shallow, and over smooth rock faces that may focus meltwater and produce "glide cracks." Such slopes may fail during conditions that encourage melt.

Wind can affect the transfer of heat into the snowpack and associated melt rates of near-surface snow. During moderate to strong winds, the moistening near-surface air in contact with the snow is constantly mixed with drier air above through turbulence. As a result, the air is continually drying out, which enhances evaporation from the snow surface rather than melt. Heat loss from the snow necessary to drive the evaporation process cools off near-surface snow and results in substantially less melt than otherwise might occur, even if temperatures are well above freezing.

When the snow surface becomes uneven in spring, air flow favors evaporation at the peaks, while calmer air in the valleys favors condensation there. Once the snow surface is wet, its ability to reflect solar energy drops dramatically; this becomes a self-perpetuating process, so that the valleys deepen (favoring calmer air and more heat transfer), while more evaporation occurs near the peaks, increasing the differential between peaks and valleys. However, a warm wet storm can quickly flatten the peaks as their larger surface area exposed to warm air, rain or condensation hastens their melt over the sheltered valleys.

Avalanches can reach speeds of up to 200 miles per hour and can exert forces great enough to destroy structures and uproot or snap off large trees. Avalanche paths consist of a starting zone, a track, and a runout zone. The runout zone is often an attractive setting for development.

Avalanche hazards occur predominantly in the mountainous regions of Colorado above 8,000 feet. The 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 (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 (CAIC) in an average winter. More than 80 percent of these occur during or just after large snowstorms.

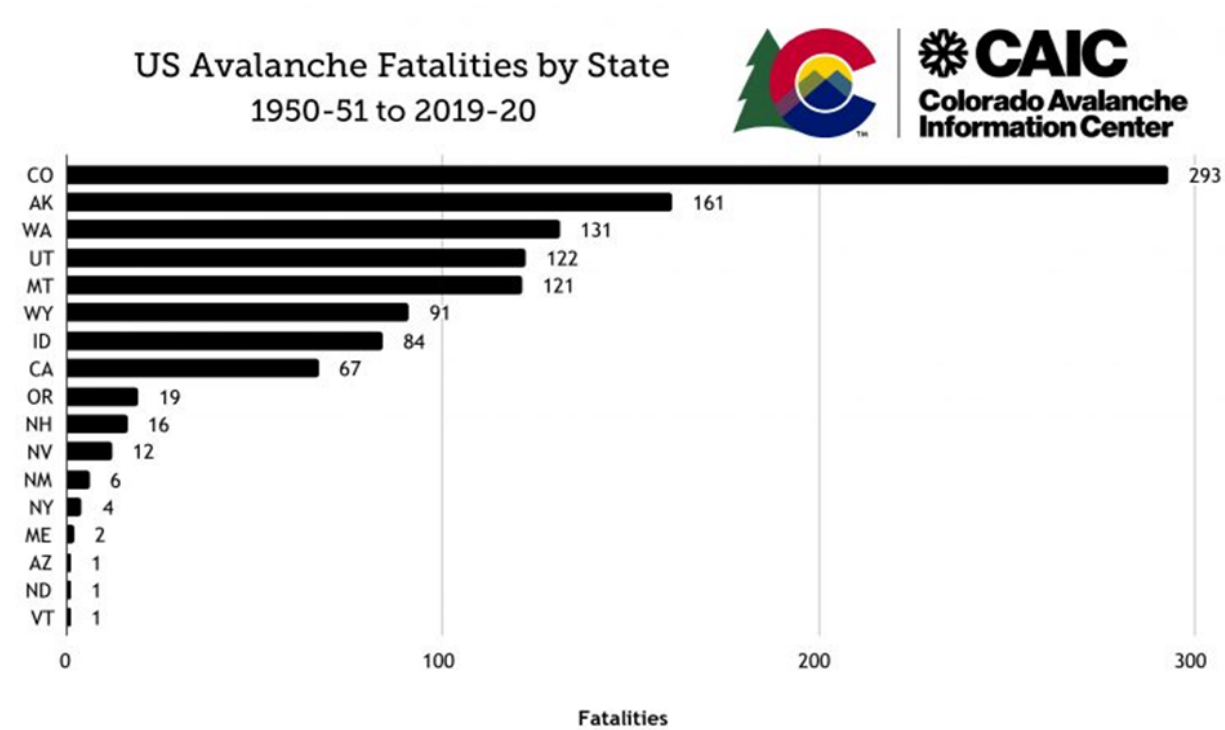
According to the CAIC, avalanches have killed more people in Colorado than any other natural hazard, and Colorado accounts for one-third of all avalanche deaths in the United States. Avalanche forecasts were first issued by the Colorado Avalanche Warning Center in 1973. The program was originally part of a federal research program but has been a part of the Colorado State government since 1983. The CAIC is now a program within the Colorado Department of Natural Resources (DNR), Executive Director's Office. The program is a partnership between the DNR, Colorado Department of Transportation (CDOT), and the Friends of the CAIC (FoCAIC) a 501(c)3 group. The mission of the CAIC is to provide avalanche information and education and to promote research for the protection of life, property, and the enhancement of the state's economy (CAIC no date).

4.3.2 Past Events

According to the CAIC, an average of 27 people have died each year in avalanches in the United States over the past ten winters. Most fatal incidents are investigated and reported; however, non-fatal incidents are likely to go unreported (CAIC). Colorado has recorded the greatest number of fatalities due to avalanches of all states in the United States, with a total of 293 fatalities in Colorado since 1951, as shown in Figure 4-4.

Although infrequent, avalanches do occur periodically in the planning area. Generally, avalanches in Gilpin County are relatively minor; the CAIC does not have records of any significant avalanches in the County. There has been no recorded deaths or serious injuries attributable to avalanches in Gilpin County during the timeframe of 1950-2020.

Figure 4-4 Avalanche Fatalities by State, 1950-51 to 2019-20



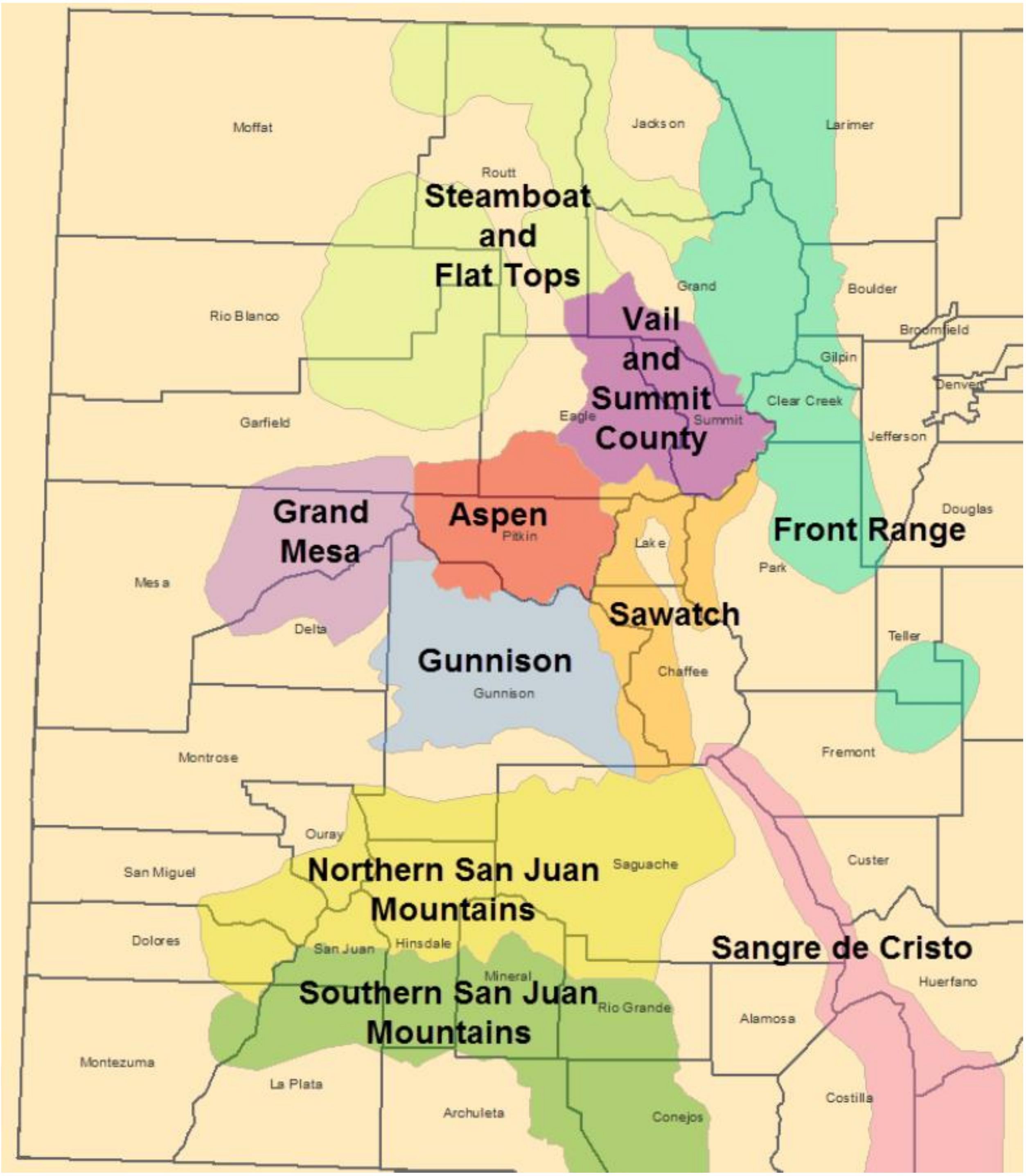
Source: CAIC Website (http://avalanche.state.co.us/accidents/statistics-and-reporting/)

4.3.3 Location

The spatial extent exposed to avalanche risk is **significant**. Figure 4-5 shows the CAIC forecast zones in Colorado; as shown, the western half of the County is in the Front Range Zone. The Cities of Black Hawk and Central City are at lower risk of avalanche because of their lower elevation, topography and location east of the Front Range Zone.

There is no mapped avalanche risk zone information available for Gilpin County. The James Peak Wilderness accessed near the Moffat Tunnel is popular with backcountry skiers and has slopes that could be prone to avalanche.

Figure 4-5 Avalanche Forecast Zones in Colorado



Source: CAIC

4.3.4 Magnitude and Severity

The potential severity of most avalanches in Gilpin County is **minor**. There is no record of avalanches resulting in significant injuries or damages in Gilpin County. While the risk for recreational users can be high, the risk to developed areas is minimal.

A number of weather and terrain factors determine avalanche severity and danger:

- Weather:
  - Storms—A large percentage of all snow avalanches occur during and shortly after storms.
  - Rate of snowfall—Snow falling at a rate of 1 inch or more per hour rapidly increases avalanche danger.
  - Temperature—Storms starting with low temperatures and dry snow, followed by rising temperatures and wetter snow, are more likely to cause avalanches than storms that start warm and then cool with snowfall.
  - Wet snow—Rainstorms or spring weather with warm, moist winds and cloudy nights can warm the snow cover, resulting in wet snow avalanches. Wet snow avalanches are more likely on sun-exposed terrain (south-facing slopes) and under exposed rocks or cliffs.
- Terrain:
  - Ground cover—Large rocks, trees, and heavy shrubs help anchor snow.
  - Slope profile—Dangerous slab avalanches are more likely to occur on convex slopes.
  - Slope aspect—Leeward slopes are dangerous because windblown snow adds depth and creates dense slabs. South-facing slopes are more dangerous in the springtime.
  - Slope steepness—Snow avalanches are most common on slopes of 30 to 45 degrees.

The common factors contributing to the avalanche hazard are old snow depth, old snow surface, new snow depth, new snow type, density, snowfall intensity, precipitation intensity, settlement, wind direction and speed, temperature, and subsurface snow crystal structure.

Avalanches can result in injury, death and limited property damage in the County. Closure of major roads or rail lines in the County due to avalanche activity can result in serious transportation disruptions as well as limited emergency response capabilities due to the limited number of roads in the County and minimal personnel. Backcountry avalanche incidents involve search and rescue teams and resources, which can put these personnel in areas of risk.

The Steering Committee members assessed the avalanche severity impact in three categories: impact on people, impact on property, and impact on the local economy. The severity of the avalanche hazard in the County is considered to be minimal, limited to backcountry areas; minimal property damage that does not threaten structural stability; and no interruption of essential facilities and services. Based on the information in this hazard profile, the magnitude/severity impact of an avalanche for Gilpin County and Cities of Black Hawk and Central City is low.

The time of an avalanche release depends on the condition of the snowpack, which can change rapidly during a day and particularly during rainfall. Although forecasts can provide information regarding when avalanches are more likely to occur, an avalanche can occur with little or no warning time.

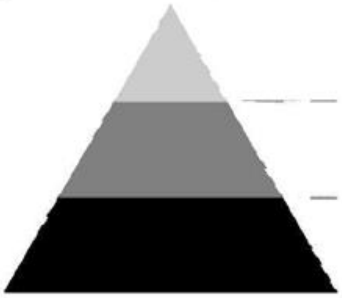
CAIC issues watches and warnings by zone to communicate avalanche danger levels to those recreating in backcountry areas. An example of this forecast for the Front Range area is shown in Figure 4-6. The North American Danger Scale, which ranges from low to extreme danger is shown in Figure 4-7.

Figure 4-6 Sample Front Range Avalanche Danger Forecast

CAIC Colorado Avalanche Information Center

Backcountry Avalanche Forecast
Front Range

Thursday, September 4, 2014 at 10:38 AM Issued by: Spencer Logan



	Today	Tomorrow
Above Treeline	**Moderate (2)** Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully.	
Near Treeline	**Moderate (2)** Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully.	
Below Treeline	**Moderate (2)** Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully.	

Danger Scale

—	1	2	3	4	5
No Rating	Low	Moderate	Considerable	High	Extreme

Summary

The areas around Loveland and Berthoud Passes picked up a few inches of very dense, slushy snow. An observer reported a period of heavy rain in Dillon Saturday evening. Overnight temperatures were near freezing, with the freeze level around 10,500 feet. The snowpack will be soggy and weak today. Travel early and avoid steep slopes in the heat of the day.

You may encounter Loose Wet avalanches on all aspects and elevations today. They will be easiest to trigger when you are sinking more than a few inches into wet, sloppy snow. If you are, it is time to move to low angled terrain or shadier slopes. They can be surprisingly strong and powerful for their size, and drag you over cliffs or pound you into rocks.

Overnight temperatures have been near or above freezing since Friday. Saturday's rain and dense snow added additional water to the snowpack. These are warning signs for Wet Slab avalanche activity. Observers have reported several wet slabs, scattered from Cameron Pass to Ten Mile Canyon. Wet Slab avalanches are very hard to assess and predict. With that uncertainty, choosing conservative routes and lower angled terrain are good options.

Vail Resorts has put up $20,000 to support Friends of CAIC's Stay Informed, Stay Alive Challenge. Help match that $20,000 today! Donate now.

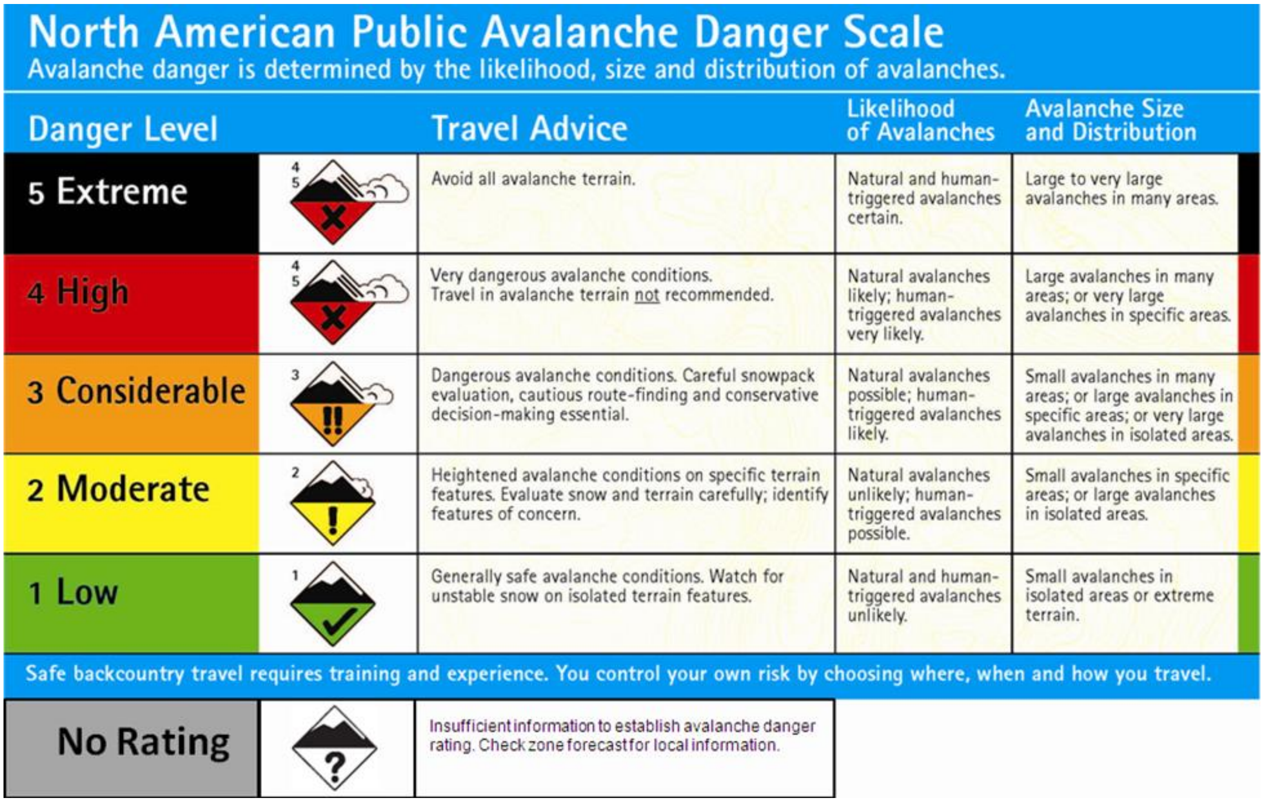
Weather Forecast for 11,000ft Issued Thursday, September 4, 2014 at 10:38 AM by Spencer Logan

	Thursday Night	Friday	Friday Night
Temperature (ºF)	35 to 40	50 to 55	35 to 40
Wind Speed (mph)	5 to 15	5 to 15	8 to 18
Wind Direction	WSW	WSW	SW
Sky Cover	Mostly Cloudy	Mostly Cloudy	Mostly Cloudy
Snow (in)	0	0	0

Avalanche conditions can change rapidly during snow storms, wind storms, or rapid temperature change. For the most current information, go to www.colorado.gov/avalanche.

Source: CAIC Website (http://avalanche.state.co.us/forecasts/backcountry-avalanche/front- range/)

Figure 4-7 Avalanche Danger Scale



North American Public Avalanche Danger Scale

Avalanche danger is determined by the likelihood, size and distribution of avalanches.

Danger Level	Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme	Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High	Very dangerous avalanche conditions. Travel in avalanche terrain not recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable	Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate	Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low	Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.

No Rating	Insufficient information to establish avalanche danger rating. Check zone forecast for local information.

Source: CAIC Website (http://avalanche.state.co.us/wp-content/uploads/2013/09/ads.jpg.)

4.3.5 Probability of Future Occurrence

Based on the information noted under the Past Events section, in the past 71 years there have been no recorded fatalities or serious injuries in Gilpin County from avalanches. While avalanches will continue to occur in the backcountry, the probability of one causing death, injury, or significant impacts is possible but **unlikely**.

4.3.6 Climate Change Considerations

Unlike other phenomena such as tropical storms, snow avalanches are rarely used as indicators of climate change. The effects of climate change on avalanche frequency and magnitude are uncertain and will likely be dependent on local climate change impacts, such as changes in snow fall events and temperature series. Some studies have indicated that the types of avalanche events (wet or dry) may shift as a result of changes in snow cover (Martin et al. 2001). Avalanches, however, are not influenced by snow cover alone, but several interrelated factors including forest structure, surface energy balance, melt water routing, precipitation, air temperature, and wind (Teich et al. 2012; Eckert 2009; and Lazar and Williams 2008).

Secondary and tertiary impacts of climate change may also alter avalanche events. For example, climate change may modify the distribution of arboreal species across mountain landscapes. Some case studies in the Swiss and French Alps indicate that climate change impacts may reduce the frequency or severity of such events, while other assessments indicate that events may occur more frequently in other mountain regions (Kohler 2009; Teich et al. 2012; and Eckert 2009). No studies assessing the relative frequency and severity of avalanches in the Colorado Rocky Mountain Range were located, but an analysis of wet avalanche hazards in an Aspen ski area indicated that such effects may occur more frequently under high emissions scenarios (Lazar and Williams 2008). Feedback loops affecting snow cover, forest structure, meteorological norms, and land use planning decisions are all likely to influence the future frequency and severity of impacts from avalanche events.

4.3.7 Vulnerability

In general, everything that is exposed to an avalanche event is vulnerable. As more people work, build, and recreate in mountain communities, there will be more people exposed to avalanche hazard areas. These individuals may have little experience with, caution regarding, or preparation for avalanche conditions. The increasing development of recreational sites in the mountains brings added exposure to the people using these sites and the access routes to them. The risk to human life is especially great at times of the year when rapid warming follows heavy, wet snowfall.

The major issues of concern in the event of an avalanche are the threat to recreational users and property and the possibility of disruptions to the electrical grid network. According to CDOT during the 2011-2012 winter there were 332 hours of road closures due to avalanche control, resulting in a total of 13,221 feet of snow covering the centerline of the roadway. These roads were closed a total of 370 hours. There is no effective way to keep the public out of avalanche-prone recreational areas, even during times of highest risk. A coordinated effort is needed among state, County, and local law enforcement, fire, emergency management, public works agencies and media to better provide winter snowpack and avalanche risk information to the public.

People

The greatest impact from an avalanche is to mountain communities in the Front Range Mountains as well as Colorado State Highway 119. However, avalanches are also a danger to hikers, mountain bike riders, and others involved in outdoor sports in these areas. The populations of the Cities of Black Hawk and Central City are unlikely to be affected by avalanches.

Property

Avalanche exposure in the County is minimal. Property and buildings within runout areas are exposed, but of the approximate 4,574 buildings in Gilpin County, most are not in avalanche runout areas. Property located within the Cities of Black Hawk and Central City are unlikely to be significantly impacted by an avalanche.

Critical Facilities and Infrastructure

It is unlikely that there are critical facilities exposed to avalanche hazards, although there may be some facilities exposed in mountain communities. The Union Pacific railroad through Gilpin County could potentially be vulnerable to backcountry avalanches. An avalanche blocking any portion of the tracks or the entrances to the Moffat Tunnel would prevent any rail transportation on this network until the blockages are cleared. There is a small amount of road infrastructure that could be blocked by avalanches, such as Colorado State Highway 119.

Government Services

Unplanned closure of Highway 119 or other major transportation routes due to an avalanche event can prevent emergency services vehicles from being able to reach people in need or be able to take them to hospital to receive medical help.

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. Closures of transportation routes into or out of the County could prevent the import and export of goods and services and economic losses for businesses, as well as disrupt tourism.

Historic, Cultural, and Natural Resources

Avalanches are a natural event, but they can negatively affect the environment. This includes trees located on steep slopes. A large avalanche can knock down many trees and kill the wildlife that live in them. In spring, this loss of vegetation on the mountains may weaken the soil, causing landslides and mudflows. If significant woody debris reaches the valley bottoms this could cause a potential for ponding and flooding. The impact on historic or cultural resources in the County is unknown

4.3.8 Development Trends

Future trends in development cannot be determined until the avalanche hazard areas are accurately mapped. The population of Gilpin County is increasing and some of this new development may be occurring in avalanche hazard areas.

4.3.9 Risk Summary

A national program to rate avalanche risk has been developed to standardize terminology and provide a common basis for recognizing and describing hazardous conditions. The avalanche danger scale relates degree of avalanche danger (low, moderate, considerable, high, extreme) to descriptors of avalanche probability and triggering mechanism, degree and distribution of avalanche hazard, and recommended action in backcountry. Avalanche danger scale information should be explained to the public and made available through appropriate county and local agencies and the media.

Measures that have been used in other jurisdictions to reduce avalanche threat include monitoring timber harvest practices in slide-prone areas to ensure that snow cover is stabilized as well as possible, and encouraging reforestation in areas near highways, buildings, power lines, and other improvements. The development of a standard avalanche report form, and the maintenance of a database of potential avalanche hazards likely to affect proposed developments in mountain wilderness areas, would be of significant value to permitting agencies.

- The overall significance of this hazard for the County is **Low**.
- Since 1950 there have been 0 recorded fatalities or injuries in the County from avalanches.
- Backcountry recreationalists, road crews, and motorists along the main roadways are the most at risk to avalanche dangers. Human-caused avalanches are most common cause of events.
- The Cities of Black Hawk and Central City have very limited avalanche exposure.
- Related hazards: Winter Storm, Severe Wind, Drought.

4.4 Dam Failure

DAM FAILURE HAZARD RANKING	
Gilpin County	Low
City of Black Hawk	Low
City of Central City	Low
Timberline Fire Protection District	Low

4.4.1 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.

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 development and infrastructure located downstream.

Non-Failure Incidents

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.

Low Head Dams

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. There is one low head dam in the County, which is used as a diversion or grade control structure; its location is shown in Figure 4-9.

4.4.2 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 US 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.

Levees

The United States Multi-Hazard (Hazus-MH) database and the US Army Corp of Engineers (USACE) National Levee Database list no known levees in Gilpin County.

4.4.3 Past Events

According to the Association of State Dam Safety Officials, there have been no reported dam failures in Gilpin County.

Colorado has a history of dam failure, with more than 130 known dam failures since 1890. A number of dams were breached in September 2013, but none were reported in Gilpin County. According to the State Engineer's 26th Annual Report on Dam Safety to the Colorado General Assembly Fiscal Year 2010-11 and Engineer's 27th Annual Report on Dam Safety to the Colorado General Assembly Fiscal Year 2011-12, no jurisdictional dam failures occurred in Colorado in water year 2010-2011 or water year 2011-2012. Fourteen dam safety incidents were logged for the same time period statewide. Dam safety incidents are defined as situations at dams that require an immediate response by dam safety engineers.

Incidents also included on the water year 2011-2012 list were associated with the large and damaging wildfires that occurred, particularly the High Park Fire and the Waldo Canyon Fire. These fires were tracked to ensure no damage would occur on dams within or near the fire areas.

4.4.4 Location

Dam data is from the Colorado Division of Water Resources (CDWR) Dam Safety Branch. The data lists 28 dams in the County and classifies dams based on the potential hazard to the downstream area resulting from failure or mis-operation of the dam or facilities:

- **High Hazard Potential:** Probable loss of life (one or more).
- **Significant-Hazard Potential:** No probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns; often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- **Low-Hazard Potential:** No probable loss of human life and low economic or environmental losses; losses are principally limited to the owner's property.

It is important to keep in mind that the hazard classification of a dam is a measure of the consequences if the dam were to fail, not a measure of how likely the dam is to fail. Based on these classifications, there is one high hazard dam and no significant-hazard dams in Gilpin County. There are nine total dams in Gilpin County (eight are considered low-hazard potential). Table 4-11 lists the one high hazard dam in Gilpin

County, Chase Gulch Dam, which is located north of Central City as shown in Figure 4-8. If a breach of the dam were to occur, the water would flow east towards Black Hawk, located approximately two miles away.

According to the Chase Gulch Dam Emergency Plan, July 2015 provided by the CDWR, a sudden failure of Chase Gulch Dam is anticipated to travel down Chase Gulch with flow depths around 13 to 14 feet to the confluence with North Clear Creek. The floodwave is anticipated to reach Black Hawk within 1.5 hours from dam breach inundation. The dam was last inspected on August 20, 2020, and received a Satisfactory rating from CDWR.

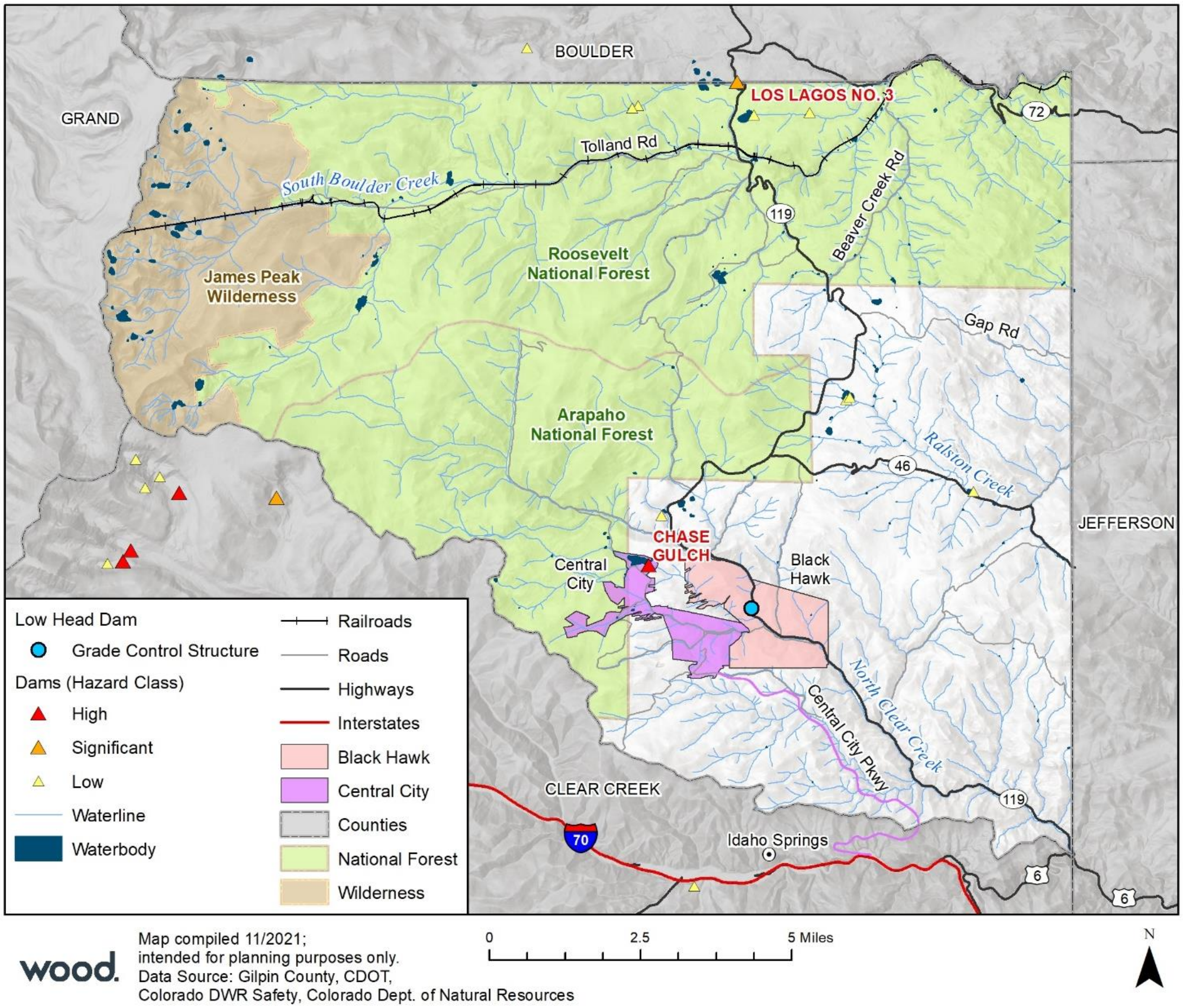
Table 4-11 High Hazard Dam in Gilpin County

Name	Stream	Downstream City	Town Distance (Miles)	Max Storage (Acre-Feet)	Hazard Class
Chase Gulch Dam	Chase Gulch	Black Hawk	2	8,748	High

Source: CDWR

There are an uncounted number of 'non-jurisdictional' dams on public and private lands in the County. These are small dams that normally do not store water but may impound water during heavy precipitation events. Because they are not monitored or maintained, there is potential for them to overtop or fail and cause flooding and property damage during a significant rainfall event. The extent and risk associated with these dams is not known.

Figure 4-8 Location of Chase Gulch Dam in Gilpin County



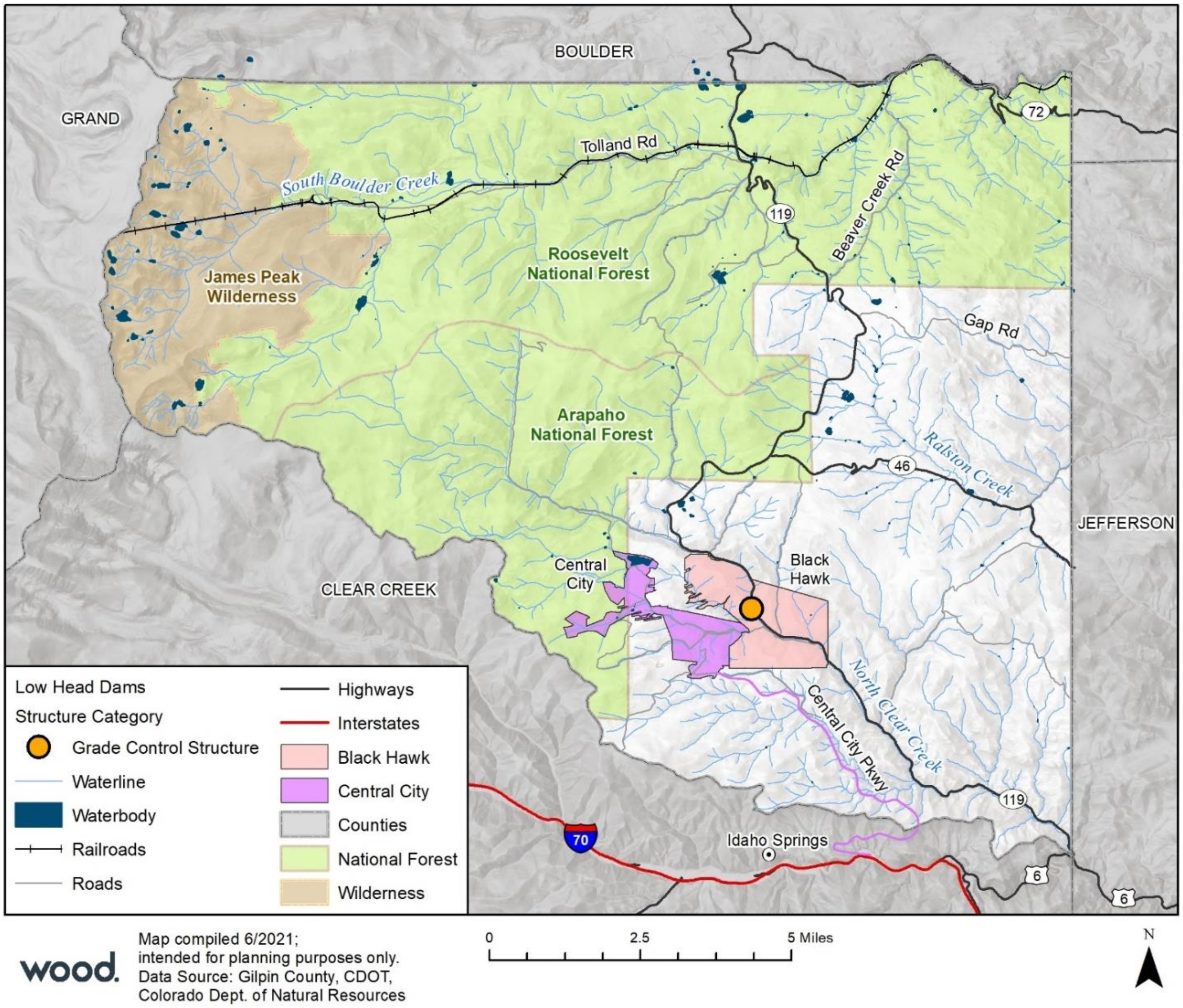
Non-Failure Dam Incidents

The Colorado DNR has a statewide database that identifies the potential for non-failure dam inundation 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.

Low Head Dams

The one low head dam in Gilpin County is used as grade control structure on North Clear Creek. Figure 4-9 shows the location of the dam.

Figure 4-9 Location of Low Head Dams in Gilpin County



4.4.5 Magnitude and Severity

As noted above, the dam 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 reflects common occurrence. There is no event of record for Gilpin 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.

There have been no recorded occurrences of dam failures in Gilpin County in the past 80 years. According to the National Performance of Dams Program Database from Stanford University, there has been one non-failure dam incident in 2013 in Gilpin County.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property located in the inundation area (downstream). A failure of any dam in Gilpin County would further impact the dams and cities of the Denver Metropolitan area located further downstream. Figure 4-10 and Figure 4-11 below show the extent of expected dam inundation in the County and Cities in the event of a breach of one of the upstream dams.

Figure 4-10 Gilpin County Dam Inundation Limits

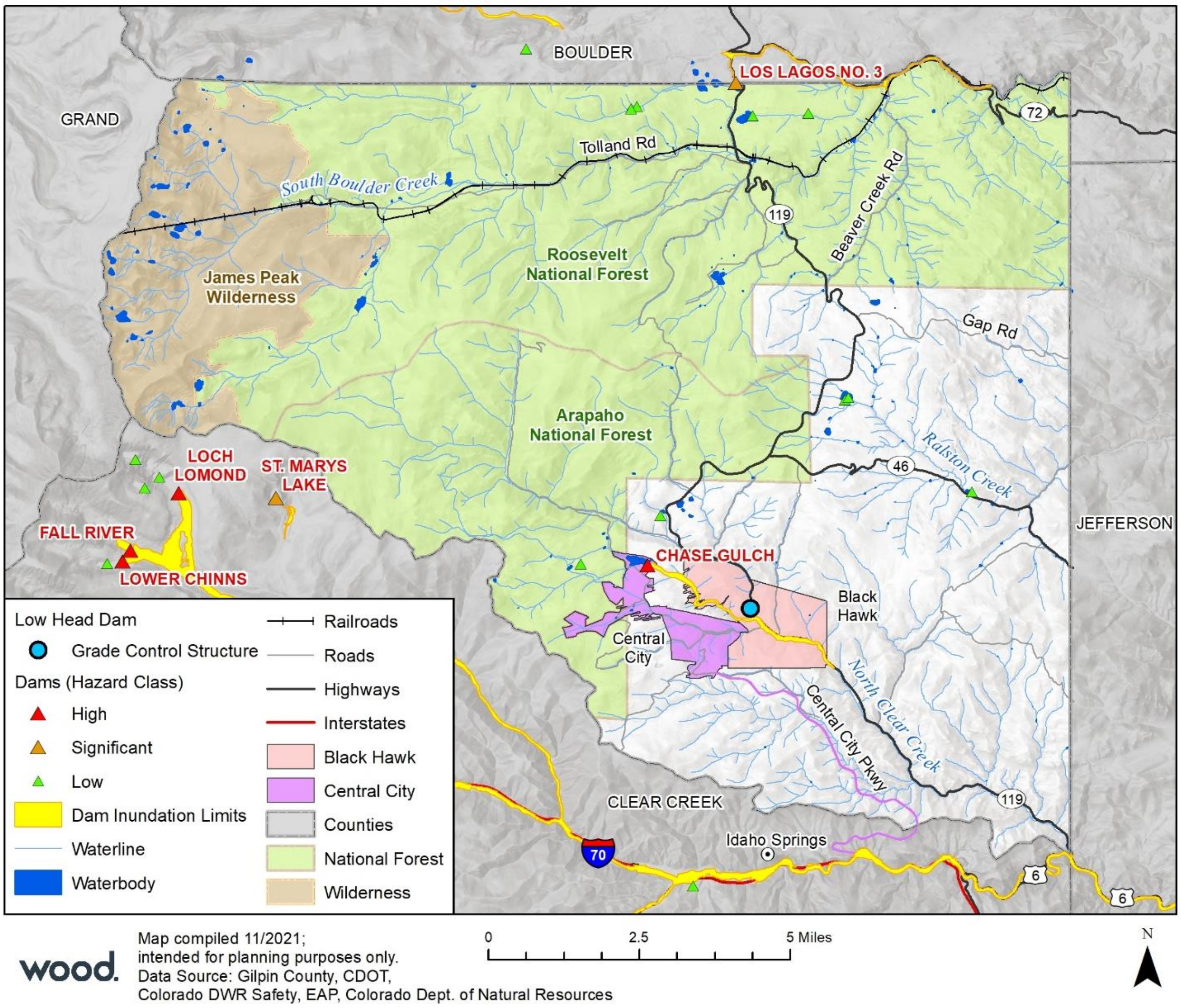
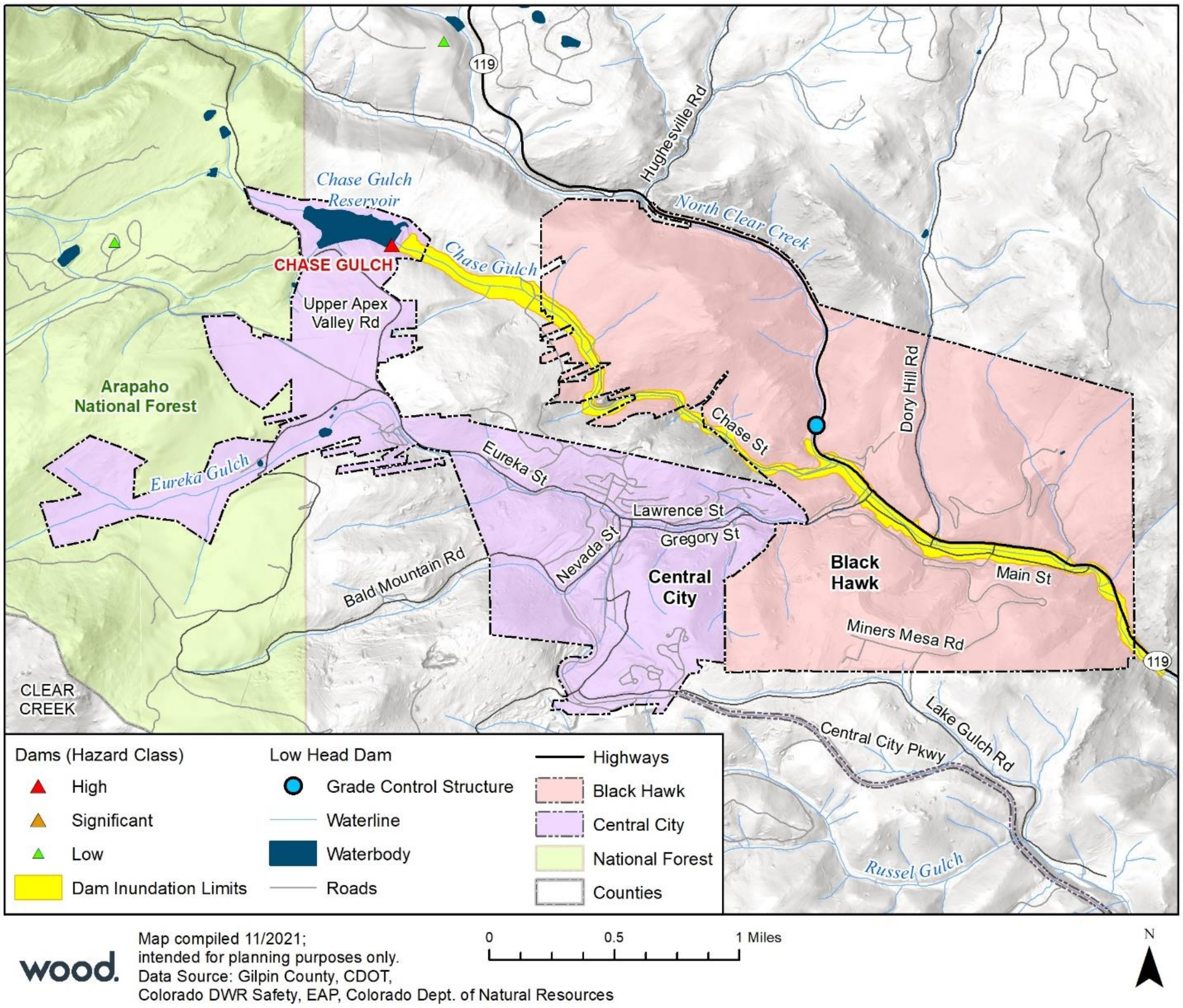


Figure 4-11 Black Hawk and Central City Dam Inundation Limits



4.4.6 Probability of Future Occurrences

The probability of future occurrences is unlikely. There have been no dam failures recorded in Gilpin County, and only one reported non-failure incidents over a 65-year period. This results in an approximate 2% chance of a dam incident in any given year. Therefore, the probability of a failure or incident in the future is minimal.

4.4.7 Climate Change Considerations

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. With a potential for increase 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 or result in potential for releases of flows or spillway overflow events.

4.4.8 Vulnerability

Structures, above-ground infrastructure, critical facilities, and natural environments are all vulnerable to dam failure. With no known failures in the past, failure impacts would likely be limited in Gilpin County.

Roads closed due to dam failure floods could result in serious transportation disruptions due to the limited number of roads in the County.

Population

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.

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 DNR, Dam Safety Division, in recent years Colorado has experienced one fatality annually and there have been a total of thirteen 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 Gilpin 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. There are an estimated 67 structures within the Chase Gulch Dam inundation area, summarized in Table 4-12. 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. Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues. This includes all roads, railroads, and bridges in the path of the dam inundation. 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.

Table 4-12 Properties Exposed to Dam Inundation within Gilpin County

Jurisdiction	Property Type	Improved Parcels	Building County
Black Hawk	Commercial	23	27
	Exempt	4	6
	Residential	19	22
	Total	**46**	**55**
Unincorporated County	Residential	10	12
	Total	**10**	**12**
	Grand Total	**56**	**67**

Source: Gilpin County Assessor, Colorado Department of Water Resources (DWR) Dam Safety

Critical Facilities and Infrastructure

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 31 critical facilities throughout the County which lie within dam inundation areas. 28 of these facilities are within inundation areas from the Chase Gulch Dam, which is the only high hazard dam located in Gilpin County. Several other facilities and their respective inundation areas are located outside of Gilpin County. For instance, a fire suppression water source and helispot, are located in neighboring Boulder and Clear Creek counties. While not located within Gilpin County these critical facilities may still have impacts on the County in response efforts to wildfire events. 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).

Table 4-13 Gilpin County Critical Facilities Exposed to Dam Inundation Areas

Dam Name	FEMA Lifeline	Jurisdiction	Facility Type	Count
Chase Gulch Dam	Communications	Black Hawk	Land Mobile Private Tower	6
	Food, Water, Shelter	Black Hawk	Casino	13
	Hazardous Material	Black Hawk	Tier II	1
	Safety and Security	Black Hawk	Fire Station / EMS Station	1
		Black Hawk	Post Office	1
	Transportation	Black Hawk	Bridge Non-Scour Fair Condition	4
		Black Hawk	Bridge Non-Scour Good Condition	2
			Total	28
Clear Creek Dam, Lower and Upper Cabin Creek Dams	Transportation	Clear Creek County	Helispot	1
			Total	1
Los Lagos No. 3 Dam	Food, Water, Shelter	Boulder County	Fire Suppression Water Source	1
	Transportation	Gilpin County	Bridge Non-Scour Good Condition	1
			Total	2
			Grand Total	31

Source: HIFLD, Wood GIS Analysis

Economy

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. Due to only one high hazard dam located in Gilpin, any economic impacts would likely be short term.

Historic, Cultural and Natural 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 or bank erosion on the rivers. The inundation could introduce many foreign elements into local waterways, potentially causing the destruction of downstream habitats.

4.4.9 Development Trends

The vulnerability to dam failure could increase if development occurs in inundation areas downstream of dams. Black Hawk casino development is increasing near the Chase Gulch inundation area and may be increasing risk. 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.

4.4.10 Risk Summary

- The overall significance of this hazard for the County is **Low**.
- 67 structures and 31 critical facilities are located within dam inundation areas.
- While an incident or failure is a low probability, the presence of one high hazard dam does pose a risk, specifically to Black Hawk and portions of the unincorporated county and Hwy 119 corridor.
- 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).
- Related hazards: Flooding, Earthquake, Landslide, Erosion.

4.5 Dense Fog

DAM FAILURE HAZARD RANKING	
Gilpin County	Medium
City of Black Hawk	Low
City of Central City	Low
Timberline Fire Protection District	Medium

4.5.1 Description

Fog is a natural phenomenon which occurs when a thick cloud made of water droplets condenses at or near the Earth's surface. It is formed when the difference between air temperature and the dew point, the temperature to which air must be cooled in order to become saturated with water, is less than 4°F. When fog forms in populated areas, it can greatly reduce or restrict the line of sight, making driving and aviation extremely dangerous. Fog obstructs visibility depending on how densely packed the water vapor is within the cloud. Fog is often accompanied by light rain or light snowfall. Each year, fog is responsible for numerous transportation accidents. Though typically minor, accidents can result in serious injuries, and even death.

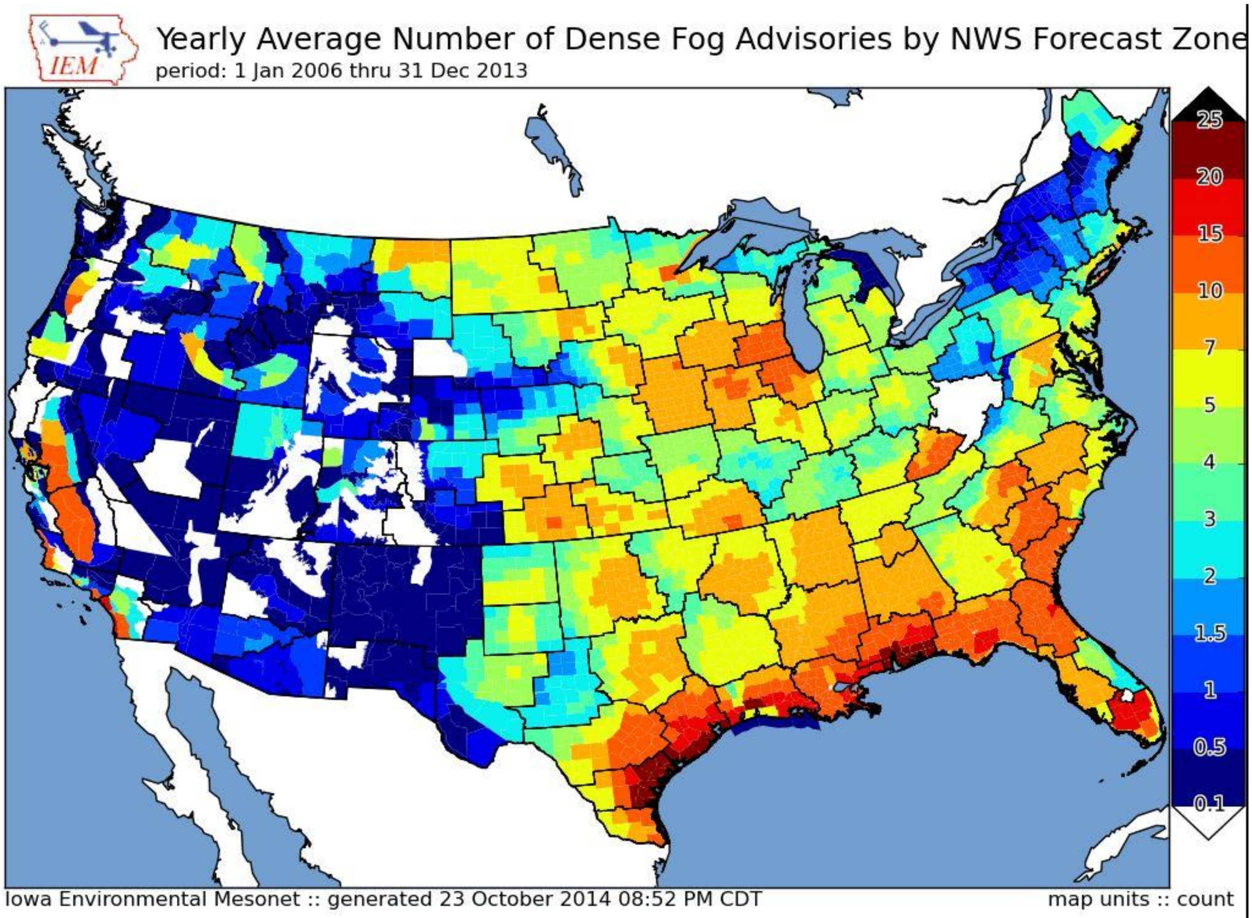
4.5.2 Past Events

According to the NCEI database, there has been no reported instances of dense fog in Gilpin County resulting in death, injury, or property damages. However, since this database does not fully take into account traffic accidents resulting from heavy fog and that not every instance of heavy fog results in an impact, it is reasonable to assume that this hazard occurs far more likely than is reported. According to the HMPC, dense fog in Gilpin County occurs annually.

4.5.3 Location

Fog typically forms in low-lying areas and valleys, where the geography allows it to condense. Oftentimes this will occur at night as the cool air from the mountains will descend rapidly due to being thinner and drier at high altitudes. When there is moisture present within the valley below, this cool, sinking air can cause the condensation of water vapor and create fog. Figure 4-12 shows the yearly average number of dense fog advisories issued by the National Weather Service (NWS). Gilpin County as a whole is on the lower end of the scale in the state of Colorado; however, instances of dense fog do occur. Based on this information the spatial extent rating for the county is **significant**, affecting less than half of the county at any given time and largely concentrated to the mountain valleys.

Figure 4-12 Nationwide Yearly Average of Dense Fog Advisories, 2006 to 2013



4.5.4 Magnitude and Severity

The National Weather Service provides resources and descriptions for several different types of fogs that can form. In the event that dense fog forms, the National Weather Service will issue a Dense Fog Advisory, or a Freezing Fog Advisory if temperatures are at or below freezing. Advisories, unlike watches and warnings, are only issued when there is an event already in progress. Dense Fog Advisories are broadcast on local radio and television channels, alerting the public to the threat.

The following are descriptions from the National Weather Service for how and when advisories are issued:

> A **Dense Fog Advisory** is issued by your local National Weather Service office when widespread dense fog develops. When this happens, visibilities frequently drop to one-quarter of a mile or less. These conditions make travel difficult. Take extra caution when on the road or avoid driving if possible.
>
> A **Freezing Fog Advisory** is issued by your local National Weather Service office when fog develops and surface temperatures are at or below freezing. The tiny liquid droplets in the fog can freeze instantly to any surface, including vehicles and road surfaces. Freezing fog makes driving, boating, flying and other forms of transportation particularly hazardous. Visibilities are typically at or below 1 mile.

Fog can contribute to transportation accidents and is a significant life safety hazard. These accidents have the potential to cause multiple injuries and deaths and could have serious implications for human health and the environment if a hazardous or nuclear waste shipment were involved. Other disruptions from fog include delayed emergency response vehicles and school closures. Based on this information and the rapid onset of dense fog, the severity rating for the county is **moderate**.

4.5.5 Probability of Future Occurrences

While there have been no reported instances of fog resulting in damages, injury, or death in Gilpin County, dense fog does occur often. According to the HMPC, dense fog occurs annually and is most commonly observed in the spring and fall months. Based on this information, the probability of future occurrences for dense for is **highly likely** in Gilpin County.

4.5.6 Climate Change Considerations

According to the Colorado State Hazard Mitigation Plan and best data available at the time of this plan update, the future impacts of climate change are not expected to influence future dense fog events in Colorado (FEMA 2017; Garfin et al. 2013; Lukas et al. 2014, and Childress et al. 2015).

4.5.7 Vulnerability

Population

The greatest vulnerability to people is reduced visibility that results from dense fog. Particularly when fog is dense, it can be hazardous to drivers, boaters, and aviators and contributes to numerous accidents each year. The majority of the County’s population and its most important transportation routes are all located in the low-lying valleys where dense fog is more common. To reduce injury and harm, people should avoid driving when dense fog is prevalent, if possible. If driving is pertinent, the National Weather Service provides several tips for ensuring safety while driving:

- Slow down and allow extra time to reach your destination.
- Make your vehicle visible to others both ahead of you and behind you by using your low beam headlights since this means your taillights will also be on. Use fog lights if you have them.
- Never use your high-beam lights. Using high beam lights causes glare, making it more difficult for you to see what’s ahead of you on the road.
- Leave plenty of distance between you and the vehicle in front of you to account for sudden stops or changes in the traffic pattern.
- To ensure you are staying in the proper lane, follow the lines on the road with your eyes.
- In extremely dense fog where visibility is near zero, the best course of action is to first turn on your hazard lights, then simply pull into a safe location such as a parking lot of a local business and stop.
- If there is no parking lot or driveway to pull into, pull your vehicle off to the side of the road as far as possible. Once you come to a stop, turn off all lights except your hazard flashing lights, set the emergency brake, and take your foot off of the brake pedal to be sure the tail lights are not illuminated so that other drivers don't mistakenly run into you.

Property

The primary effects of fog are not likely to result in significant or measurable damages to physical property. The scenarios in which this could occur would typically be covered by insurance.

Critical Facilities and Infrastructure

Fog can have serious impacts on transportation corridors in the County. Multi-car pileups can result from drivers using excessive speed for the conditions and visibility. These accidents can cause multiple injuries and deaths and could have serious implications for human health and the environment if a hazardous or nuclear waste shipment were involved. Other disruptions from fog include delayed emergency response vehicles and school closures.

Economy

The most likely economic impacts from dense fog would be the result of road closures or decreased tourism traffic from travel impacts. Any losses that could result from traffic accidents would likely be covered by insurance.

Historic, Cultural, and Natural Resources

Dense fog is a naturally occurring environmental process that has no negative impact on the health or availability of natural resources. Similarly, historic and cultural resources are not particularly vulnerable to dense fog.

4.5.8 Development Trends

Dense fog will continue to remain an issue for the foreseeable future, and is not likely to change in the near future. Therefore, it is important to understand how the future population of Colorado will be affected by this hazard and to properly communicate to the public risk and measures to improve safety.

4.5.9 Risk Summary

- The overall significance of this hazard for the County is **Low**.
- Dense fog in Gilpin County mostly occurs in the spring and fall months.
- There have been no reported incidents causing death or injury in the county, however dense fog occurs multiple times a year and will continue to present some level of risk.
- Transportation lifelines are the most vulnerable critical facility sector due to the risk for traffic incidents and road closures.
- Emergency service response times can be impacted by dense fog.
- Related hazards: Hazardous materials, transportation incidents, winter storm, hail.

4.6 Drought and Extreme Heat

DROUGHT AND EXTREME HEAT HAZARD RANKING		
	Drought	**Extreme Heat**
Gilpin County	High	Medium
City of Black Hawk	Low	Low
City of Central City	High	Low
Timberline FPD	Medium	Medium

4.6.1 Description

Drought

Drought is a normal phase in the climatic cycle of most geographical areas. According to the National Drought Mitigation Center, drought originates from a deficiency of precipitation over an extended period, usually a season or more. This results in a water shortage for some activity, group, or environmental sector. Drought is the result of a significant decrease in water supply relative to what is "normal" in a given location. Unlike most disasters, droughts normally occur slowly but last a long time. There are four generally accepted operational definitions of drought (National Drought Mitigation Center 2006):

- **Meteorological drought** is an expression of precipitation's departure from normal over some period of time. Meteorological measurements are the first indicators of drought. Definitions are usually region-specific and based on an understanding of regional climatology. A definition of drought developed in one part of the world may not apply to another, given the wide range of meteorological definitions.
- **Agricultural drought** occurs when there is not enough soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought happens after meteorological drought but before hydrological drought. Agriculture is usually the first economic sector to be affected by drought.
- **Hydrological drought** refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow and as lake, reservoir, and groundwater levels. There is a time lag between lack of rain and less water in streams, rivers, lakes, and reservoirs, so hydrological measurements are not the earliest indicators of drought. After precipitation has been reduced or deficient over an extended period of time, this shortage is reflected in declining surface and subsurface water levels. Water supply is controlled not only by precipitation, but also by other factors, including evaporation (which is increased by higher than normal heat and winds), transpiration (the use of water by plants), and human use.
- **Socioeconomic drought** occurs when a physical water shortage starts to affect people, individually and collectively. Most socioeconomic definitions of drought associate it with the supply and demand of an economic good.

Droughts originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple months), the drought is considered short-term. If the weather pattern becomes entrenched and the precipitation deficits last for several months or years, the drought is considered to be long-term. It is possible for a region to experience a long-term circulation pattern that produces drought, and to have short-term changes in this long-term pattern that result in short-term wet spells. Likewise, it is possible for a long-term wet circulation pattern to be interrupted by short-term weather spells that result in short-term drought.

Precipitation, as snowmelt runoff, is the main source of Colorado's water supply. Annual precipitation in the populated areas of the planning area is approximately 11 to 15 inches per year. According to the 2018 Colorado State Drought Mitigation and Response Plan, "there are no major rivers that flow into Colorado (McKee et al. 1999). There are several major river basins originating in the Colorado Rockies, which flow out of the state, providing water to much of the southwestern United States, and contributing to the Missouri and Mississippi Rivers as well. Thus, Colorado earns its title as "the Mother of Rivers" (CWCB 2013). This supply is stored in five forms throughout the state: snowpack, streamflow, reservoir water, soil moisture, and groundwater (McKee and others 2000).

Defining when drought begins is a function of the impacts of drought on water users, and includes consideration of the supplies available to local water users as well as the stored water they may have available in surface reservoirs or groundwater basins. Different local water agencies have different criteria for defining drought conditions in their jurisdictions. Some agencies issue drought watch or drought warning announcements to their customers. Determinations of regional or statewide drought conditions are usually based on a combination of hydrologic and water supply factors.

Extreme Heat

Extreme heat events are defined by the Colorado State Hazard Mitigation Plan 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." Criteria that define an excessive heat event may differ among jurisdictions and in the same jurisdiction depending on the time of year. Extreme heat events are often a result of more than just ambient air temperature. Heat index tables (see Figure 4-13) provide information about how hot it feels based on the interactions between temperature and relative humidity. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15 degrees Fahrenheit (°F). Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

NOAA and the National Weather Service issue watch, warning, and advisory information for extreme heat. Meteorologists can often forecast extreme heat days.

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 4-13 Heat Index Table

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

4.6.2 Past Events

Drought

Colorado has experienced multiple severe droughts. Colorado has experienced drought in 2020, 2018, 2011-2013, 2006-2004, 1996, 1994, 1990, 1989, 1975-1979, 1963-1965, 1951-1957, 1931-1941, and 1893-1905 (Colorado Drought Mitigation and Response Plan, 2018). The most significant are listed in Table 4-14. Although drought conditions can vary across the state, it is likely that Gilpin County was affected during these dry periods.

Table 4-14 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

Date	Dry	Wet	Duration (years)
2011-2013*	X		2
2018-2019**	X		2
*Modified for 2018 State of Colorado Drought Mitigation and Response Plan Update based on input from the Colorado Climate Center **Modified for 2023 Gilpin HMP update			

Source: McKee, et al. 1999

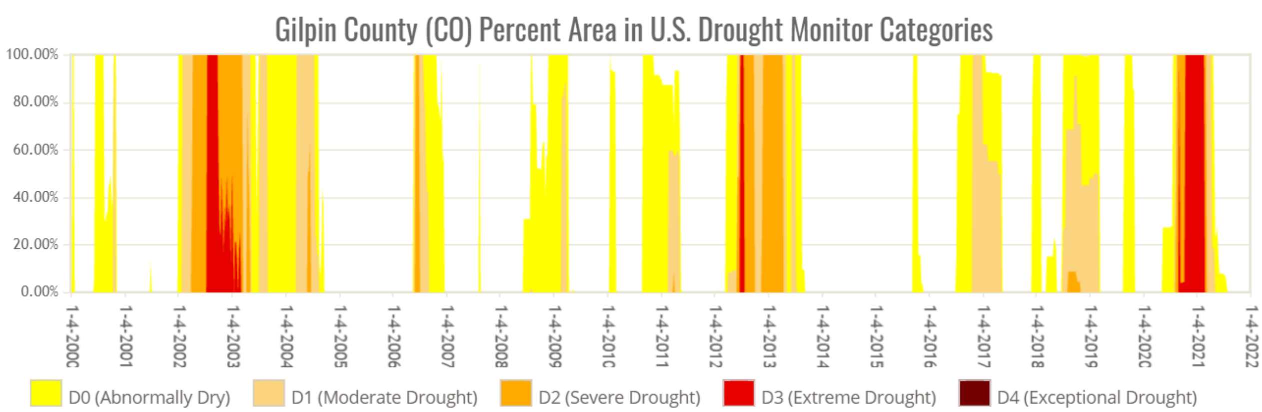
From 2012 to 2020, Gilpin County received seven USDA Disaster Declarations for drought. Drought is a regular and widespread occurrence in the State of Colorado. According to the US Drought Monitor records for Gilpin County, in the 1,095-week period from January 1, 2000, through December 31, 2020, the County spent 137 weeks (13% of the time) in some level of drought, defined as abnormally dry (D0) or worse conditions. Approximately 8% of the time, or 90 weeks, was spent in moderate drought (D1) or worse conditions. Weeks in drought are summarized in Table 4-15 and shown in time series in Figure 4-14.

Table 4-15 Gilpin County Weeks in Drought by Intensity, 2000-2020

Category	Description	Palmer Drought Severity Index (PDSI)	Standardized Precipitation Index (SPI)	Gilpin County Weeks in Drought, 2000-Jan. 4, 2021
D0	Abnormally Dry	-1.0 to -1.9	-0.5 to -0.7	47
D1	Moderate Drought	-2.0 to -2.9	-0.8 to -1.2	35
D2	Severe Drought	-3.0 to -3.9	-1.3 to -1.5	28
D3	Extreme Drought	-4.0 to -4.9	-1.6 to -1.9	27
D4	Exceptional Drought	-5.0 or less	-2.0 or less	0

Source: US Drought Monitor

Figure 4-14 Gilpin County Drought Intensity, 2000-August 2021



Source: National Drought Mitigation Center

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 a variety of sources: online, drought-related news stories and scientific publications, members of 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 924 impacts statewide and 17 impacts from droughts that specifically affected Gilpin County between 2000 and 2020. Most of the impacts (10) were classified as “relief, response and restrictions”. Other impacts include “relief, response, & restrictions” (10), “fire” (6), “plants & wildlife” (5), “agriculture” (4), “water supply and quality” (3), “tourism & recreation” (3), and “society and public health” (1). The following are the descriptions of each category and reported number of impacts. Note that some impacts have been assigned to more than one category.

Agriculture (4) — 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.

Plants and Wildlife (5) — 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.

Society and Public Health (1) — 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.

Fire (6) — 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.

Tourism and Recreation (3) — 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 (10) — 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, US 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, nonprofit organization-based relief, water restrictions, fire restrictions, NWS Red Flag Warnings, and declaration of drought watches or warnings.

Water Supply and Quality (3) — 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.

Extreme Heat

The High Plains Regional Climate Center with support from NOAA, has averaged monthly temperatures for Gilpin County in the past 30 years (1991-2020). Table 4-16 contains temperature summaries related to extreme heat for the County. The average maximum temperature in July is 77°F and in August is 74°F. Based on this climate data, temperatures in the County rarely exceeds 90°F.

Table 4-16 Temperature Data for Gilpin County, 1991 – 2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (degrees Fahrenheit)												
Average Maximum Temperature	36	38	45	50	59	71	77	74	68	56	44	36
Average Temperature	25	26	33	38	47	57	63	61	54	43	33	25

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

4.6.3 Location

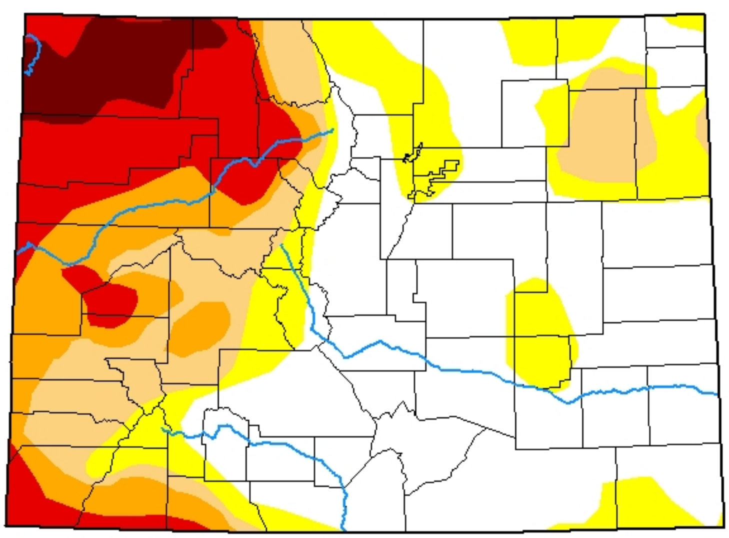
The spatial extent of both drought and extreme heat is **extensive**.

Drought

The National Oceanic and Atmospheric Administration (NOAA) has developed several indices to measure drought impacts and severity and to map their extent and locations:

- The Palmer Crop Moisture Index measures short-term drought on a weekly scale and is used to quantify drought's impacts on agriculture during the growing season.
- The Palmer Z Index measures short-term drought on a monthly scale.
- The Palmer Drought Index (PDI) measures the duration and intensity of long-term, drought- inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during a given month is dependent on the current weather patterns plus the cumulative patterns of previous months. Weather patterns can change quickly from a long-term drought pattern to a long- term wet pattern, and the PDI can respond fairly rapidly.
- The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop and it takes longer to recover from them. The Palmer Hydrological Drought Index (PHDI), another long-term index, was developed to quantify hydrological effects. The PHDI responds more slowly to changing conditions than the PDI.
- While the Palmer indices consider precipitation, evapotranspiration and runoff, the Standardized Precipitation Index (SPI) considers only precipitation. In the SPI, an index of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The SPI is computed for time scales ranging from 1 to 24 months.
- US Drought Monitor releases maps every Thursday showing the areas of the United States that are in drought. Five classifications areas used: abnormally dry, areas that may be going into or coming out of drought, and then four levels of drought, moderate, severe, extreme and exceptional. The Drought Monitor is a collaborative effort between NDMC, USDA, and NOAA. Figure 4-15 shows the US Drought Monitor for Colorado as of September 7, 2021, illustrating the regional nature of drought.

Figure 4-15 US Drought Monitor, as of September 7, 2021



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	47.43	52.57	36.47	24.48	15.05	3.91
Last Week 08-31-2021	49.43	50.57	36.47	24.44	15.05	3.91
3 Months Ago 06-08-2021	54.98	45.02	41.42	35.54	29.15	17.53
Start of Calendar Year 12-29-2020	0.00	100.00	100.00	93.73	76.17	27.60
Start of Water Year 09-29-2020	0.00	100.00	99.29	89.35	52.88	2.64
One Year Ago 09-08-2020	0.00	100.00	98.83	92.27	54.82	0.38

Intensity:
None
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

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droughtmonitor.unl.edu

In Colorado, 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 portion of the state are quite common.

The entire County is at risk to drought conditions. Drought is one of the few hazards that has the potential to directly or indirectly impact every person in the County as well as adversely affect the local economy.

Extreme Heat

The entire County is at low risk to extreme heat events, even urban areas of Black Hawk and Central City. The record high temperature for Gilpin County was set on June 26, 1994, at 90°F. The high altitude of the County, as well as mountainous terrain is not conducive to extreme heat. Average temperatures tend to decrease with increases in elevation, roughly 4°F per 1,000 feet above mean sea level.

4.6.4 Magnitude and Severity

Drought

Drought impacts are wide-reaching and may be economic, environmental, or societal. The most significant impacts associated with drought in Colorado are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. An ongoing drought may leave an area more prone to beetle kill and associated wildfires. 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 water quality deterioration is also a potential problem. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in streams and groundwater decline. Water reductions in other western states may impact the water usage in Colorado and Gilpin County in future years. The HMPC noted road maintenance and dust mitigation on the over 100 miles of dirt roads in the County as a concern if water supply is low.

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. Droughts are not usually associated with direct impacts on people or property, but they can have significant impacts on agriculture, which can impact people indirectly. The US Drought Monitor provides a drought classification scheme (shown in Figure 4-16) used to monitor drought nationwide. The figure below shows historical impacts by drought category, which can be used as a measure of the magnitude of drought.

Figure 4-16 Historically Observed Impacts by Drought Monitor Category in Colorado

Category	Historically observed impacts
D0	Hay production decreases; rangeland is dry
	Irrigation begins sooner
D1	Rangeland growth is stunted; very little hay is available
	Dryland crops suffer
	Wildfires increase
	Pheasant population declines; ski season is limited
D2	CRP lands suffer
	Farmers reduce planting; producers sell cattle
	Fire season is extended
	Snowpack is low; surface water levels are low; river flow is reduced
D3	Pasture conditions worsen
	City landscapes are dying
	Large fires develop
	Rafting, fishing, hunting, skiing are reduced; fish kills occur
	Grasshopper and insect infestation are noted
	Reservoirs are extremely low; mandatory water restrictions are implemented; water temperature increases
D4	Dust storms and topsoil removal are widespread
	Agricultural and recreational economic losses are large

The 2018 State of Colorado Drought Mitigation and Response Plan evaluated the vulnerability of different sectors to drought for all counties in Colorado. (The evaluation excluded the Municipal and Industrial sector because that sector did not follow standard methodology.) The sector vulnerability scores for Gilpin County are shown in Table 4-17. A score of 3.0 or above means that sector is vulnerable to drought. While none of the sectors in Gilpin County score above 3.0, the socioeconomic sector has a score of 2.60 and is vulnerable to an increase. This is largely due to the County's lack of economic diversity and tourism economy base. This includes vulnerability to secondary economic impacts, behavioral health impacts and public health concerns specific to drought.

Table 4-17 Drought Vulnerability Scores by Sector

Sector	Gilpin County Score
Socioeconomic	2.60
State Assets	1.74
Environment	1.52
Recreation	1.33
Energy	0.0
Agriculture	0.0
Average Overall Vulnerability	**1.20**

Source: 2018 State of Colorado Drought Mitigation and Response Plan

Extreme Heat

Extreme heat can threaten health and safety, and in severe cases can cause damage to infrastructure. According to the NWS, young children and infants, older adults, people with chronic medical conditions, and pregnant women are all particularly vulnerable to extreme heat. Outdoor workers are also at higher risk due to greater exposure to heat. As a measure of the magnitude of heat, the NWS Heat Index Program provides a measure of the extent of health impacts of exposure to heat by heat index temperatures, shown in Table 4-18.

Table 4-18 Typical Health Impacts of Extreme Heat by Heat Index

Heat Index	Disorder
80-90° F	Fatigue possible with prolonged exposure and/or physical activity
90-105° F	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F	Heatstroke/sunstroke highly likely with continued exposure

Source: NWS Heat Index Program

Based on the information in this hazard profile, the magnitude/severity of extreme heat is considered to have a minimal potential impact for residents of the County, but the HMPC expressed concerns for tourists and recreational enthusiasts which may not be used to heat and high elevations. Although the Cities of Black Hawk and Central City experience higher temperatures because they are located in a valley and at lower elevations than the rest of the County, extreme heat is considered to have a minimal potential impact in the cities because of their elevation and lack of history of extreme heat events.

4.6.5 Probability of Future Occurrences

Drought

The probability of a future drought in Gilpin County is likely, with a recurrence interval of 10 years or less. According to information from the 2018 Colorado State Drought Mitigation and Response Plan, over 119 years (1893 to 2012) there were seven recorded drought incidents that totaled 41 dry years. Short duration droughts occur much more frequently. According to a study cited in the 2018 Colorado Drought Mitigation and Response Plan, they occur somewhere in Colorado in nearly nine out of every 10 years. (McKee and others 2000).

Extreme Heat

There are no recorded instances of extreme heat or heat events in Gilpin County from 1996 to 2020 in the National Centers for Environmental Information’s Storm Events Database. In addition, average temperatures show that the County rarely exceed 90°F. Therefore, extreme heat is considered unlikely to occur in the future.

4.6.6 Climate Change Considerations

The long-term effects of climate change on regional water resources are unknown, but global water resources are already experiencing the following stresses without climate change:

- Growing populations,
- Increased competition for available water,
- Poor water quality,
- Environmental claims,
- Uncertain reserved water rights,
- Groundwater overdraft, and
- Aging urban water infrastructure.

Per the 2018 Colorado Drought Mitigation and Response Plan, regional studies commissioned by the CWCB suggest a reduction in the total water supply in Colorado by the mid-21st century. Projections show a decline in snowpack across western Colorado by the mid-21st century, including severe declines at lower elevations and modest declines at high elevations. Additionally, warming temperatures have been resulting in earlier onset of streamflow from melting snow, which may cause a reduction in late summer flows.

The Fourth National Climate Assessment reports that throughout the southwest region, increased temperatures are resulting in decreases in snowpack and its water content, earlier peak of snow-fed streamflow, and increases in the proportion of rain to snow, all of which exacerbate hydrological drought. Additionally, drought risk is being exacerbated by the depletion of groundwater.

With a warmer climate, droughts could become more frequent, more severe, and longer lasting. From 1987 to 1989, losses from drought in the US totaled $39 billion (Congressional Office of Technology Assessment [OTA] 1993). More frequent extreme events such as droughts could end up being more cause for concern than the long-term change in temperature and precipitation averages.

4.6.7 Vulnerability

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to the ability to produce goods and provide services. Drought can affect a wide range of economic, environmental, and social activities. The vulnerability of an activity to the effects of drought usually depends on its water demand, how the demand is met, and what water supplies are available to meet the demand. Extreme heat can exacerbate the effects of drought.

Population

The jurisdictions have the ability to minimize any impacts on residents and water consumers in the County should several consecutive dry years occur. No significant life or health impacts are anticipated as a result of drought within the planning area.

According to the Environmental Protection Agency (EPA), the individuals with the following combinations or characteristics are typically at greater risk to the adverse effects of excessive heat events: individuals with physical or mobility constraints, cognitive impairments, economic constraints, and social isolation.

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. 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.

Critical Facilities and Infrastructure

Most critical facilities will continue to be operational during a drought, as long as utilities remain operational. 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. Regional power outages may occur as a result of extreme heat events.

Economy

According to the USDA Census of Agriculture, the market value of agricultural products sold in Gilpin County was $216,000 in 2017, up 31 percent from the 2012 Census of Agriculture. Livestock accounted for 83 percent of sales and crops accounted for 17 percent. Therefore, overall agriculture exposure in the County is decreasing. However, drought and extreme heat may impact all crops grown in Gilpin County and the pastureland used to sustain private livestock. Agricultural damages may result from direct impacts or water usage restrictions that limit irrigation.

In addition to agriculture, economic exposure is largely associated with industries that use water or depend on water for their business. For example, landscaping businesses were affected in the droughts of the past as the demand for service significantly declined because landscaping was not watered. Recreation and tourism industries, including rafting, angling, and ski resorts, have experienced past losses due to low flows and/or low snowpack; these businesses continue be exposed to drought impacts. Refer to Table 4-17 above for the results of the section vulnerability analysis from the 2018 State of Colorado Drought Mitigation and Response Plan. The County's Strategic Water Plan aims to encourage economic development by placing water resources to beneficial use. Growing dependency on water resources may make the County more vulnerable to drought in the future.

The CWCB maintains a Future Avoided Cost Explorer (FACE) tool, which estimates annual damages from drought. According to FACE analysis (detailed in Table 4-19), Gilpin County could experience an average annual less than $10,000 due to drought conditions under current population and climate scenarios.

Historic, Cultural and Natural Resources

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, 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.

Drought can also increase risk of wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. A drought may also increase the speed at which dead and fallen trees dry out and become more potent fuel sources for wildfires. Drought may also weaken trees in areas already affected by mountain pine beetle infestations, causing more extensive damage to trees and increasing wildfire risk, at least temporarily (CWCB 2018).

Drought conditions can also cause soil to compact, decreasing its ability to absorb water, making an area more susceptible to flash flooding and erosion (CWCB 2018).

4.6.8 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 FACE developed by the CWCB 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 Gilpin County due to drought events for each of the climate and population scenarios.

Table 4-19 Potential Future Economic Losses from Drought in Gilpin County

Climate Scenarios	Population Scenarios		
	Low Growth (~5,700)	Medium Growth (~6,600)	High Growth (~7,700)
Current Conditions	Total damages: Less than $10K	Total damages: Less than $10K	Total damages: Less than $10K
	Total damages per person: Less than $10	Total damages per person: Less than $10	Total damages per person: Less than $10
Moderately Warmer Climate by 2050	Total damages: Less than $10K	Total damages: Less than $10K	Total damages: Less than $10K
	Total damages per person: Less than $10	Total damages per person: Less than $10	Total damages per person: Less than $10
Severely Warmer Climate by 2050	Total damages: Less than $10K	Total damages: Less than $10K	Total damages: Less than $10K
	Total damages per person: Less than $10	Total damages per person: Less than $10	Total damages per person: Less than $10

Source: CWCB Future Avoided Cost Explorer: Hazards https://cwcb.colorado.gov/FACE

Extreme heat is unlikely to impact future development since it typically does not affect structures. However, growth may add to stress on the electric grid, which could increase the possibility of power outages when demand is high during periods of extreme heat.

4.6.9 Risk Summary

- The overall significance of extreme heat is Low to Medium; the overall significance of drought is **High**.
- Drought and extreme heat were both ranked as Low risk in the 2016 Gilpin HMP. The Planning Team felt that those ranking severely underestimated both the frequency and the severity of these hazards, even before climate change impacts were considered. Additionally, the impact that droughts on the Western Slope can have on the Front Range was not considered in the 2016 Plan. Analysis conducted for the 2023 update supports this, particularly when evaluating the economic costs.
- Drought vulnerability may increase over time as demand for water from different sectors increases and as the County plans for economic development around the use of water resources.
- Climate change may result in an increase in the frequency and severity of drought which could lead to impacts to the recreation and tourism industry in the County.
- Extreme heat events are unlikely throughout the County, and the magnitude of heat events is low.
- The effects of recent droughts have exposed the vulnerability of the planning area's economy to drought events.
- Related hazards: Wildfire, Erosion.

4.7 Earthquake

EARTHQUAKE HAZARD RANKING	
Gilpin County	Low
City of Black Hawk	Low
City of Central City	Low
Timberline Fire Protection District	Low

4.7.1 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 the majority 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 as a result 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 commonly used magnitude scale is the moment magnitude (MMS) scale, symbolized as M_w, with the following classifications of magnitude:

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

Estimates of M_w scale roughly match the local magnitude scale (ML) commonly called the Richter scale. One advantage of the M_w scale is that, unlike other magnitude scales commonly used, it is a measure of the energy released by a specific seismic event, and it therefore does not saturate in larger events. That is to say that as earthquakes grow larger and larger in magnitude, the Richter scale becomes less reliable at measuring the difference between a magnitude 7.5 event and a magnitude 8.5 event. For the M_w scale there is no value beyond which all large earthquakes will report the same magnitude, as is the case with the Richter scale. For this reason, M_w scale is now the most often used estimate of large earthquake magnitudes.

Intensity

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

Table 4-20 Modified Mercalli Intensity Scale (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	10 to 20 per year

Magnitude	Mercalli Intensity	Effects	Frequency
		across great distances with major damage mostly limited to 250 km from epicenter.	
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

Source: U.S. Geological Survey

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 commonly 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 4-21 lists damage potential and perceived shaking by PGA factors, compared to the modified Mercalli scale.

Table 4-21 Mercalli Scale and Peak Ground Acceleration Comparison

Modified		Potential Structure Damage		Estimated PGA[a]
Mercalli Scale	Perceived Shaking	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

a. PGA measured in percent of g (%g), where g is the acceleration of gravity

b. Sources: USGS 2008; USGS 2010

Source: U.S. Geological Survey

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 4-22 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 4-22 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)	

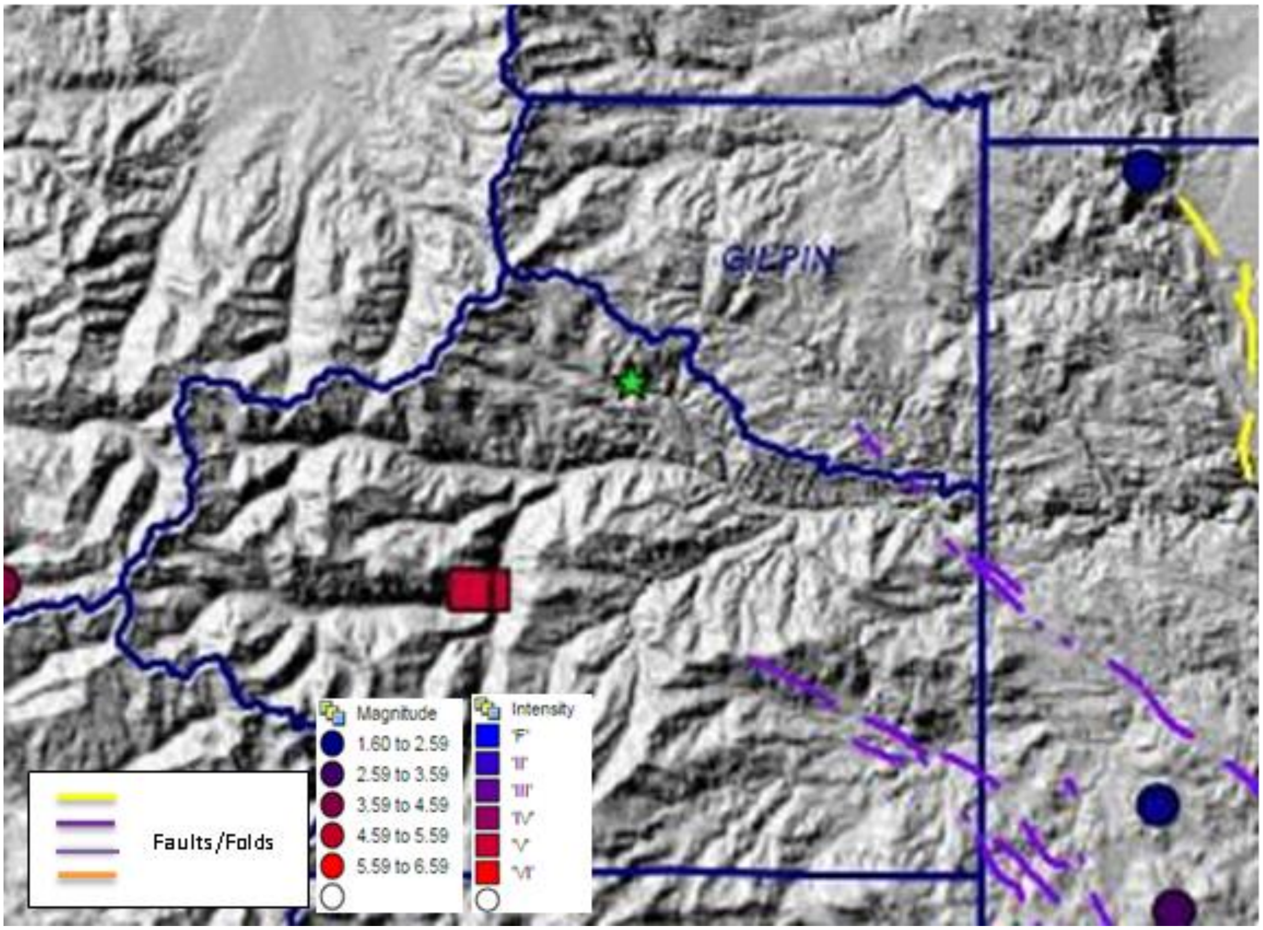
Notes:
m Meters
m/s Meters per second

Source: FEMA, National Earthquake Hazard Reduction Program

4.7.2 Past Events

Colorado has a relatively short period of historical records for earthquakes. An earthquake and fault map developed by the CGS depicts the location of historical epicenters and potentially active faults in that state. Figure 4-17 shows the faults and recorded earthquakes for Gilpin County and vicinity. The figure is a collection of all known and catalogued earthquakes in the area. The map indicates that no recorded earthquake events occurred in Gilpin County. However, a 2.0 magnitude earthquake did occur just east of the County line in 1965. A fault runs through the southern portion of the County and expends southeast.

Figure 4-17 Earthquake Faults and 1870 – 2015 Recorded Epicenters Map Near Planning Area



Source: CGS (http://dnrwebmapgdev.state.co.us/cgsonline/)

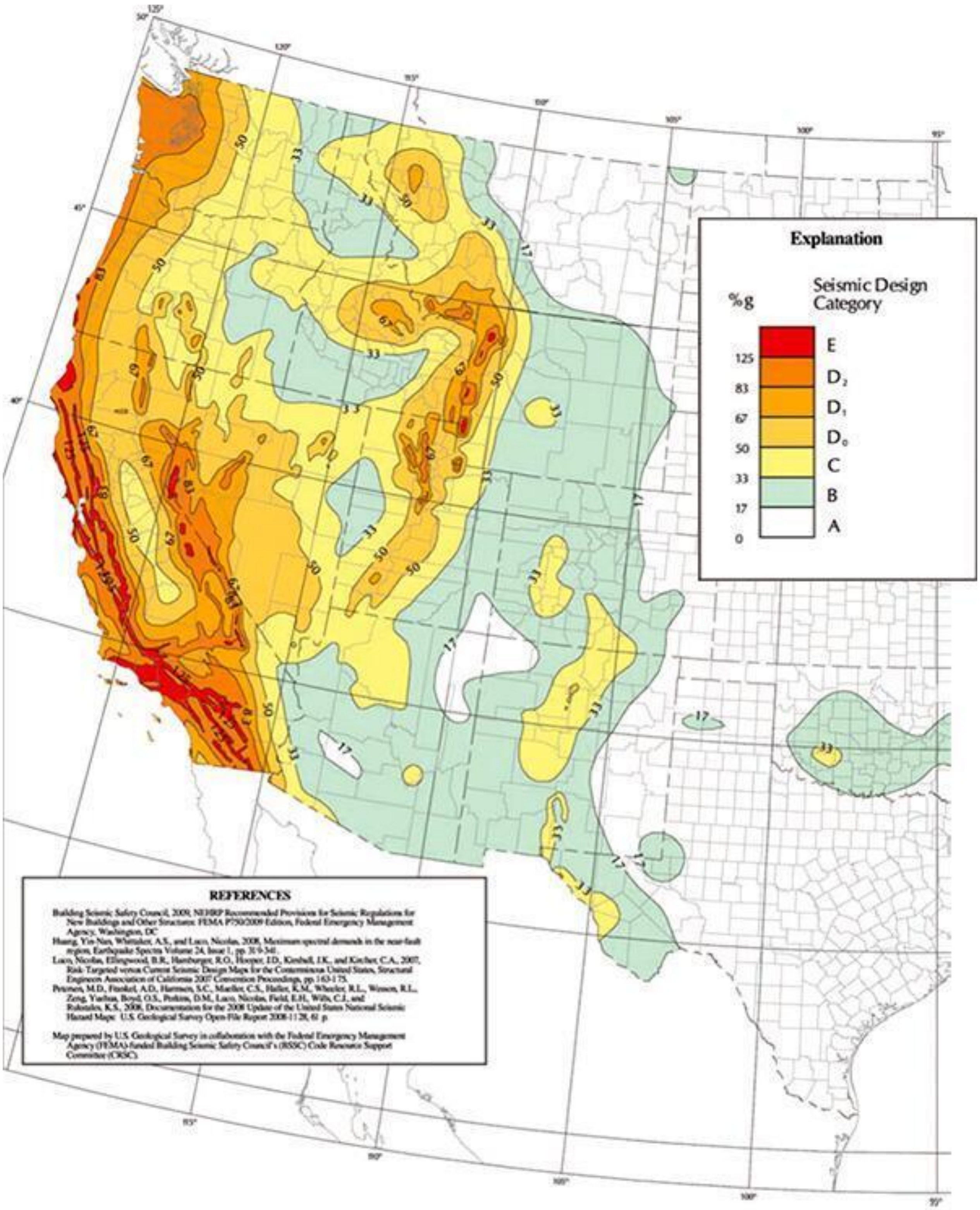
4.7.3 Location

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. Gilpin County contains Floyd Hill Fault, located on the southeastern portion of the County. 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 have been classified based on the geologic 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 to 130,000 years).
- MLQ—Middle to Late Quaternary (130,000 to 750,000 years).
- Q—Quaternary (approximately past 2 million years).
- LC—Late Cenozoic (approximately past 23.7 million years).

Figure 4-18 USGS and Building Seismic Safety Council (BSSC) Seismic Design Categories



4.7.4 Magnitude and Severity

Faults with evidence of movement in the past 130,000 years (Late Quaternary) are considered active faults. Faults that last moved between 130,000 and 1.8 million years ago may be considered potentially active. These active and potentially active faults are thought to be the most likely source for future earthquakes (Source: 2018 Colorado State Hazard Mitigation Plan). While the record of past occurrences does not indicate many earthquakes have originated from within Gilpin County, when earthquakes do occur, they are very often felt across large geographic areas, with impacts and potential damage possible miles away from the epicenter. This means that there is potential for impacts to the County from an event that originated elsewhere in the region.

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.

The severity of an earthquake can be expressed in terms of intensity or magnitude. Intensity represents the observed effects of ground shaking on people, buildings, and natural features. Magnitude is related to the amount of seismic energy released at the hypocenter of an earthquake. It is calculated based on the amplitude of the earthquake waves recorded on instruments. Whereas intensity varies depending on location with respect to the earthquake epicenter, magnitude is represented by a single, instrumentally measured value for each earthquake event.

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?

Mapping that shows the impacts of these components was used to assess the risk of earthquakes within the planning area. While the impacts from each of these components can build upon each other during an earthquake event, the mapping looks at each component individually. One probabilistic scenario was selected for this plan:

2,500-Year Probabilistic Scenario: This is a Hazus-MH Probabilistic Event scenario, which allows the user to generate estimates of damage and loss based on the seismic hazard with a 2% probability of exceedance in 50 years return period.

4.7.5 Probability of Future Occurrences

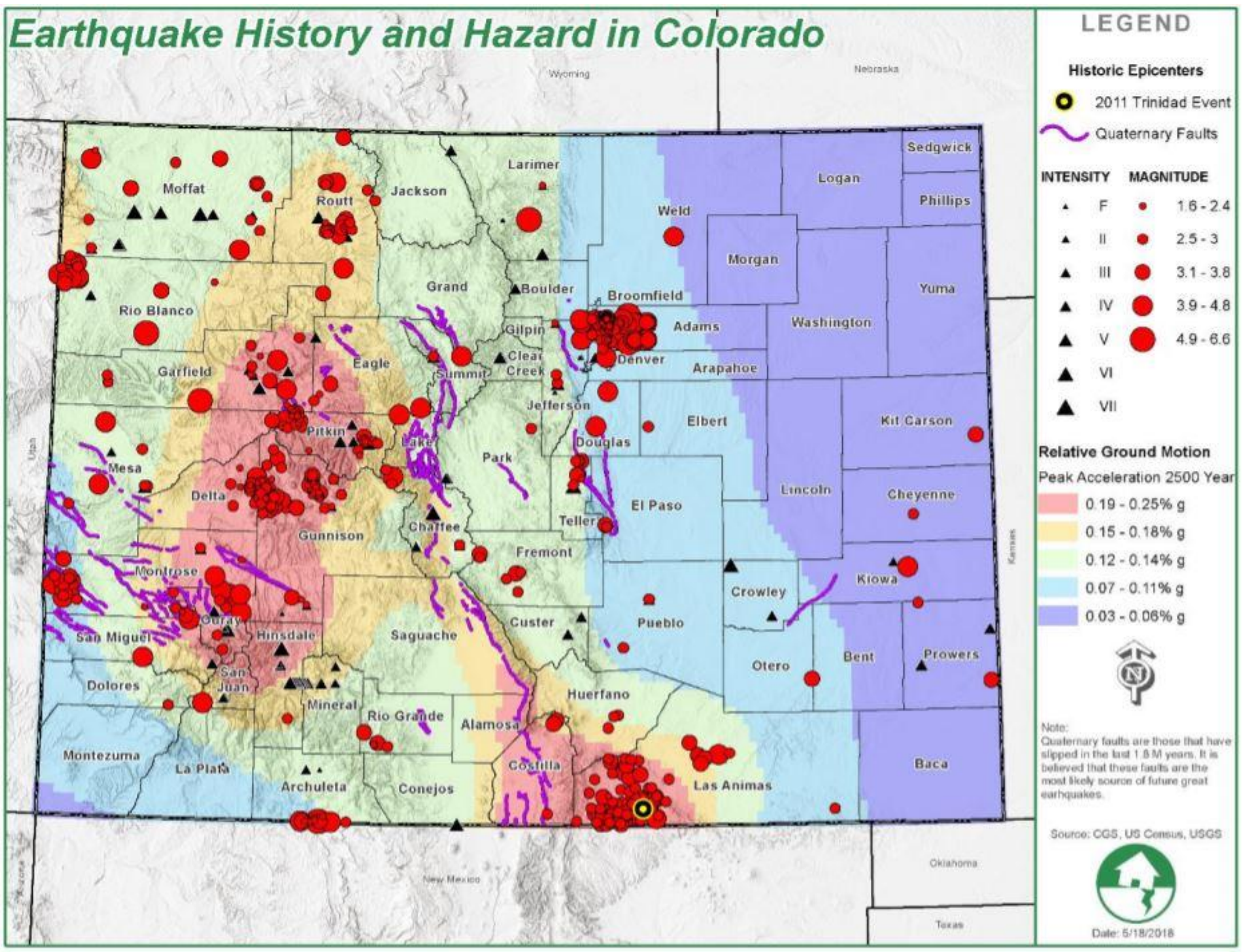
Research based on Colorado's earthquake history suggests that an earthquake of magnitude 6.3 or larger has a 1% probability of occurring each year somewhere in Colorado (Charlie, Doehring, Oaks Colorado Earthquake Hazard Reduction Program Open File Report 93-01 1993).

According to the CGS, it is not possible to accurately estimate the timing or location of future dangerous earthquakes in Colorado because the occurrence of earthquakes is relatively infrequent in the state, and the historical earthquake record is relatively short (only about 145 years). It is prudent to expect future earthquakes as large as magnitude 6.6, the largest historical event in Colorado. Studies indicate earthquakes as large as 7.25 could occur within the state, but scientists are unable to accurately predict when and where it will occur (Source: Colorado Earthquake Hazards – Colorado Earthquake Mitigation Council 2008.)

National seismic hazard zone maps indicate the probability of earthquakes in the United States, based on analyses of faults, soils, topography, and past events. Figure 4-19 is a probabilistic seismic hazard map of Colorado from the USGS that depicts the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed for a particle at ground level that is moving horizontally because of an earthquake). Figure 4-19 represents the 2,500-year probability ground motion, which is more of a worst-case scenario, and depicts the shaking level that has a 2 percent chance of being exceeded over a period of 50 years. In this scenario, Gilpin County lies in the range of 0.12-0.14 percent peak acceleration. Ground motions become structurally damaging when average peak accelerations reach 0.10 to 0.15 peak ground acceleration, average peak velocities reach 8 to 12 centimeters per second, and when the MMI Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Thus, probability of an earthquake causing significant damage is **unlikely**, with less than a 1 percent chance of occurrence over the next 100-year period.

Figure 4-19 Colorado Seismic Hazard Map – 2% Probability of Exceedance in 50 Years



Source: Colorado State Hazard Mitigation Plan, 2018

Part of what makes earthquakes so destructive is that they generally occur without warning. The main shock of an earthquake can usually be measured in seconds, and rarely lasts for more than a minute. Aftershocks can occur within the days, weeks, and even months following a major earthquake.

By studying the geologic characteristics of faults, geoscientists can often estimate when the fault last moved and estimate the magnitude of the earthquake that produced the last movement. Because the occurrence of earthquakes is relatively infrequent in Colorado and the historical earthquake record is short, accurate estimations of magnitude, timing, or location of future dangerous earthquakes in Colorado are difficult to estimate.

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. Research is being done with warning systems that use the low energy waves that precede major earthquakes. These potential warning systems give approximately 40 seconds notice that a major earthquake is about to occur. The warning time is very short, but it could allow for someone to get under a desk, step away from a hazardous material they are working with, or shut down a computer system.

4.7.6 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.

4.7.7 Vulnerability

Earthquake vulnerability data was generated during the 2023 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.

Population

The entire population of Gilpin 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 types 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 earthquakes 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—Under 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 2013 made up 6.6% 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 9.5% of the residents in Gilpin 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 4-23 summarizes the results. Further impacts to the population as estimated by Hazus are detailed in Table 4-23. 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 nine injuries across the County, one 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 4-23 Estimated Earthquake Impact on Persons and Households

	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
2,500-Year Earthquake	2	0

Source: Hazus-MH 5.0 Global Summary Report, Wood analysis

Property

The Hazus analysis estimates that there are 3,000 buildings in the planning area, with a total replacement value of $898 million. 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 (94%) and most of the associated building value (88%) are residential. According to the model about 132 buildings will be at least moderately damaged. A summary of these damage estimates is included in Table 4-24 below:

Table 4-24 Estimated Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	5.02	0.17	0.60	0.18	0.31	0.28	0.06	0.35	0.00	0.32
Commercial	119.73	3.93	15.54	4.70	8.80	7.76	1.83	10.16	0.10	12.59
Education	1.68	0.06	0.20	0.06	0.10	0.09	0.02	0.11	0.00	0.11
Government	6.70	0.22	0.81	0.24	0.42	0.37	0.07	0.38	0.00	0.42
Industrial	43.79	1.44	5.90	1.78	3.52	3.11	0.76	4.22	0.03	3.35
Other Residential	120.99	3.97	18.82	5.69	9.26	8.17	0.90	4.98	0.04	4.60
Religion	6.73	0.22	0.79	0.24	0.40	0.36	0.07	0.38	0.00	0.44
Single Family	2739.29	89.99	288.27	87.11	90.49	79.86	14.30	79.43	0.64	78.17
Total	**3,044**		**331**		**113**		**18**		**1**	

Source: Hazus-MH 5.0 Global Summary Report, Wood analysis

Property losses were estimated through the Level 1 Hazus-MH analysis for a 2,500-year probabilistic earthquake. The figure 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 $14.8 million, inclusive of building and business disruption losses as shown in Table 4-25.

Table 4-25 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	0.2846	0.4208	0.0061	0.0201	0.7316
	Capital-Related	0.0000	0.1215	0.5075	0.0035	0.0023	0.6348
	Rental	0.2058	0.3603	0.1350	0.0021	0.0077	0.7109
	Relocation	0.7276	0.0619	0.1601	0.0183	0.0432	1.0111
	Subtotal	**0.9334**	**0.8283**	**1.2234**	**0.0300**	**0.0733**	**3.0884**
Capital Stock Losses							
	Structural	1.0997	0.1869	0.1764	0.0383	0.0439	1.5452
	Non_Structural	4.5789	1.3475	0.8280	0.1727	0.1632	7.0903
	Content	1.9380	0.4234	0.4982	0.1081	0.1139	3.0816
	Inventory	0.0000	0.0000	0.0044	0.0208	0.0013	0.0265
	Subtotal	**7.6166**	**1.9578**	**1.5070**	**0.3399**	**0.3223**	**11.7436**
	Total	**8.55**	**2.79**	**2.73**	**0.37**	**0.40**	**14.83**

Source: Hazus-MH 5.0Global 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 3,000 tons.

Critical Facilities and Infrastructure

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 also estimates lifeline damages to linear networks such as transportation and utilities. Damage to the transportation system is estimated at $540,000 and utility lifelines at $28 million. The steep terrain in the County adjacent to road corridors would likely create multiple rockslides that could damage roadways and disrupt traffic.

Government Services

Damage impacts to transportation corridors and communications lines could affect first responders' ability to effectively respond in the aftermath of an earthquake. Damage to government facilities/personnel in incident area may require temporary relocation of some operations. Regulatory waivers may be needed locally. The public may question local government's ability to respond and recover if planning, response, and recovery are not timely and effective. A significant earthquake may require disaster declarations and aid programs. These needs may impact funding or administrative resources for other regular operations or may necessitate changes to existing operating procedures.

Economy

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

Table 4-26 Hazus-MH Earthquake Loss Estimation 2,500 Year Scenario Results

Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 331 Moderate: 113 Extensive: 18 Complete: 1
Building and Income Related Losses	$14.8 million 76% of damage related to residential structures 21% of loss due to business interruption
Total Economic Losses (includes building, income, and lifeline losses)	$43.4 Million Building: $14.8 Million Income: $3.1 Million Transportation/Utility: $28.5 Million
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 1 Requiring hospitalization: 0 Life threatening: 0 Fatalities: 0
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 2 Requiring hospitalization: 0 Life threatening: 0 Fatalities: 0
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 1 Requiring hospitalization: 0 Life threatening: 0 Fatalities: 0
Fire Following Earthquake	0 Ignitions
Debris Generation	3,000 tons of debris generated 120 truckloads
Displaced Households	2
Shelter Requirements	0

Source: Hazus-MH Global Summary Report, Wood analysis.

Historic, Cultural, and Natural 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. The historic building stock in Black Hawk and Central City is commonly made of unreinforced masonry, which is highly vulnerable to damage from earthquakes.

4.7.8 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. The information in this plan provides the participating partners a tool to ensure that there is no increase in exposure in areas of high seismic risk. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The International Building Code also establishes provisions to address seismic risk.

4.7.9 Risk Summary

- Earthquakes represent a high consequence but low probability hazard; due to the low probability the overall significance is considered **Low**.
- Colorado has much lower seismic activity compared to other Western states.
- Resulting damages to building stock and utility lifelines, and income related losses could equate to millions of dollars based on Hazus-MH modeling.
- Light casualties are anticipated.
- Earthquake risk is relatively the same across all participating jurisdictions, though impacts could be greater in areas with historic buildings and concentrations of people, such as Central City and Black Hawk.
- 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.
- Earthquakes could produce damaging and disruptive rockfalls that could damage roads and block access/egress.
- Related hazards: Landslide, rockfall.

4.8 Erosion and Deposition, Expansive Soil, and Subsidence

EROSION AND DEPOSITION, EXPANSIVE SOIL, AND SUBSIDENCE HAZARD RANKING			
	Erosion & Deposition	**Expansive Soil**	**Subsidence**
Gilpin County	Medium	Low	Low
City of Black Hawk	Low	Low	Medium
City of Central City	Medium	Low	Medium
Timberline Fire Protection District	Medium	Low	Low

4.8.1 Description

Erosion and Deposition

The CGS defines erosion as "the removal and simultaneous transportation of earth materials from one location to another by water, wind, waves, or moving ice" (CGS 2014). Deposition is defined as "the placing of eroded material in a new location" (CGS 2014). Material that is eroded is later deposited in another location. Both erosion and deposition are continually occurring phenomenon, although the rate of erosion and deposition varies tremendously and can be affected by a variety of factors including rate of scour, type of material being eroded, and the presence or absence of vegetation.

Expansive Soil

Expansive and collapsible soils are some of the most widely distributed and costly geologic hazards. Collapsible soils are a group of soils that can rapidly settle or collapse the ground. They are also known as metastable soils and are unsaturated soils that undergo changes in volume and settlement in response to wetting and drying, often resulting in severe damage to structures. The sudden and usually large volume change can cause considerable structural damage.

Expansive soil and rock are characterized by clayey material that shrinks as it dries or swells as it becomes wet. In addition, trees and shrubs placed closely to a structure can lead to soil drying and subsequent shrinkage. The parent (source) rock most associated with expansive soils is shale.

Collapsible soils consist of loose, dry, low-density materials that collapse and compact under the addition of water or excessive loading. Soil collapse occurs when the land surface is saturated at depths greater than those reached by typical rain events. This saturation eliminates the clay bonds holding the soil grains together. Similar to expansive soils, collapsible soils result in structural damage such as cracking of the foundation, floors, and walls in response to settlement.

Subsidence and Sinkholes

According to the 2018 Colorado State Hazard 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 Division of Emergency Management 2015). 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.

Collapsible Soils

Collapsible soils are a group of soils that can rapidly settle or collapse the ground. The most common type of collapsible soil is hydrocompactive soil. According to the CGS, "hydrocompactive soils form in semi-arid to arid climates in the western US and large parts of Colorado in specific depositional environments" (CGS

2014). These soils are low in density and in moisture content and are loosely packed together. Agents that bind these loosely packed particles together, such as clay and silk buttresses, are water sensitive. When water is introduced to these soils, the binding agents may quickly break down, soften, disperse, or dissolve. This results in a reorganization of the soil particles in a denser arrangement, which in turn results in a net volume loss indicated by resettlement or subsidence at the surface (CGS 2014). Volume loss can be between 10 to 15%, which can result in several feet of surface-level displacement.

Abandoned Mine Workings

The underground removal of minerals and rock can undermine underground support systems and lead to void spaces. These voids can then be affected by natural and man-made processes such as caving, changes in flowage, or changes in overlying rock and soil material resulting in collapse or subsidence. Hazards from these abandoned sites are complicated by the fact that many "final mine maps" are inaccurate or incomplete (CGS 2014). Mines operating after August 1997 were required by federal and state law to take potential surface subsidence into account; however, mining has been an activity in the state since the 1860s (CGS 2001). There are some mapped, known mine hazard areas in Colorado and in Gilpin County; however, it is likely that there are additional hazard areas for which no records exist.

4.8.2 Past Events

Erosion and Deposition

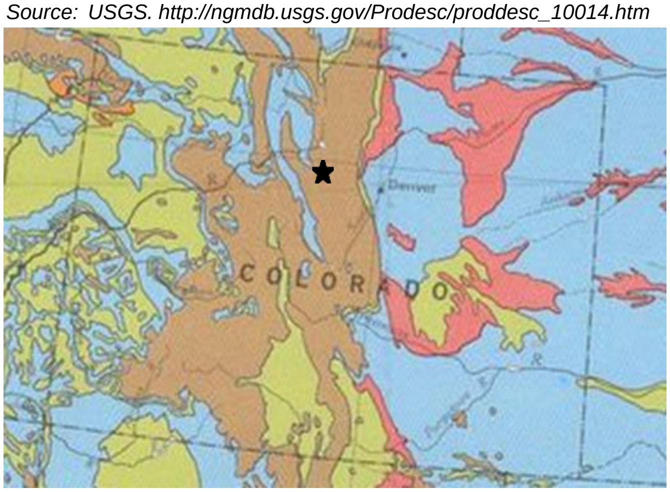
Soil erosion and deposition are ongoing events that can be affected by both natural and human-induced processes. Soil erosion and deposition events are continually occurring throughout the County. Portions of the County vary between highly erodible land to not highly erodible land. The majority of the highly erodible land is in higher sloped and mountainous areas.

Expansive Soil

Expansive soils are primarily areas that are underlain by soils with little to no clays with swelling potential Figure 4-20). The majority of the County is found in mountainous areas, in particular the Front Range Mountains. There is no record of significant damage from expansive soils in Gilpin County.

Figure 4-20 Expansive Soils in the State of Colorado

Source: USGS. http://ngmdb.usgs.gov/Prodesc/proddesc_10014.htm



Over 50% of these areas are underlain by soils with abundant clays of high swelling potential

Less than 50% of these areas are underlain by soils with clays of high swelling potential.

Over 50% of these areas are underlain by soils with abundant clays of moderate swelling potential

Less than 50%of these areas are underlain by soils with abundant clays of moderate swelling potential

These areas are underlain by soils with little to no clays with swelling potential.

Data insufficient to indicate the clay content or the swelling potential of soils.

★ Gilpin County

Subsidence and Sinkholes

The occurrence of subsidence is an ongoing process resulting from natural and human-induced causes. Central City has experienced two significant sinkhole events in recent years:

- May 26, 2012: An old mine shaft caved in near the end of Gregory Street east of town, creating a crater 30' wide and 50' deep.
- February 1, 2022: A sinkhole formed on I-70 near the Central City Parkway exit, closing one eastbound lane closed overnight.

According to the USGS, the risk of ground collapse in Gilpin County is low, with a medium hazard ranking near Black Hawk and Central City where there is a high density of known abandoned mines.

4.8.3 Location

Erosion and Deposition

Soil erosion and deposition occur in all parts of the County. Point sources of erosion often occur in areas where humans interact with exposed areas of the earth's surface, such as construction sites. Waterways are continually involved in erosion and deposition processes. Erosion and deposition may be exacerbated in areas where wildfires have occurred. According to the 2013 State of Colorado Hazard Mitigation Plan, "there is a high risk for erosion in the aftermath of a wildfire event. As a fire burns, it destroys plant material and the layers of litter that blanket the floor of an ecosystem. These materials, as well as trees, grasses, and shrubs, buffer and stabilize the soil from intense rainstorms. The plant materials slow runoff to give rainwater time to percolate into the ground. When fire destroys this protective later, rain and wind wash over the unprotected soil and erosion occurs" (Colorado Division of Emergency Management 2015). Areas in Gilpin County that were recently burned are more susceptible to exacerbated erosion and deposition. Additionally, areas with high slopes and mountainous regions have a higher susceptibility to soil erosion.

Figure 4-22 shows the erosion potential per acre per year in portions of Gilpin County. The areas most susceptible for high erosion potential are located in the western portion of the County, along high mountainous areas. There is high erosion potential also along stream banks, where flooding can result in high erosion potential. The Cities of Black Hawk and Central City both appear to be predominately in areas with low potential for erodible land.

Expansive Soil

Colorado is home to expansive soil, particularly bentonite. The leading cause of foundation damage in this type of soil is uneven moisture. Drying soil can shift and crack foundation as it shrinks. When moisture is applied the resulting swelling can crumble foundation. The entire planning area is exposed to minimal risks from expansive soil since this mountainous county has very little underlay of clay soils.

Subsidence and Sinkholes

According to the CGS, "Most catalogued sinkholes of Colorado lie on surficial deposits such as flat-lying glacial outwash terraces, recent valley side sediments, or older deposits on pediment slopes overlying the evaporite bedrock. The highest density of sinkholes that are manifested at the surface in Colorado occur in the Garfield County, Eagle County, Rio Blanco County, and Park County" (CGS 2001).

In Gilpin County, there are no known areas of evaporite-bearing bedrock as well as areas gypsum mining has occurred.

Figure 4-21 Gilpin County Mapped Mine Locations

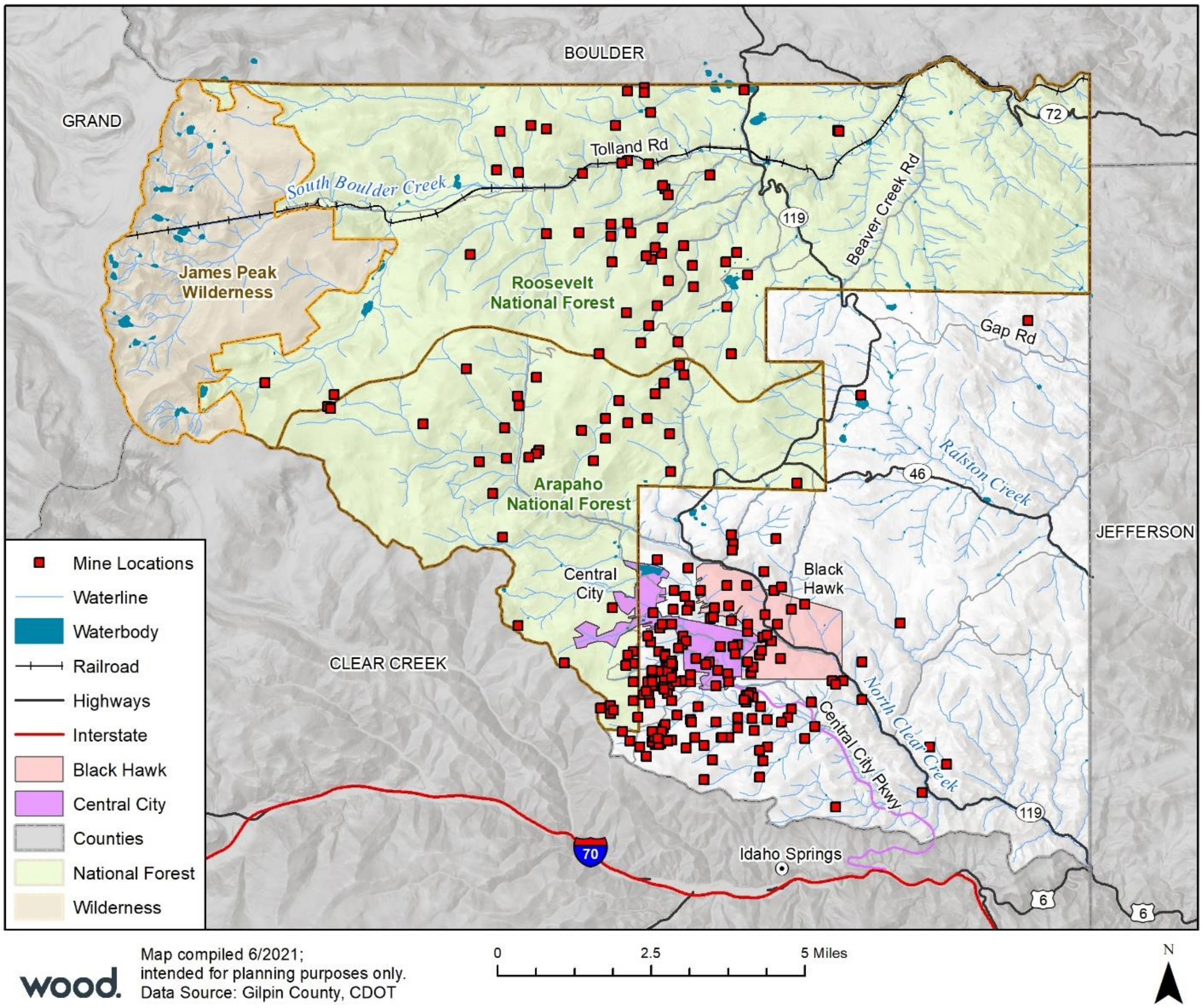
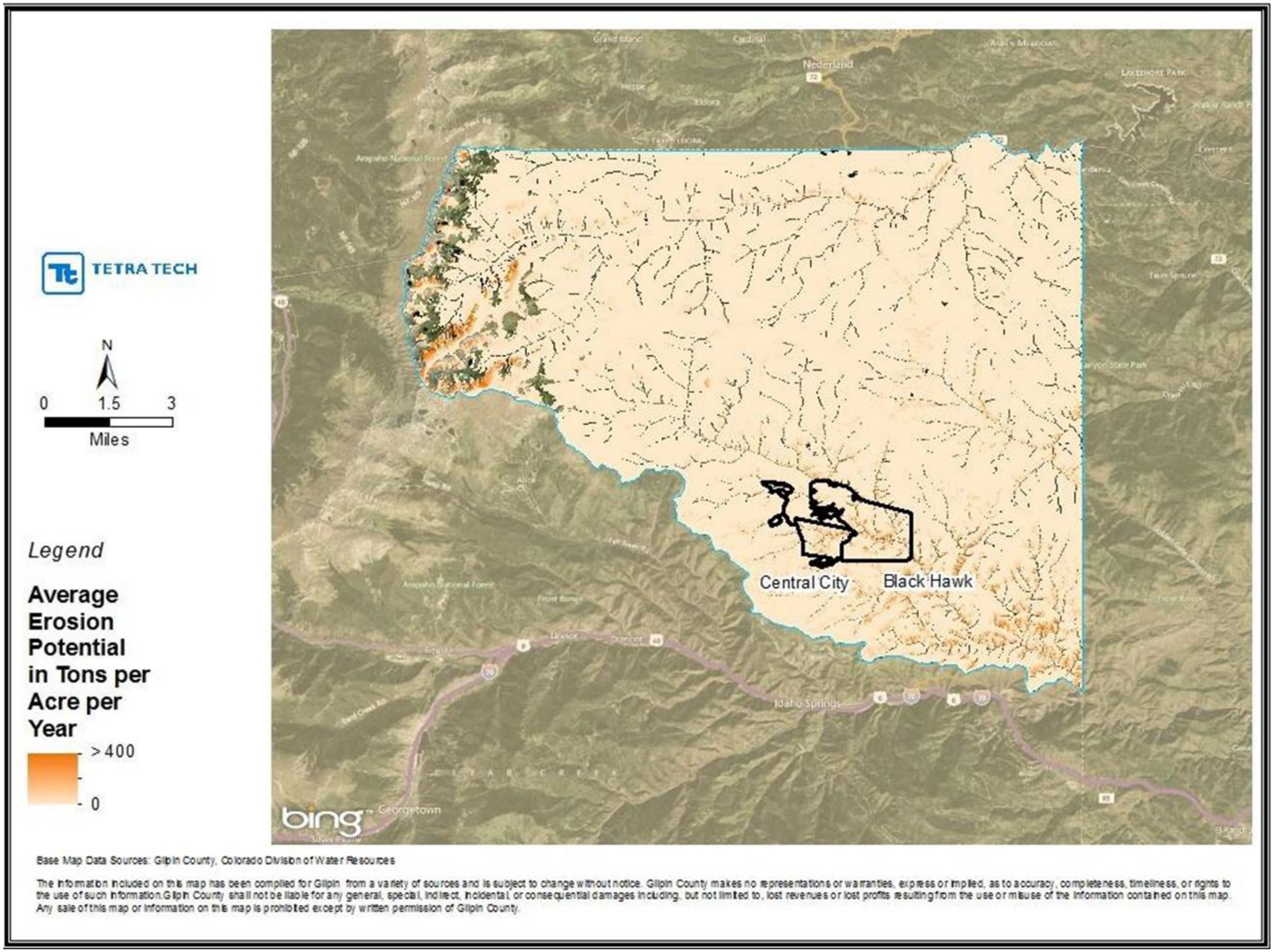


Figure 4-22 Gilpin County Average Erosion Potential in Tons per Acre per Year



4.8.4 Magnitude and Severity

Erosion and Deposition

Erosion and deposition are occurring continuously throughout the County. Large precipitation events as well as human activity may influence the frequency of these events. Such events can cause property damage as well as loss of life; however, events may also occur in remote areas of the County where there is little to no impact to people or property. Erosion can cause undercutting that can result in an increase in landslide or rockfall hazards. Deposition can have impacts that aggravate flooding, bury crops, or reduce capacities of water reservoirs.

Based on these factors, the magnitude severity rating for erosion and deposition is considered **limited,** mainly for watershed health and critical facility impacts.

Expansive Soil

Expansive soils are not likely to occur in the County, although large precipitation events as well as human activity may influence the frequency of these events. While fiscal damage from widespread expansive soils could be significant, the overall severity and impacts of the hazard are readily mitigated, reducing the overall impacts. All participating jurisdictions have a low potential impact for expansive soils.

Based on these factors, the magnitude and severity rating for expansive soils is considered **limited**.

Subsidence and Sinkholes

Subsidence, and sinkholes are occurring continuously throughout the County. Large precipitation events as well as human activity may influence the frequency of these events. Subsidence can happen suddenly and without warning or can occur gradually over time. Soil erosion and deposition generally occurs gradually over time; however, these processes may be intensified as a result of natural or human-induced activities. According to the CGS, there are some instances where the rate of subsidence can be calculated, particularly subsidence that occurs as a result of mining activities (CGS 2001):

Where longwall mining is active and subsidence is a well-documented and predictable action, surface response to ongoing mining can be accurately estimated. However, in the case of room and pillar mines, especially where they are inaccessible and record-keeping may be inaccurate, predictions of when subsidence will happen are not possible.

How much subsidence will occur and the features that will appear at the surface depend not only on the type of mining but on geology and several physical features of the voids left by mining. Some general rules of thumb are:

- The larger the mine opening height and width, the larger the subsidence feature at the surface.
- The shallower the mine below ground, the more noticeable the surface subsidence evidence; however, in Colorado pits have been found over mines as deep as 350 feet.
- The strength of the rock above the coal seam influences whether subsidence will reach the surface and the kind of features that can appear.

Unmapped and abandoned mining locations can cause a serious issue for Gilpin County with the threat of soil collapse. There is historically a good deal of mining that has occurred in Gilpin County. Though there are no marked areas of immediate concern, more research is needed to identify locations of past mining locations.

Based on these factors, no known history of subsidence and sinkhole events, and locations of abandoned mines, the Towns of Blackhawk and Central City have a medium potential for subsidence while the remaining areas of Gilpin County have low potential. Based on these factors, the magnitude severity rating for subsidence is considered **limited**.

4.8.5 Probability of Future Occurrences

Erosion and Deposition

Erosion occurs daily as a natural process in both developed and undeveloped lands, and natural erosion is not considered a hazard.

Future incidents of erosion associated with wildfires are likely particularly in a mountainous area where the ground is sloping. As such, for this erosion and deposition, the probability of future occurrence mimics that of the wildfire hazard and flood. While there have been no large wildfire events (10 acres or more), there have been 11 fires of 3.2 acres or less since 1986 giving a probability of erosion occurring as a result of small wildfire (<3.2 acres) in any given year of 31%. This corresponds to a probability of future occurrences rating of **occasional**.

Expansive Soil

Since records of specific occurrences are not available to the planning process, it is difficult to estimate the probability of future occurrences. The hazards occur seasonally and annually, which should theoretically equate to a highly likely rating. However, mitigation efforts in place in the County should prevent the likelihood of the hazard having damaging impacts. The probability rating for this hazard is considered **occasional.**

Subsidence and Sinkholes

This assessment was conducted to maintain consistency with other hazards profiled in this planning effort but represents some significant problems. As the data of previous occurrence is skewed, the accuracy of future probability predictions is heavily impeded. In addition, the existing mitigation efforts in the planning area heavily restrict development in subsidence-prone areas, which reduces the number of occurrences that cause damages, and therefore, reduces the number of occurrences that are reported.

There is no known history of subsidence and sinkhole events that have occurred within Gilpin County. Also, much of the area is hard rock which is less susceptible to subsidence and sinkholes. However due to the mining activity in the area, the probability of future occurrences rating is **occasional**.

4.8.6 Climate Change Considerations

According to the 2018 State of Colorado Hazard Mitigation Plan, the extent of erosion and deposition are expected to increase as the frequency of wildfires increase across the state. Overall, wildfire erosion is expected to increase across Colorado. Changes in precipitation events and the hydrological cycle may result in changes in the rate of subsidence and soil erosion. According to a 2003 paper published by the Soil and Water Conservation Society (Soil and Water Conservation 2003):

The potential for climate change – as expressed in changed precipitation regimes – to increase the risk of soil erosion, surface runoff, and related environmental consequences is clear. The actual damage that would result from such a change is unclear. Regional, seasonal, and temporal variability in precipitation is large both in simulated climate regimes and in the existing climate record. Different landscapes vary greatly in their vulnerability to soil erosion and runoff.

4.8.7 Vulnerability

Population

The risk of injury or fatalities as a result of these hazards are limited, but possible. Spontaneous collapse and opening of voids are rare, but still may occur resulting in death or injury to any people in the area at the time. It is likely that any such injuries would be highly localized to the area directly impacted by an event. Erosion can adversely impact populations who have respiratory issues by reducing air quality, so those with existing respiratory issues are likely to be more vulnerable.

Residents of the County living or traveling in areas prone to subsidence and erosion are exposed to the hazard. Population exposure estimates are unavailable. Most of the population is not significantly exposed to subsidence, particularly in the Cities of Black Hawk and Central City. Other erosive areas in Gilpin County are areas outside of the County's incorporated areas and are in more mountainous areas.

Property

Property exposed to subsidence and erosion can sustain minor damages or can result in complete destruction. According to the CGS, merely an inch of differential subsidence beneath a residential structure can cause several thousand dollars of damage. Structures may be condemned as a result of this damage resulting in large losses. Structures exposed to erosion hazard areas may be undermined, resulting in damages. This may also result in the condemnation of a structure. Additionally, physical loss land area may occur as a result of erosion.

Structures and other improvements located in areas prone to subsistence or soil erosion are exposed to risk from these hazards, particularly structures located along streams and other waterways. Additionally, deposition may result in damage to structures and property.

Critical Facilities and Infrastructure

Large erosion and deposition events as seen with the 2013 flooding can result in serious structural damage to critical facilities and infrastructure such as roads and transportation corridors.

Although subsidence and sinkholes are unlikely, according to the CGS, large ground displacements caused by collapsing soils can destroy roads and structures and alter surface drainage. Minor cracking and distress may result as the improvements respond to small adjustments in the ground beneath them. Erosion can also impact structures such as bridges and roads by undermining their foundations. Structures and underground utilities found in areas prone to subsidence or soil erosion can suffer from distress. The shifting and settling of the structure can be seen in a number of ways:

- Settlement, cracking and tilting of concrete slabs and foundations.
- Displacement and cracking in door jams, window frames, and interior walls.
- Offset cracking and separation in rigid walls such as brick, cinderblock, and mortared rock (CGS 2001).

Any critical facilities or infrastructure that is located on or near areas prone to subsidence or soil erosion are exposed to risk from the hazard; particularly facilities located along streams and other waterways. Deposition may result in additional exposure to facilities and infrastructure, including dams, bridges, and roads.

Government Services

Large erosion or deposition events along transportation corridors, such as the 2013 flooding events, could affect the availability of resources over an extended period of time, which could impact the ability to provide a rapid response and recovery.

Economy

Erosion and deposition events along transportation corridors, such as in 2013 flooding events along transportation corridors, could result in repair costs and delays. In addition to the repair costs of roadways, these events would delay tourist to Gilpin County.

Historic, Cultural and Natural Resources

Ecosystems that are exposed to increased sedimentation as a result of erosion and deposition degrades habitat. However, some erosion and disposition are required for healthful ecosystem functioning. Ecosystems that are already exposed to other pressures, such as encroaching development, may be more vulnerable to impacts from these hazards.

Erosion and deposition are all naturally occurring processes but can still cause damage to the natural environment.

4.8.8 Development Trends

Jurisdictions in the planning area should ensure that known hazard areas are regulated under their planning and zoning programs. In areas where hazards may be present, permitting processes should require geotechnical investigations to access risk and vulnerability to hazard areas. Erosion issues generally do not impact land use except along river channels. Issues pertaining to land use in these areas are likely addressed through jurisdictional floodplain ordinances and regulations.

4.8.9 Risk Summary

- Overall significance of this hazard is **Low**, except the subsidence hazard is **Medium** for Central City and Black Hawk, and the Erosion / Deposition hazard is Medium for Gilpin County including Central City.
- Subsidence was ranked Low for Central City in the 2016 Plan; additional USGS data along with anecdotal reports from planning team members resulted in raising the significance to medium.
- Human activities greatly influence the rate and extent of erosion and deposition. Activities should be evaluated before proceeding with them.
- Riverine erosion can reduce water quality and impact aquatic habitat as well as impacting private property and critical infrastructure.
- Knowledge of hydrologic factors is critical for evaluating most types of ground subsidence.
- Abandoned mine information is incomplete. There are likely to be hazardous areas in addition to known locations.
- Some housing developments have had subsidence hazard investigations completed before development. This practice should be expanded.
- Homeowners within an undermined area that were built before 1989 are eligible to participate in the Mine Subsidence Protection Program, a federal program operated by the Mined Land Reclamation Board of the Division of Minerals and Geology. Homes built after 1989 are not covered.
- More detailed analysis should be conducted for critical facilities and infrastructure exposed to hazard areas. This analysis should address how potential structural issues were addressed in facility design and construction.
- Related hazards: Drought, flood, landslide, wildfire.

4.9 Flood

FLOOD HAZARD RANKING	
Gilpin County	Medium
City of Black Hawk	Medium
City of Central City	Medium
Timberline Fire Protection District	Medium

4.9.1 Description

Flood

The following section is excerpted from the 2018 State of Colorado Flood Mitigation Plan.

A flood is a general and temporary condition of partial or complete inundation of normally dry land areas from:

- The overflow of stream banks,
- The unusual and rapid accumulation of runoff of surface waters from any source, or
- Mudflows or the sudden collapse of shoreline land.

Flooding results when the flow of water is greater than the normal carrying capacity of the stream channel. Rate of rise, magnitude (or peak discharge), duration, and frequency of floods are a function of specific physiographic characteristics. Generally, the rise in water surface elevation is quite rapid on small (and steep gradient) streams and slow in large (and flat sloped) streams.

The causes of floods relate directly to the accumulation of water from precipitation, rapid snowmelt, or the failure of man-made structures, such as dams or levees. Floods caused by precipitation are further classified as coming from: rain in a general storm system, rain in a localized intense thunderstorm, melting snow, rain on melting snow, and ice jams.

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 (e.g., development). These changes can also be created by other events such as wildfires. Wildfires 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.

Gilpin County is susceptible to flooding, particularly in the jurisdictions that are located in river valleys. Snowmelt and rainfall tend to travel off the mountains and enter the towns below. Potential flood impacts include loss of life, injuries, and property damage. Floods can also affect infrastructure (water, gas, sewer, and power utilities), transportation, jobs, tourism, the environment, and ultimately local and regional economies.

General Rain Floods

General rain floods can result from moderate to heavy rainfall occurring over a wide geographic area lasting several days. They are characterized by a slow steady rise in stream stage and a peak flood of long duration. As various minor streams empty into larger and larger channels, the peak discharge on the mainstream channel may progress upstream or downstream (or remain stationary) over a considerable length of river. General rain floods can result in considerably large volumes of water. The general rain flood season is historically from the beginning of May through October. Because the rate of rise is slow and the time available for warning is great, few lives are usually lost, but millions of dollars in valuable public and private property are at risk.

Thunderstorm or Flash Floods

Damaging thunderstorm floods are caused by intense rain over basins of relatively small area. They are characterized by a sudden rise in stream level, short duration, and a relatively small volume of runoff. Because there is little or no warning time, the term “flash flood” is often used to describe thunderstorm floods. The average number of thunderstorm days per year in Colorado varies from less than 40 near the western boundary to over 70 in the mountains along the Front Range. The thunderstorm flood season in Colorado is from the middle of July through October.

Snowmelt Floods

Snowmelt floods result from melting of winter snowpack in the high mountain areas. Snowmelt floods typically begin as spring runoff appears, after the first spring warming trend. If the warming trend continues up to 8 to 10 consecutive days in a basin where the snowpack has a water content more than about 150% of average, serious flooding can develop. The total duration of snowmelt floods is usually over a period of weeks rather than days. They yield a larger total volume in comparison to other types of floods in Colorado. Peak flows, however, are generally not as high as flows for the other types. A single cold day or cold front can interrupt a melting cycle causing the rising water to decline and stabilize until the cycle can begin again. Once snowmelt floods have peaked, the daily decreases are moderate, but fairly constant. Snowmelt flooding usually occurs in May, June, and early July.

Rain on Snowmelt Floods

Rain on snow flooding occurs most often in Colorado during the month of May. It is at this time of year that large general rainstorms occur over western Colorado. These rainstorms are most often caused when warm moist air from the Gulf of Mexico begins pushing far enough north that it begins to affect western weather. In combination with this movement of air mass is the continued possibility of cold fronts moving into Colorado from the Pacific Northwest. When these weather phenomena collide, long lasting general rainstorms can often occur. Rain on snowmelt exacerbates an already tenuous situation as snowmelt waters rush down heavily incised stream channels. Any abnormal increase in flow from other sources usually causes streams to leave their banks.

During the summer months of May and June when rivers are running high, there is a potential for flooding due to rain falling on melting snow. Usually, such rain is over a small part of a basin, and the resulting flood is of short duration and may often go unnoticed in the lower reaches of a large drainage basin. To some extent, the cloud cover associated with the rain system can slow the melting cycle and offset the compound effect. In some cases, however, rainfall may be heavy and widespread enough to noticeably affect peak flows throughout the basin.

Ice Jam Floods

Ice jam floods can occur by two phenomena. In the mountain floodplains during extended cold periods of 20 to 40 degrees below zero, the streams ice over. The channels are frozen solid and overbank flow occurs, which results in ice inundation in the floodplains. Ice jam floods can occur when frozen water in the upper reaches of a stream abruptly begins to melt due to warm Chinook winds. Blocks of ice floating downstream can become lodged at constrictions and form a jam. The jam can force water to be diverted from the stream channel causing a flood. An ice jam can also break up, suddenly causing a surge of water as the “reservoir” that was formed behind it is suddenly released. Ice jamming occurs in slow moving streams where prolonged periods of cold weather are experienced. Sometimes the ice jams are dynamited, allowing a controlled release of the backed-up water to flow downstream.

Urban or Street Flood Events

Urban or street flood events occur due to the conversion of land from undeveloped areas to surfaces appropriate for roads, parking lots, and other types of site development needs. This is called urbanization, which is the reason that a soil's ability to absorb water is reduced. When soil is subjected to an excessive amount of water in an accelerated timeframe, it cannot balance the rate of absorption. Urbanization increases runoff two to six times over what would occur on natural terrain. Underpasses, street flooding and yard ponding usually do not exceed more than a foot or two and are often viewed more as a nuisance than a major hazard. However, in some localized urban areas, larger flood velocities and depths, which can develop as rapidly as flash floods, can produce extremely hazardous conditions to the public and block vehicular traffic. Stormwater drainage systems may or may not be adequate enough to handle the incoming flow. Impervious surface studies can be conducted to assess runoff levels, which can identify areas of increased risk or threat as well as the need for improved capture of stormwater runoff.

Floodplain

A floodplain is the area adjacent to a river, creek, or lake that becomes inundated during a flood. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain unconsolidated sediments (accumulations of sand, gravel, loam, silt, or clay), often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

Connections between a river and its floodplain are most apparent during and after major flood events. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced.

Measuring Floods and Floodplains

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to estimate the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-year discharge has a 1% chance of being equaled or exceeded in any given year. The "annual flood" is the greatest flood event expected to occur in a typical year. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-year or higher recurrence interval to occur in a short time period. The same flood can have different recurrence intervals at different points on a river.

The extent of flooding associated with a 1% annual probability of occurrence (the base flood or 100-year flood) is used as the regulatory boundary by many agencies. Also referred to as the special flood hazard area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. Corresponding water surface elevations describe the elevation of water that will result from a given discharge level, which is one of the most important factors used in estimating flood damage.

Floodplain Ecosystems

Floodplains can support ecosystems that are rich in plant and animal species. A floodplain can contain 100 or even 1,000 times as many species as a river. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. Opportunistic feeders (particularly birds) move in to take advantage. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick growing compared to non-riparian trees.

Effects of Human Activities

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to develop. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

National Flood Insurance Program

The 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 study presents water surface elevations for floods of various magnitudes, including the 1% annual chance flood and the 0.2% annual chance flood (the 500-year flood). Base flood elevations and the boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps (FIRM), which are the principal tool for identifying the extent and location of the 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.

Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

Gilpin County and the Cities of Black Hawk and Central City participate in the NFIP program. As shown in Table 4-28 and Table 4-29 in Section 4.9.7, there are 65 buildings in the 1% chance floodplain (18 in Black Hawk and 47 in the unincorporated County), and an additional 22 buildings in the 0.2% chance floodplain (10 in Black Hawk, 5 in Central City, and 7 in the unincorporated County). Structures permitted or built in the County before they joined are called "pre-FIRM" structures, and structures built afterwards are called "post-FIRM." The insurance rate is different for the two types of structures. The effective date for the current countywide FIRM is March 1, 1986, and it was digitized by Digital Data Services for Gilpin County. The County and participating communities are currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff. Maintaining compliance under the NFIP is an important component of flood risk reduction.

4.9.2 Past Events

The National Centers for Environmental Information Storm Events Database includes flood events that happened in Gilpin County between 1998 and 2020, as listed in Table 4-27. According to the database, only one event in 1998 resulted in any recorded property damage.

Table 4-27 Gilpin County Flood Events (1998-2020)

			Estimated Damage Cost	
Location	**Date**	**Event Type**	**Property**	**Crops**
Black Hawk	7/31/1998	Flash Flood	$500,000	$0
East Portal	9/12/2013	Flash Flood and Flood	$0	$0

Source: National Centers for Environmental Information, Storm Events Database

Notable incidents causing damages from the Storm Events Database in Gilpin County are described below:

- **July 31, 1998** – Flooding occurred after a month of above-average precipitation and in areas where the ground was already fully saturated. Heavy rains pushed a river of mud, trees, and boulders through Main Street causing as estimated $500,000 in damages to the Golden Gate Casino in Black Hawk. Approximately 100 people were evacuated.
- **September 11 to 18, 2013** – FEMA-EM-3365 and FEMA-DR-4145. A deep southerly flow over Colorado, ahead of a near stationary low-pressure system over the Great Basin, pumped monsoonal moisture into the area. In addition, a weak stationary front stretched along the Front Range Foothills and Palmer Divide. As a result, a prolonged period of moderate to heavy rain developed across the Front Range Foothills, Palmer Divide, and Urban Corridor. By September 14, storm totals ranged from 6 to 18 inches, highest in the foothills of Boulder County. Continuous moderate to heavy rainfall produced flash flooding through September 18. Colorado State Highway 72 was closed from Colorado State Highway 119 in Gilpin County to Colorado State Highway 93 in Jefferson County. US Highway 6 from Golden to the junction of US Highway 6 and Colorado State Highway 119 was closed in both directions due dangerous conditions from falling rocks. FEMA-DR-4145 approved over $61 million for individual assistance and over $354 million for public assistance aid for the affected communities of this federal disaster (Source: FEMA, https://www.fema.gov/disaster/4145). According to information provided by the HMPC, Gilpin County completed numerous public works projects repairing roadways, culverts, and drainage that were damaged during the flood. The total claimed by the county came out to $344,272.88, which was covered by FEMA and State grant funds.

4.9.3 Location

Gilpin County is a very mountainous county with elevations above 7,500 feet and bounded on the west by the continental divide. Gilpin County is in the Clear Creek River basin. All streams in the County are either direct or indirect tributaries of the South Boulder Creek (northern portion of the County) or Clear Creek (southern portion of the County). The South Boulder Creek flows primarily west to east, through Rollinsville in the northern portion of the County. Pine Creek, Elk Creek, and Mission Creek all flow south into Central City and Black Hawk. These streams normally flow year-round, although they may dry up during unusually dry years. The Clear Creek Watershed is shown in Figure 4-25.

Gilpin County has 1,430 acres in the 100-year floodplain. Figure 4-23 below highlights the extent of the 100-year floodplain countywide. Figure 4-24 below shows a more focused view of the extent of the FEMA floodplain within the city limits of Black Hawk and Central City.

Figure 4-23 Gilpin County FEMA Flood Hazards

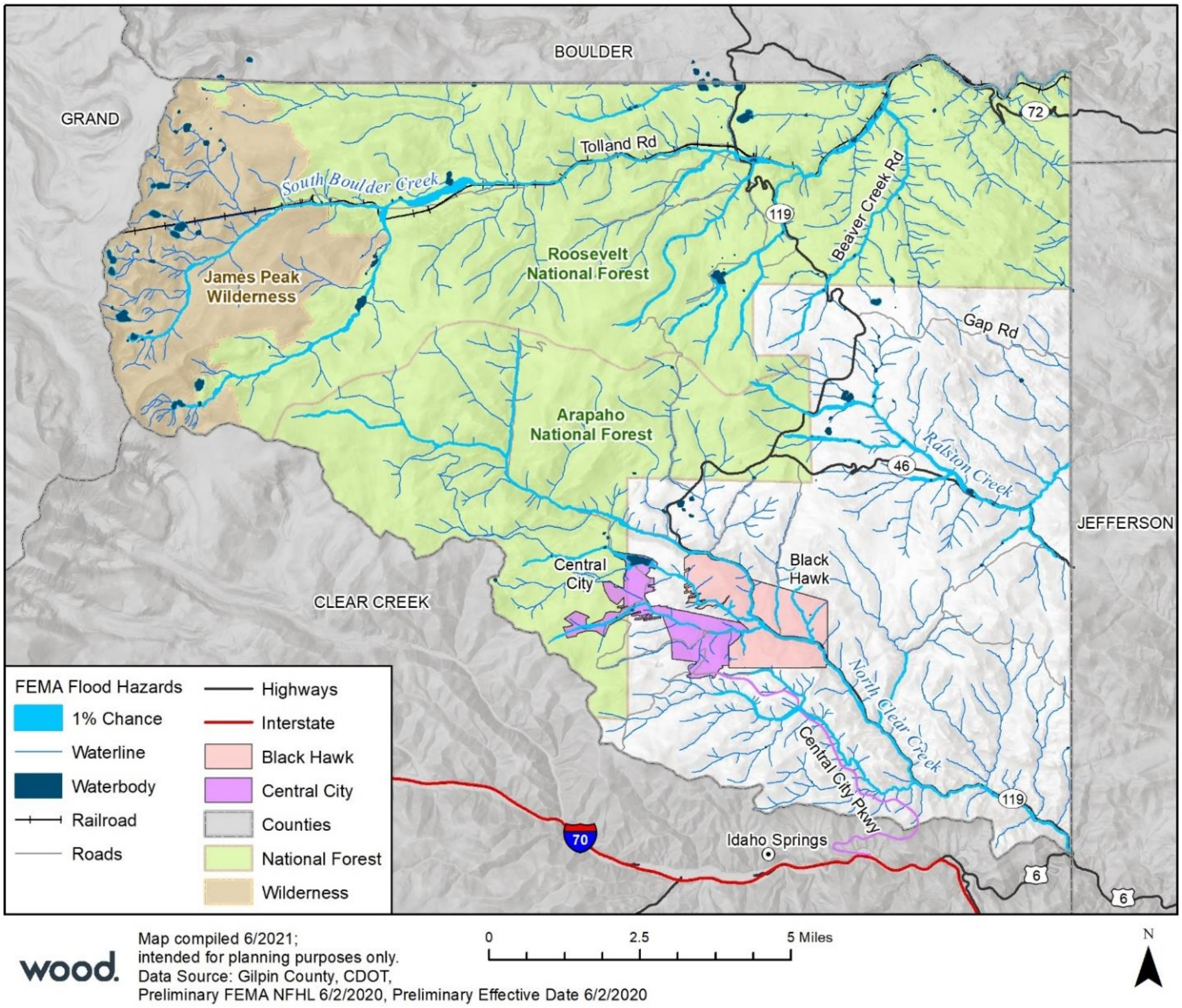


Figure 4-24 Black Hawk and Central City FEMA Flood Hazards

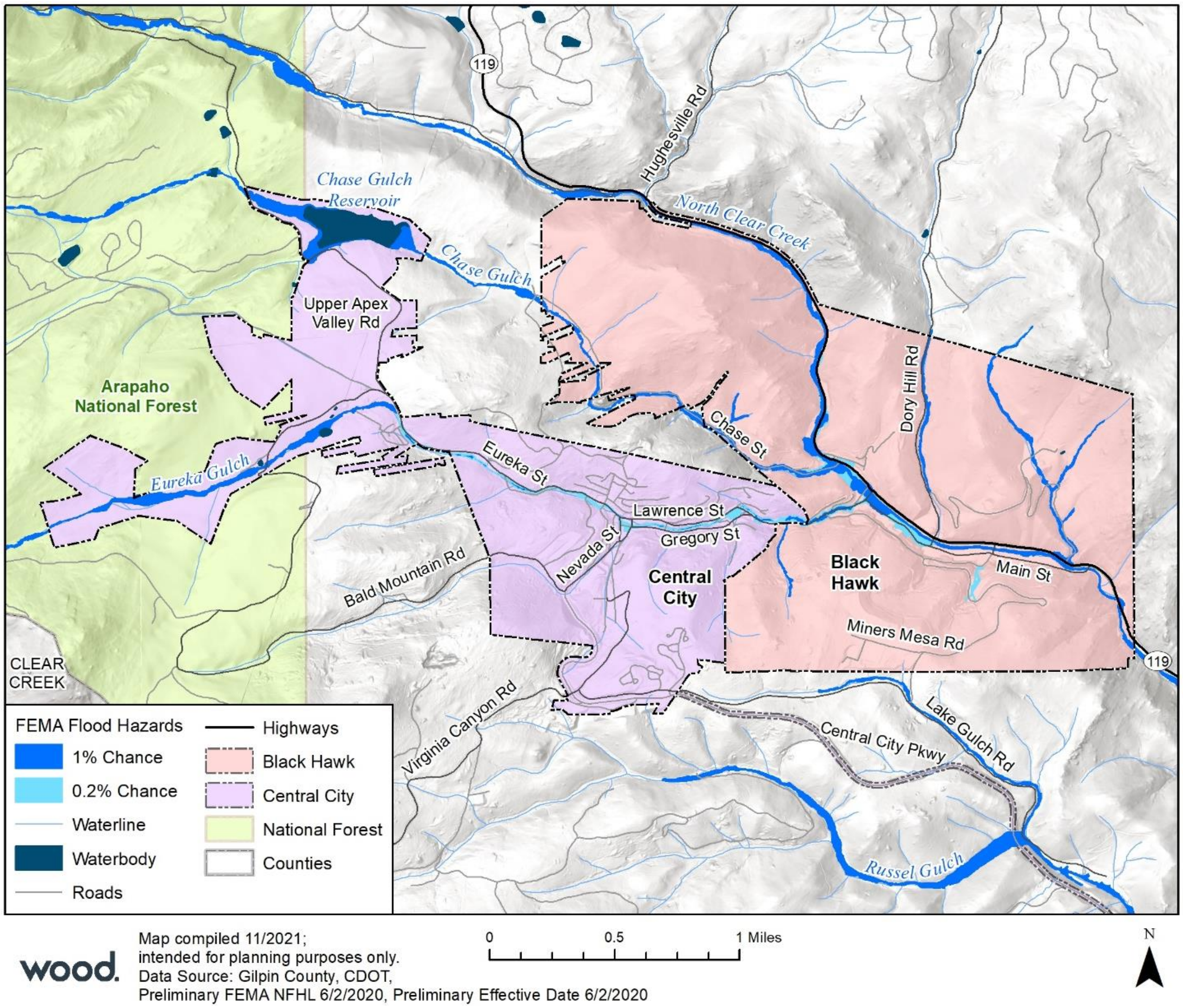
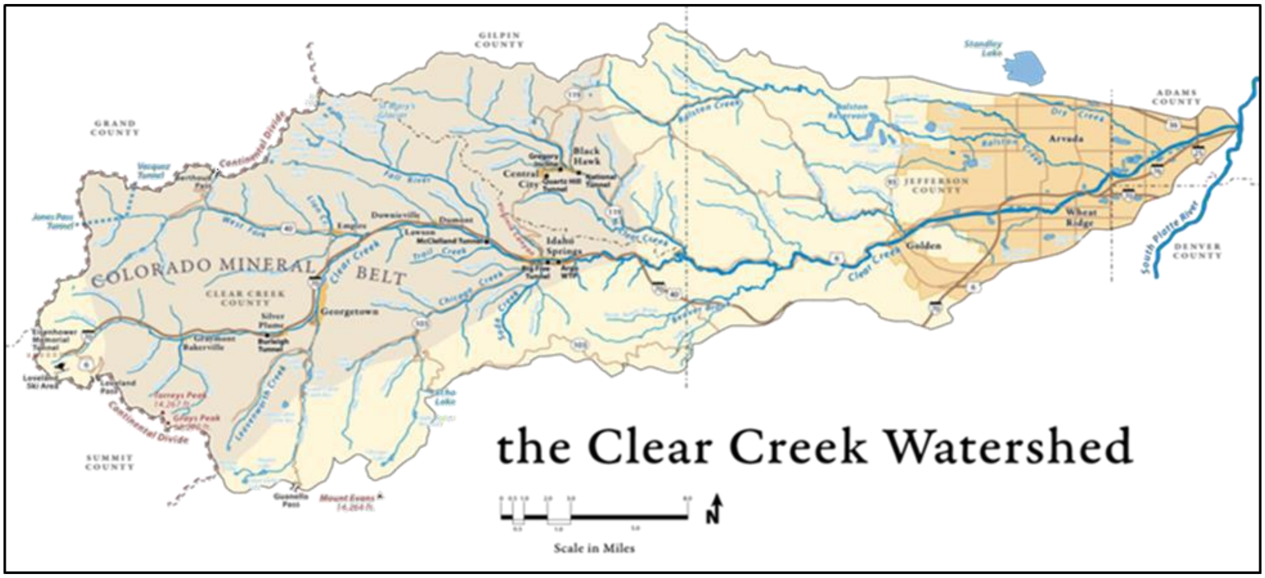


Figure 4-25 Clear Creek Watershed



4.9.4 Magnitude and 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. Several factors contribute to the relative vulnerabilities of certain areas in the floodplain. Development, or the presence of people and property in the hazardous areas, is a critical factor in determining vulnerability to flooding. Additional factors that contribute to flood vulnerability range from specific characteristics of the floodplain to characteristics of the structures located within the floodplain. The following is a brief discussion of some of these flood factors which pose risk.

- **Elevation:** The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage, due to the higher likelihood that it will come into contact with water for a prolonged amount of time.
- **Flood depth:** The greater the depth of flooding, the higher the potential for significant damages due to larger availability of flooding waters.
- **Flood duration:** The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for **damage.**
- **Velocity:** Flowing water exerts forces on the structural members of a building, increasing the likelihood of significant damage (such as scouring).
- **Construction type:** Certain types of construction and materials are more resistant to the effects of floodwaters than others. Typically, masonry buildings, constructed of brick or concrete blocks, are the most resistant to damages simply because masonry materials can be in contact with limited depths of flooding without sustaining significant damage. Wood frame structures are more susceptible to damage because the construction materials used are easily damaged when inundated with water.

Based on the information in this hazard profile, the magnitude of flooding is moderate for all the planning partners. The loss potential is the highest for the unincorporated county and the City of Black Hawk. This is reflected in the flood hazard map shown previously and quantified in the vulnerability subsection below.

Seasonal flooding in Gilpin County has been decreasing through time due to the increased attention to water management issues. Flash floods and floods, however, are still considered to be moderately likely by the Planning Team, even though there are only two events documented.

The NWS has issued general flood forecasting guidance for the region. Although it can be difficult to predict how much rain will result in a flood event on any given day, there are some general principles regarding when flood events are more likely to occur (NWS 2010):

- If 1 inch or more of rain falls in an urban or mountain area in 1 hour, a flood statement should be issued. In mountain areas, a flash flood warning may be necessary.
- If 2 or more inches of rain falls in an urban or mountain area in 1 hour, a flash flood warning should be issued.
- In rural areas on the plains, if rainfall reaches 2 inches in 1 hour, a flood statement should be issued and if rainfall reaches 3 inches in 1 hour, a flash flood warning should be issued.

If precipitable water values exceed 150% of normal, this is a good indicator that flash flood- producing rains will develop if precipitation occurs.

4.9.5 Probability of Future Occurrences

In the past, Gilpin County has had significant seasonal floods. Flooding in the County is now predominantly the result of snowmelt and cloudbursts that result in flash flooding. Severe flash flooding poses the greatest risk. These rain events are most often microbursts, which produce a large amount of rainfall in a short amount of time. Flash floods, by their nature, occur suddenly but usually dissipate within hours. Despite their sudden nature, the NWS is usually able to issue advisories, watches, and warnings in advance of a flood. In mountainous, rugged terrain, runoff can damage drainage systems or cause them to fail.

Periodic flooding of lands adjacent to rivers and streams is a natural occurrence in the County and can be expected to take place based upon established flood recurrence intervals.

A 100-year flood, which has a 1% chance (1 in 100) of occurring in a given year, is a regulatory standard used by federal agencies, states, and NFIP participating communities to administer and enforce floodplain management programs, as well as set insurance requirements nationwide.

The 500-year flood event, which has a 0.2% chance (1 in 500) chance of occurring in a given year, is another commonly mapped and studied event by FEMA flood related programs and efforts.

Seasonal flooding in Gilpin County has been decreasing through time due to the increased attention to water management issues. Flash floods and floods, however, are still considered to be likely to occur, with approximately 9% chance of occurrence in any given year. This probability is based on the historical record of two events occurring over the 22 years reported in the National Centers for Environmental Information Storm Events Database (Table 4-27). This corresponds to a probability of future occurrences rating of likely.

4.9.6 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. Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted. 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.

High frequency flood events (e.g., 10-year floods) in particular will likely increase with a changing climate, as well as the potential for less frequent, more extreme events. 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.

4.9.7 Vulnerability

This section describes vulnerabilities in terms of population, property, infrastructure, and environment. The vulnerability analysis was performed at the parcel level using GIS during the 2023 update. This methodology improves upon the census block level Hazus analysis done in the previous HMP, which likely overestimated impacts from both the modeled 100-year and 500-year flood events as it is assumed that both structures and the population are evenly spread throughout the census block.

The flood vulnerability assessment was performed for Gilpin 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.

Building improvement values and counts for those buildings within the flood zone were then extracted from the parcel/assessor’s data and summed for the unincorporated county and jurisdictions. Results of the overlay analysis area shown in Table 4 26 for the 1% annual chance flood and Table 4 27 for 0.2% annual chance flood. Property type refers to the land use of the parcel and includes agricultural, commercial, exempt, improved vacant, industrial, natural resource, residential, and state assessed. A loss estimate analysis was also performed based on depth damage functions developed by the Army Corp of Engineers and FEMA. The loss curves depict the expected flood losses associated with the depth of flooding at a structure. Contents values were estimated as a percentage of building value based on their occupancy type, using FEMA/Hazus estimated content replacement values. This includes 100% of the structure value for agricultural, commercial, exempt, natural resource, and state assessed structures, 50% for residential structures and 150% for industrial structures. Building and contents values were totaled to obtain total exposure.

There are different depth damage curves for structure and content losses. For the purposes of this planning level analysis, an average flood depth of 2 feet is assumed. A depth damage ratio of 25% was used for structural loss, based on the FEMA damage curves, assuming a 2-foot-deep flood. The following sections describe vulnerabilities in terms of population, property, infrastructure, and environment, and results of the analysis for each vulnerability subject are detailed.

Population

Injuries or fatalities typically result if people are caught off guard by the flood event, more commonly associated with flash floods. Most fatalities occur when people attempt to drive across flooded areas.

Population counts of those living in the floodplain in the planning area were generated by analyzing tax assessor data and building locations that intersect with the 1% annual chance and 0.2% annual chance floodplains (sometimes referred to as the 100-year and 500-year floodplains) identified on the NFHL. Since both floodplains are nearly identical spatially (that is, the 100-year and 500-year floodplains overlap), they contain similar numbers of structures and therefore have similar population distributions. Total populations were estimated by multiplying the number of residential properties exposed to the floodplain by the average Gilpin County household size of the respective communities (ranging from 1.94 to 2.23 persons per household).

Using this approach, an estimated 123 people countywide live within the 100-year floodplain; 103 in the unincorporated county and 20 in Black Hawk. An additional 26 people live in the 500-year floodplain. This analysis does not account for the visitor population swells that coincides with the summer months when flash flooding is more likely also.

Property

Figure 4-23 illustrates the extent of the 100-year floodplain throughout the municipalities and unincorporated county. Table 4-28 summarizes the total number of improved parcels and number of structures in the 100-year floodplain by municipality and unincorporated areas. The analysis determined that there are an estimated 65 structures within the 100-year floodplain total. Approximately 72% of these structures are in unincorporated areas and approximately 86% of the structures are residential. The parcel analysis revealed there are significantly fewer structures in the 500-year floodplain, with a total of only 22 structures, as shown in Table 4-29. While the building counts are low in both flood hazard areas, Black Hawk has a significant dollar exposure related to commercial buildings. The analysis does not account for those structures that might have been more recently constructed in accordance with local floodplain management regulations, and thus are not prone to 1% annual chance flooding. Properties constructed in the 500-year floodplain are not regulated, however.

Table 4-28 Property and Estimated Values in the 1% Annual Chance Flood Hazard

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value	Estimated Loss
Black Hawk	Commercial	7	7	$37,943,590	$37,943,590	$75,887,180	$18,971,795
	Exempt	1	1	$80,670	$80,670	$161,340	$40,335
	Residential	9	10	$2,590,390	$1,295,195	$3,885,585	$971,396
	Total	**17**	**18**	**$40,614,650**	**$39,319,455**	**$79,934,105**	**$19,983,526**
Unincorporated	Natural Resource	1	1	$2,570	$2,570	$5,140	$1,285
	Residential	35	46	$7,969,130	$3,984,565	$11,953,695	$2,988,424
	Total	**36**	**47**	**$7,971,700**	**$3,987,135**	**$11,958,835**	**$2,989,709**
	Grand Total	**53**	**65**	**$48,586,350**	**$43,306,590**	**$91,892,940**	**$22,973,235**

Source: Gilpin County Assessor, FEMA NFHL 6/2/2020, Wood GIS Analysis

Table 4-29 Property and Estimated Values in the 0.2% Annual Chace Flood Hazard

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value	Estimated Loss
Black Hawk	Commercial	2	3	$29,885,380	$29,885,380	$59,770,760	$14,942,690
	Exempt	2	3	$443,300	$443,300	$886,600	$221,650
	Residential	4	4	$839,840	$419,920	$1,259,760	$314,940
	Total	**8**	**10**	**$31,168,520**	**$30,748,600**	**$61,917,120**	**$15,479,280**
Central City	Commercial	1	2	$36,000	$36,000	$72,000	$18,000
	Exempt	1	1	$644,280	$644,280	$1,288,560	$322,140

Jurisdiction	Property Type	Improved Parcels	Building Count	Improved Value	Content Value	Total Value	Estimated Loss
	Residential	1	1	$8,380	$4,190	$12,570	$3,143
	Vacant w/Improvements	1	1	$8,420	$8,420	$16,840	$4,210
	Total	**4**	**5**	**$697,080**	**$692,890**	**$1,389,970**	**$347,493**
Unincorporated	Residential	6	7	$3,486,530	$1,743,265	$5,229,795	$1,307,449
	Total	**6**	**7**	**$3,486,530**	**$1,743,265**	**$5,229,795**	**$1,307,449**
	Grand Total	**18**	**22**	**$35,352,130**	**$33,184,755**	**$68,536,885**	**$17,134,221**

Source: Gilpin County Assessor, FEMA NFHL 6/2/2020, Wood GIS Analysis

National Flood Insurance Program

Table 4-30 lists flood insurance statistics that help identify vulnerability in the planning area. Gilpin County and the Cities of Black Hawk and Central City participate in the NFIP.

Table 4-30 National Flood Insurance Program Statistics

	Initial FIRM EffectiveDate	Claims (11/1978 to 2/29/2016)	Value of Claims Paid (11/1978 to 2/29/2016)
City of Black Hawk	10/16/1984	4	$8,332
City of Central City	01/06/2010	1	$0
Unincorporated County	03/01/1986	3	$1,462
Total		**7**	**$9,794**

Source: FEMA

Properties constructed after a FIRM has been adopted are eligible for reduced flood insurance rates. Such structures are less vulnerable to flooding since they were constructed after regulations and codes were adopted to decrease vulnerability. Properties built before a FIRM is adopted may be more vulnerable to flooding because they do not meet code or are located in hazardous areas.

The following information from flood insurance statistics is relevant to reducing flood risk:

- The use of flood insurance in the planning area is below the national average.
- The average claim paid in the planning area is below the national average.

Repetitive Loss

The NFIP defines a repetitive loss property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period since 1978. At least two of the claims must be more than 10 days apart but within 10 years of each other. A repetitive loss property may or may not be currently insured by the NFIP. Gilpin County and the Cities of Black Hawk and Central City have no repetitive loss or severe repetitive loss properties as defined by FEMA.

Critical Facilities and Infrastructure

To estimate the potential impact of floods on critical facilities, a GIS overlay was performed of the flood hazard layer for critical facility point locations critical facilities at risk to the 1% annual chance flood are listed in Table 4-31. Critical facilities at risk to the 0.2% annual chance flood are shown in Table 4-32.

Replacement values were not available with the data thus an estimate of potential monetary loss could not be performed. Impacts to any of these facilities could have wide ranging ramifications, in addition to property damage.

Table 4-31 Critical Facilities in 1% Annual Chance Flood Hazard Areas

FEMA Lifeline	Jurisdiction	Facility Type	Count
Communications	Black Hawk	Land Mobile Private Tower	1
	Gilpin County	Land Mobile Private Tower	1
	Total		**2**
Food, Water, Shelter	Black Hawk	Casino	3
	Gilpin County	Fire Suppression Water Source	1
	Boulder County	Fire Suppression Water Source	2
	Total		**6**
Transportation	Black Hawk	Bridge Non-Scour Fair Condition	1
		Bridge Non-Scour Good Condition	1
	Gilpin County	Bridge Non-Scour Fair Condition	2
		Bridge Non-Scour Good Condition	1
		Bridge Scour Fair Condition	1
	Total		**6**
	Grand Total		**14**

Source: HIFLD, FEMA NFHL 6/2/2020, Wood GIS Analysis

Table 4-32 Critical Facilities in 0.2% Annual Chance Flood Hazard Areas

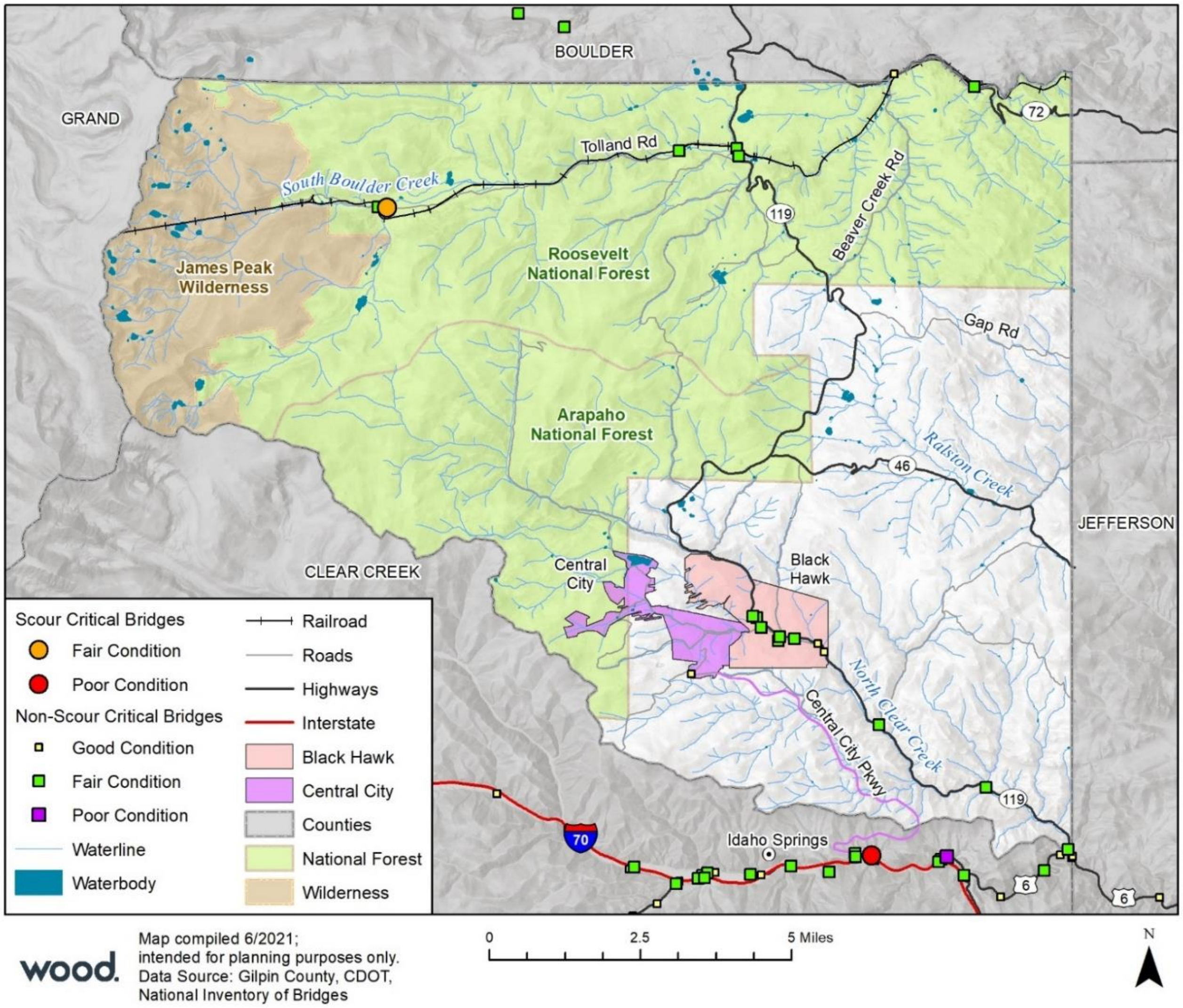
FEMA Lifeline	Jurisdiction	Facility Type	Count
Food, Water, Shelter	Black Hawk	Casino	1
	Total		**1**
Safety and Security	Black Hawk	Post Office	1
	Total		**1**
Transportation	Black Hawk	Bridge Non-Scour Fair Condition	2
	Gilpin County	Bridge Non-Scour Fair Condition	2
	Total		**4**
	Grand Total		6

Source: HIFLD, FEMA NFHL 6/2/2020, Wood GIS Analysis

Transportation routes could be cut off due to floodwaters, isolating portions of the planning area. These impacts may last after the floodwater recedes as flash floods in the area have been known to cause extensive damage to roadway infrastructure.

Gilpin County does have a number of bridges of concern, including scour critical (a bridge with a foundation element determined to be unstable for the observed or evaluated scour condition) structurally deficient (when key components like the superstructure are inspected and rated 'poor' or worse by a bridge engineer) and functionally obsolete (when design components are outdated) facilities. Based on a search of the National Bridge inventory there is one bridge in the County that falls within these categories, located in the northwest area of the County as shown in Figure 4-26 below.

Figure 4-26 Gilpin County Bridges



Government Services

Publicly owned facilities are a key component of daily life for all citizens of the County. Public buildings are of particular importance during flood events because they house critical assets for government response and recovery activities. Damage to public water and sewer systems, transportation networks, flood control facilities, emergency facilities, and offices can hinder the ability of the government to deliver services. Loss of power and communications can be expected. Drinking water and wastewater treatment facilities may be temporarily out of operation.

Flooding can have various impacts to responders in terms of response time and the personal safety of first responders. Flooded roadways can block emergency vehicles from crossing certain areas, delaying response times.

Public confidence in government services may be hindered if warnings and alerts prior to the flood event are not communicated effectively. The government's ability to respond and recover may be questioned and challenged by the public if planning, response, and recovery is not timely and effective, particularly in areas that have repeated flooding.

Economy

Flooding can have a major negative impact on the economy. Based on the flood loss analysis, there are seven commercial structures worth an estimated $75.9 million in total value directly at risk to flooding in the 1% annual chance zone. Based on the loss analysis this could result in approximately $19 million in direct losses. This does not account for other indirect losses such as business interruption, reduced tourism and visitation, lost wages, and other downtime costs.

These indirect losses can also have a significant economic cost. Flood events can cut off customer access to a business as well as close a business for repairs or permanently. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

Historic, Cultural, and Natural Resources

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, with human development factored in, flooding can impact the environment in negative ways. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development such as bridge abutments can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

4.9.8 Development Trends

Development trends include large commercial development in and near the Clear Creek floodplain in Black Hawk. Gilpin County and its planning partners regulate growth within the 1% annual chance flood hazard areas. All municipal planning partners are participants in the NFIP and have adopted flood damage prevention ordinances in response to its requirements. The County and all municipal planning partners have committed to maintaining their good standing under the NFIP through initiatives identified in this plan.

4.9.9 Risk Summary

- The overall significance rating for flood in the County is **Medium**.
- Countywide an estimated $22.97 million in property losses is at risk to a 1% annual chance flood hazard. The City of Black Hawk makes up the majority of this risk, with an estimated $19.98 million in estimated losses.
- Flash flooding that occurs with little or no warning will continue to impact the planning area.
- Flooding may be exacerbated by other hazards, such as wildfires.
- Flooding may also bring other related hazards, such as erosion and landslides.
- Damages resulting from flood may impact tourism, which may have significant impacts on the local economy.
- Continued compliance with the NFIP and the promotion of flood insurance as a means of protecting private property owners from the economic impacts of flood events should continue.
- Related hazards: wildfire, winter storm, hail.

4.10 Hail, Lightning, and Severe Wind

HAIL, LIGHTNING, AND SEVERE WIND HAZARD RANKING			
	Hail	Lightning	Severe Wind
Gilpin County	Low	High	High
City of Black Hawk	Low	Low	High
City of Central City	Medium	Medium	High
Timberline Fire Protection District	Low	High	High

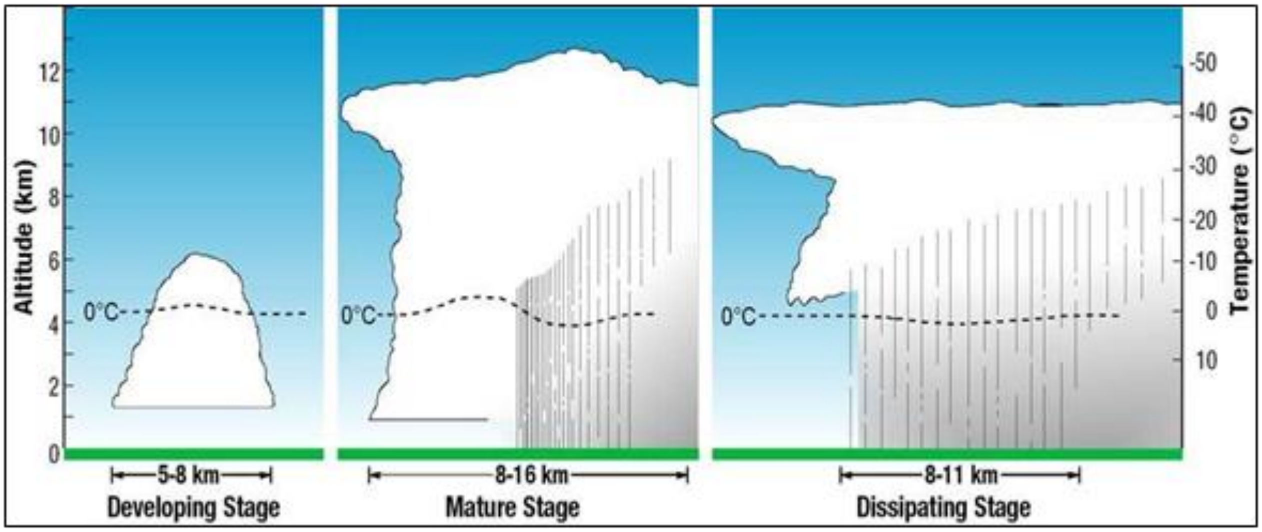
4.10.1 Description

A thunderstorm is a rain event that includes thunder and lightning. A thunderstorm is classified as "severe" when it contains one or more of the following: hail with a diameter of three-quarter inch or greater, winds gusting in excess of 50 knots (58 mph), or a tornado.

Three factors cause thunderstorms to form: moisture, rising unstable air (air that keeps rising when disturbed), and a lifting mechanism to provide the disturbance. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise (hills or mountains can cause rising motion, as can the interaction of warm air and cold air or wet air and dry air), it will continue to rise as long as it weighs less and stays warmer than the air around it. As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool and it condenses into a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice and some of it turns into water droplets. Both have electrical charges. Ice particles usually have positive charges, and rain droplets usually have negative charges. When the charges build up enough, they are discharged in a bolt of lightning, which causes the sound waves we hear as thunder. Thunderstorms have three stages (see Figure 4-27):

- The developing stage of a thunderstorm is marked by a cumulus cloud that is being pushed upward by a rising column of air (updraft). The cumulus cloud soon looks like a tower (called towering cumulus) as the updraft continues to develop. There is little to no rain during this stage but occasional lightning. The developing stage lasts about 10 minutes.
- The thunderstorm enters the mature stage when the updraft continues to feed the storm, but precipitation begins to fall out of the storm, and a downdraft begins (a column of air pushing downward). When the downdraft and rain-cooled air spread out along the ground, they form a gust front, or a line of gusty winds. The mature stage is the most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes. The storm occasionally has a black or dark green appearance.
- Eventually, a large amount of precipitation is produced and the updraft is overcome by the downdraft beginning the dissipating stage. At the ground, the gust front moves out a long distance from the storm and cuts off the warm moist air that was feeding the thunderstorm. Rainfall decreases in intensity, but lightning remains a danger.

Figure 4-27 Thunderstorm Life Cycle



There are four types of thunderstorms:

- **Single-Cell Thunderstorms:** Single-cell thunderstorms usually last 20 to 30 minutes. A true single-cell storm is rare, because the gust front of one cell often triggers the growth of another. Most single-cell storms are not usually severe, but a single-cell storm can produce a brief severe weather event. When this happens, it is called a pulse severe storm.
- **Multi-Cell Cluster Storm:** A multi-cell cluster is the most common type of thunderstorm. The multi-cell cluster consists of a group of cells, moving as one unit, with each cell in a different phase of the thunderstorm life cycle. Mature cells are usually found at the center of the cluster and dissipating cells at the downwind edge. Multi-cell cluster storms can produce moderate size hail, flash floods, and weak tornadoes. Each cell in a multi-cell cluster lasts only about 20 minutes; the multi-cell cluster itself may persist for several hours. This type of storm is usually more intense than a single-cell storm.
- **Multi-Cell Squall Line:** A multi-cell line storm, or squall line, consists of a long line of storms with a continuous well-developed gust front at the leading edge. The line of storms can be solid, or there can be gaps and breaks in the line. Squall lines can produce hail up to golf ball size, heavy rainfall, and weak tornadoes, but they are best known as the producers of strong downdrafts. Occasionally, a strong downburst will accelerate a portion of the squall line ahead of the rest of the line. This produces what is called a bow echo. Bow echoes can develop with isolated cells as well as squall lines. Bow echoes are easily detected on radar but are difficult to observe visually.
- **Super-Cell Storm:** A super-cell is a highly organized thunderstorm that poses a high threat to life and property. It is similar to a single-cell storm in that it has one main updraft, but the updraft is extremely strong, reaching speeds of 150 to 175 mph. Super-cells are rare. The main characteristic that sets them apart from other thunderstorms is the presence of rotation. The rotating updraft of a super-cell (called a mesocyclone when visible on radar) helps the super-cell to produce extreme weather events, such as giant hail (more than 2 inches in diameter), strong downbursts of 80 mph or more, and strong to violent tornadoes.

Hail

Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Recent studies suggest that super-cooled water may accumulate on frozen particles near the backside of a storm as they are pushed forward across and above the updraft by the prevailing winds near the top of the storm. Eventually, the hailstones encounter downdraft air and fall to the ground.

Hailstones grow two ways: by wet growth or dry growth. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a super-cooled drop, the water does not freeze on the ice immediately. Instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape, resulting in a layer of clear ice. Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are "frozen" in place, leaving cloudy ice. Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are "balanced" in an updraft. One can tell how many times a hailstone traveled to the top of the storm by counting its layers. Hailstones can begin to melt and then re-freeze together, forming large and very irregularly shaped hail.

The NWS classifies hail as non-severe and severe based on hail diameter size. Descriptions and diameter sizes are provided in Table 4-35. According to the NWS Storm Prediction Center, Gilpin County experiences on average 5 to 6 severe hail days a year.

Lightning

Lightning is an electrical discharge between positive and negative regions of a thunderstorm. A lightning flash is composed of a series of strokes with an average of about four strokes per flash. The length and duration of each lightning stroke vary, but typically average about 30 microseconds.

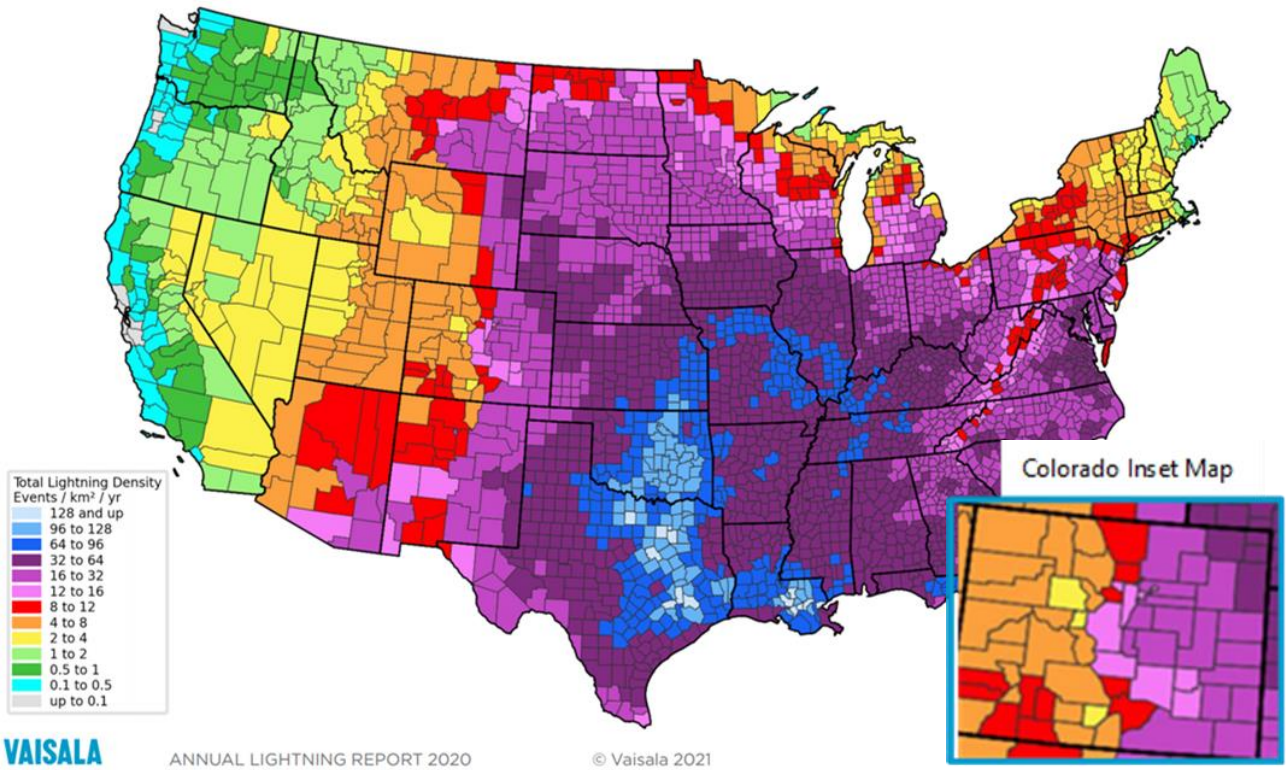
Lightning is one of the more dangerous and unpredictable weather hazards in the United States and in Colorado. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines and electrical systems. Lightning also causes forest and brush fires as well as deaths and injuries to livestock and other animals. According to the National Fire Protection Association (NFPA), between 2007 and 2011 local fire departments in the US responded to an average of 22,600 structural fires per year due to lightning. On average the Rocky Mountain region has a report of 1,395 lighting-caused fires. On average the number of acres burned due to lightning-caused fires is nine times (402 acres) higher than the average acres burned for human-caused fires (45 acres) (NFPA 2013). The National Lightning Safety Institute estimates property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects to be in excess of $8-10 billion per year. People or objects can be directly struck, or damage can occur indirectly when the current passes through or near it.

Intra-cloud 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 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 minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. 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.

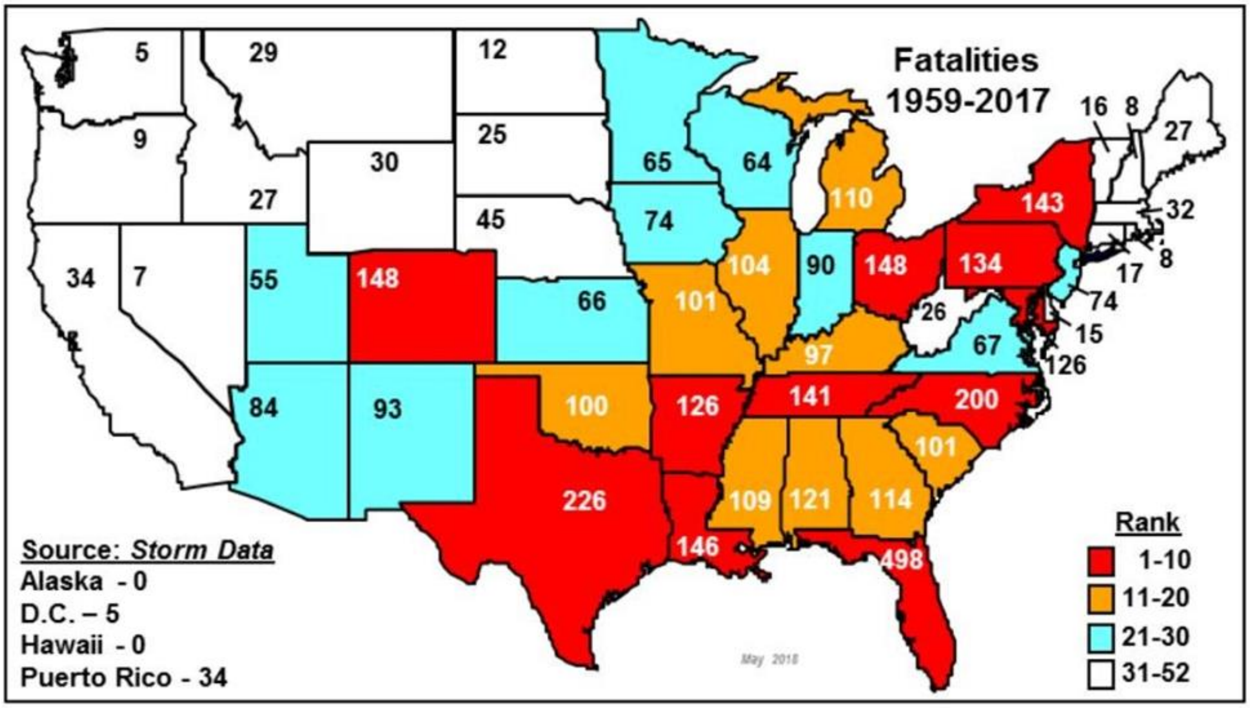
The ratio of cloud-to-ground and intra-cloud lightning can vary significantly from storm to storm. Depending upon cloud height above ground and changes in electric field strength between cloud and earth, the discharge stays within the cloud or makes direct contact with the earth. If the field strength is highest in the lower regions of the cloud, a downward flash may occur from cloud to earth. Using a network of lightning detection systems, NOAA monitors a yearly average of 25 million strokes of lightning from the cloud-to-ground. Figure 4-28 shows average total lightning density per county in the US. Gilpin County experiences 4-8 lightning events per square kilometer per year.

Figure 4-28 Average US Total Lightning Density Per County, 2015-2019



Data from the National Lightning Detection Network ranks Colorado 20th in the nation (excluding Alaska and Hawaii) with respect to the number of lighting counts, cloud-to-ground strokes plus cloud pulse, with an average number of more than 3,704,799 lightning counts per year. US lightning statistics compiled by NOAA between 1959 and 1994 indicate that most lightning incidents occur during the summer months of June, July, and August, and during the afternoon hours from between 2 p.m. and 6 p.m. In the Rocky Mountains of Colorado, it is common for afternoon thunderstorms during the summer months to occur with lightning strikes at the higher elevations.

Figure 4-29 Lightning Fatalities in the United States (2005-2014)



Source: NWS, http://www.lightningsafety.noaa.gov/media.shtml

Severe Winds

Damaging winds are classified as those exceeding 60 mph. Damage from such winds accounts for half of all severe weather reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. There are seven types of damaging winds:

- **Straight-line winds:** Any thunderstorm wind that is not associated with rotation; this term is used mainly to differentiate from tornado winds. Most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft.
- **Downdrafts:** A small-scale column of air that rapidly sinks toward the ground.
- **Downbursts:** A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- **Microbursts:** A small, concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- **Gust front:** A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.

- **Derecho:** A derecho is a widespread thunderstorm wind caused when new thunderstorms form along the leading edge of an outflow boundary (the boundary formed by horizontal spreading of thunderstorm-cooled air). The word “derecho” is of Spanish origin and means “straight ahead.” Thunderstorms feed on the boundary and continue to reproduce. Derechos typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.
- **Bow Echo:** A bow echo is a linear wind front bent outward in a bow shape. Damaging straight- line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

The most significant secondary hazards associated with severe hail and windstorms are floods, falling and downed trees, landslides, and downed power lines. Fires can occur as a result of lightning strikes. Many locations in the region have minimal vegetative ground cover and the high winds can create a large dust storm, which becomes a hazard for travelers and a disruption for local services. High winds in the winter can turn small amount of snow into a complete whiteout and create drifts in roadways. Debris carried by high winds can also result in injury or damage to property. A wildland fire can be accelerated and rendered unpredictable by high winds, which makes a dangerous environment for firefighters.

4.10.2 Past Events

Hail

The National Centers for Environmental Information Storm Events Database lists 12 hail events in Gilpin County between 1986 and 2020. Note, the database did not show records of events after 2015. These events are noted in Table 4-33.

Table 4-33 Gilpin County Hail Events (1986-2020)

Date	Location	Maximum Hail Size (inches)
7/6/1986	Gilpin Co	1.00
8/6/1989	Gilpin Co	0.75
8/13/1994	Rollinsville	0.25
6/20/2002	Central City	1.50
	Black Hawk	0.75
8/27/2002	Rollinsville	1.00
	Black Hawk	1.00
	Rollinsville	1.00
5/27/2003	Central City	0.75
8/29/2006	Black Hawk	1.00
7/3/2007	Rollins	1.00
6/28/2013	Central City	1.5

Source: National Centers for Environmental Information

Lightning

According to the National Centers for Environmental Information Storm Events Database, one reported lightning event occurred in the Gilpin County between 1986 and 2020 (Note, the database did not show events after 2015). The event was located in unincorporated Gilpin County on September 18, 1996. The lighting event caused no property or crop damage, death or injuries. Since lightning accompanies thunderstorms, it can be assumed that lightning occurs more often than damages are reported.

Severe Wind

High winds can occur year-round in Gilpin County. In the spring and summer, high winds often accompany severe thunderstorms. The varying topography in the area has the potential for continuous and sudden gusting of high winds. According to the State of Colorado Plan, Chinook winds are a fairly common wintertime phenomena in Colorado's Front Range. These winds develop in well-defined areas and can be quite strong. Atmospheric conditions are expected to continue unchanged with windstorms remaining a perennial occurrence. The areas within the County that have the highest wind potential are located in the western portion of the County in the Front Range Mountains.

Historical severe weather data from the National Centers for Environmental Information Storm Events Database does not include specific wind events for Gilpin County but shows the County within the regions listed in Table 4-34 below. The database includes 119 high wind events between 1996 and 2020. Table 4-34 shows the high wind events with property damage or injuries. Wind-related events caused approximately $16,825,000 in damages to property and ten injuries in the region.

Table 4-34 Gilpin County Wind-Related Events with Property Damage or Injuries (1996-2020)

Location	Date	Event Type	Peak Wind Speed (knots)	Property Damage	Injuries
Jefferson & W Douglas Counties Above 6000 Feet/Gilpin/Clear Creek/ NE Park Counties Below 9000 Feet	10/29/1996	High Wind	88	$0	5
Jefferson & W Douglas Counties Above 6000 Feet/Gilpin/Clear Creek/ NE Park Counties Below 9000 Feet	1/21/1997	High Wind	N/A	$0	2
Southern Front Range Foothills/Clear Creek Basin	2/2/1999	High Wind	110	$3,000,000	0
Southern Front Range Foothills/Clear Creek Basin	4/9/1999	High Wind	85	$13,800,000	0
Jefferson & W Douglas Counties Above 6000 Feet/Gilpin/Clear Creek/ NE Park Counties Below 9000 Feet	1/7/2009	High Wind	80	$25,000	0
Jefferson & W Douglas Counties Above 6000 Feet/Gilpin/Clear Creek/ NE Park Counties Below 9000 Feet	11/12/2011	High Wind	71	$0	3
			Total	**$16,825,000**	**10**

Source: National Centers for Environmental InformationN/A= Not Applicable

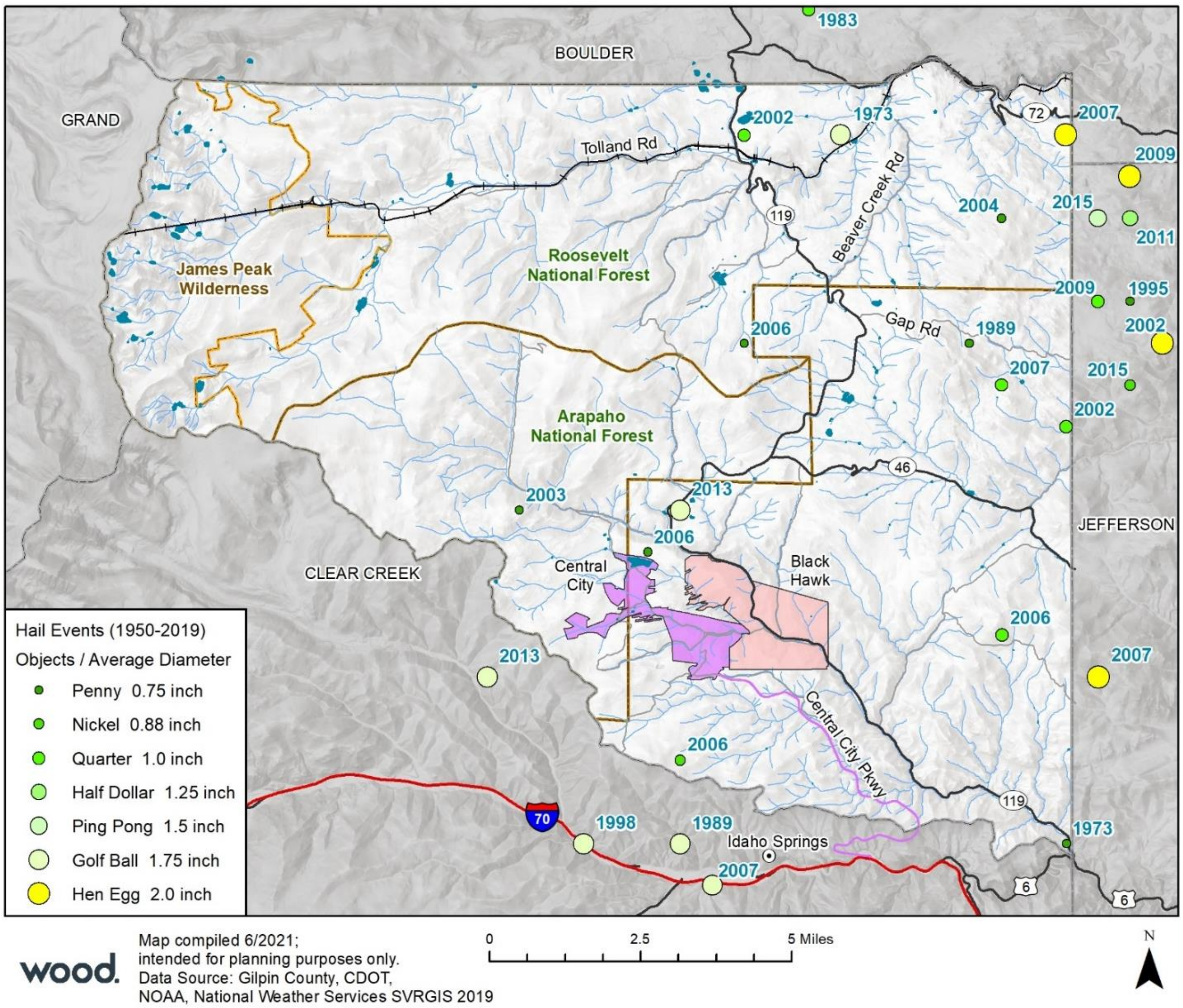
4.10.3 Location

Severe hail, wind, and lightning events have the potential to happen anywhere in the planning area. Thunderstorms are generally expansive in size. The entire County is susceptible to any of the effects of a severe thunderstorm, including hail, heavy rain, and high winds.

Hail

While all of Gilpin County is potentially exposed to hail, most of the reported hail events occur in the eastern portions of Gilpin County. Previous instances of hail events in the County are shown in Figure 4-30. Several of the events occurred in the same area and overlap on the map.

Figure 4-30 Hail Events in Gilpin County



Lightning

The entire extent of Gilpin County is exposed to some degree of lightning hazard, though exposed points of high elevation have significantly higher frequency of occurrence. Since lightning accompanies thunderstorms, it can be assumed that lightning occurs more often than damages are reported.

Severe Wind

Windstorms could occur anywhere in Gilpin County. They have the ability to cause damage over 100 miles from the center of storm activity. Higher elevations could experience the most significant wind speeds, but these areas are generally not developed or populated. Wind events are most damaging to areas that are heavily wooded. Winds impacting walls, doors, windows, and roofs may cause structural components to fail. The locations of previous occurrences of damaging high winds primarily in high mountainous areas, mountain passes, and mountain valleys.

4.10.4 Magnitude and Severity

The nation has experienced severe storms (wind, tornado, hail) that are occurring with more intensity and affecting more areas of the country. While scientists debate why these storms occur, no one argues with their effects—extensive property damage and many times, loss of life. The property damage can be as minimal as a few broken shingles to total destruction of buildings.

Hail

Severe hailstorms can be quite destructive to property and crops. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury to humans and occasionally has been fatal.

Colorado's severe hail season is between mid-April to mid-September for an average of 119 days per year (National Insurance Crime Bureau (NICB) 2020). According to the Rocky Mountain Insurance Information Association, hailstorms in the last 10 years have caused more than $5 billion in insured damaged in Colorado. An event in May 2017 alone caused $3.6 billion in damage (NICB 2020). The costliest hailstorms have been centered in the Denver Metropolitan Area and Colorado Front Range.

According to the NICB April 2020 Hail Report, Colorado was second in the number of hail claims from 2017 to 2019 with 380,066 claims. Texas had the highest number of claims every year except 2018, where Colorado topped the states with 191,679 claims that year. The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4-35 indicates the hailstone measurements utilized by the NWS.

There is no clear distinction between storms that do and do not produce hailstones. Nearly all severe thunderstorms probably produce hail aloft, though it may melt before reaching the ground. Multi-cell thunderstorms produce many hailstones, but not usually the largest hailstones. In the life cycle of the multi-cell thunderstorm, the mature stage is relatively short so there is not much time for growth of the hailstone. Super-cell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud. In general, hail 2 inches (5 cm) or larger in diameter is associated with super-cells (a little larger than golf ball size which the NWS considers to be 1.75 inch.). Non-super-cell storms are capable of producing golf ball size hail.

The largest hailstone recorded in the NCEI database for Gilpin County was two inches on July 3, 2007, and the most recorded hailstone size is one inch. Refer to Table 4-34 for a summary of recorded hail events in Gilpin County. Based on the information in this hazard profile, the overall significance of hail events is minimal.

Table 4-35 National Weather Service Hail Severity

Severity	Description	Hail Diameter Size (inches)
Non-Severe Hail Does not typically cause damage and does not warrant severe thunderstorm warning from the NWS.	Pea	1/4"
	Plain M&M Candy	1/2"
	Penny	3/4"
	Nickel	7/8"
Severe Hail	Quarter	1" (severe)
	Half Dollar	1 1/4"

Severity	Description	Hail Diameter Size (inches)
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 the National Weather Service	Walnut/Ping Pong Ball	1 1/2"
	Golf Ball	1 3/4"
	Hen Egg/Lime	2"
	Tennis Ball	2 1/2"
	Baseball	2 3/4"
	Teacup/Large Apple	3"
	Grapefruit	4"
	Softball	4 1/2"
	Computer CD-DVD	4 3/4"- 5"

Source: NWS

Lightning

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the NWS to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. Due to the high elevation and varied topography of the County, Gilpin is at risk to experience lightning in any of these categories. The LAL is reproduced in Table 4-36.

Table 4-36 Lightning Activity Level Scale

Lightning Activity Level	
LAL 1	No thunderstorms.
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud-to-ground strikes in a five-minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud-to-ground strikes in a five-minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud-to-ground strikes in a five-minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud-to-ground strikes in a five-minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning.

Source: NWS

The number of reported injuries from lightning is likely to be low, but since lightning accompanies thunderstorms, it can be assumed that lightning occurs more often than damages are reported.

The relationship of lightning to wildfire ignitions in the County increases the significance of this hazard. Lightning strikes are more likely at higher elevations, such as mountain peaks and may pose a threat to hikers, climbers, and other recreational users in the County. Based on the information in this hazard profile, the overall significance of lightning events is high for Gilpin County, but minimal for the Cities of Black Hawk and Central City because they are located at a lower elevation.

Severe Wind

High winds, often accompanying severe thunderstorms, can cause significant property damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Windstorms in

Gilpin County are rarely life threatening, but do disrupt daily activities, cause damage to buildings, and structures, and increase the potential for other hazards, such as wildfire. Winter winds can also cause damage, close highways (blowing snow), and induce avalanches. Winds can also cause trees to fall, particularly those killed by pine beetles or wildfire, creating a hazard to property or those outdoors.

Damaging wind is measured using the Beaufort Wind Scale as shown in Table 4-37. This scale only reflects land-based effects and does not take into consideration the effects of wind over water. Gilpin County can potentially experience up through Beaufort 12 winds.

Table 4-37 Beaufort Wind Scale

Beaufort Number	Description	Windspeed (MPH)	Land Conditions
0	Calm	<1	Calm. Smoke rises vertically.
1	Light air	1 – 3	Wind motion visible in smoke.
2	Light breeze	3 – 7	Wind felt on exposed skin. Leaves rustle.
3	Gentle breeze	8 – 12	Leaves and smaller twigs in constant motion.
4	Moderate breeze	13 – 17	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	18 – 24	Branches of a moderate size move. Small trees begin to sway.
6	Strong breeze	25 – 30	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	High wind, Moderate gale, Near gale	31 – 38	Whole trees in motion. Effort needed to walk against the wind. Swaying of skyscrapers may be felt, especially by people on upper floors.
8	Gale, Fresh gale	39 – 46	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	47 – 54	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over. Damage to circus tents and canopies.
10	Storm, Whole gale	55 – 63	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	Violent storm	64 – 72	Widespread vegetation damage. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	Hurricane	≥ 73	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris may be hurled about.

Source: NCEI

Based on the information in this hazard profile, the magnitude/severity of severe winds is considered high. Overall significance of the hazard is considered to have a high potential impact because of the high mountainous terrain found throughout the County.

4.10.5 Probability of Future Occurrences

Severe thunderstorm events that include lightning, hail and/ or high winds can be predicted with a reasonable level of certainty. By identifying and tracking various indicators of weather systems, warning time for snowstorms can be as much as a week in advance. 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 thunderstorm events provide benchmarks for projecting similar conditions into the future. Based on historical records and frequencies there is nearly a 100% chance that this type of event will occur somewhere in Gilpin at least once every year.

4.10.6 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 increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

4.10.7 Vulnerability

Population

It can be assumed that the entire planning area is exposed to some extent to thunderstorm, high wind, and hail events. 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, lightning, and black out, while populations in low-lying areas are at risk for possible flooding. It is not uncommon for residents living in more remote areas of the County to be isolated after such events.

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 can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. In Gilpin County, 13% of Medicare beneficiaries (136 of 1,066 total beneficiaries) rely on electricity to live independently in their homes. Isolation of these populations is a significant concern. These populations face isolation and exposure during thunderstorm, lightning, wind, and hail events and could suffer more secondary effects of the hazard. 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.

Property

All property is vulnerable during thunderstorm, lightning, wind, and hail events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Generally, damage is minimal and goes unreported. 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.

Older building stock in the planning area may be built to low code standards or none at all. These structures could be highly vulnerable to severe weather events such as windstorms. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. As positive and negative forces impact the building’s protective envelope (doors, windows, and walls), the result can be roof or building component failures and considerable structural damage.

All of these buildings are considered to be exposed to the thunderstorm, wind, and hail hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations.

Hail

There have been 12 reported hail events for Gilpin County, but none have resulted in reported property damage or injury. Loss estimates cannot be made because the events did not result in any reported damages in the County or any of the jurisdictions. It is likely that insured losses resulted, but these loss amounts are not made publicly available.

Lightning

A total of one lightning strike event was reported in Gilpin County between 1996 and 2020. There were no reported injuries, damages, or fatalities from that strike. While there were almost certainly additional strikes that went unreported, loss estimates cannot be made because the events did not result in any reported damages in the County or any of the jurisdictions.

Severe Winds

A total of 119 severe wind events have taken place in the region between 1996 and 2020. The loss estimate for severe wind events in the region including Gilpin County is listed in Table 4-38.

Table 4-38 Loss Estimate for Severe Wind Events in Gilpin County

Annual Rate of Occurrence	Average Loss Expectancy	Annualized Loss
5 events/year	$141,387/event	$706,933
Note: Loss estimates based on historical record of 119 wind-related events.		

Source: NOAA - National Centers for Environmental Information. 1996 - 2020.

Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from thunderstorms, wind, and hail, mostly associated with secondary hazards. High winds 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.

Facilities on higher ground may also be exposed to wind damage or damage from falling trees. The most common problems associated with these weather events are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function.

Economy

Large, prolonged storms can have negative economic impacts for an entire region but are typically short term. Severe windstorms and downed trees can create serious impacts on power and above-ground communication lines. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance. Lightning events in the County can have destructive effects on power and information systems. Failure of these systems would have cascading effects throughout the County and could possibly disrupt critical facility functions. Generally, long-term economic impacts center more around hazards that cascade from a severe thunderstorm, including wildfires ignited by lightning, and flooding (refer to the Wildfire and Flood sections). In general, all severe thunderstorms pose a risk to the tourism economy in the County. These events can disrupt travel into and out of all areas of the County and create perilous conditions for residents, tourists and nature alike.

Historic, Cultural and Natural Resources

The environment is highly exposed to lightning, winds, and hail. Forests can be susceptible to major damage from lightning-sparked wildfires. Large swaths of tree blowdowns can occur, particularly in the beetle-killed forests prevalent in the County.

4.10.8 Development Trends

All future development will be exposed to severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The planning partners have adopted the International Building Code. This code is equipped to deal with the impacts of severe weather events. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of severe weather.

4.10.9 Risk Summary

- Hail events have an overall significance of low while lightning and severe wind events have an overall significance of **Medium** for the County as a whole, although the risk varies from location to location.
- The 2016 Plan ranked the significance of hail and lightning for Central City to be low. The Planning Team felt this underestimated the risk from those hazards, and so elected to raise it to Medium for Central City. This was based on an analysis of past hail events, and anecdotal reports or both hail and lightning events; the role of lightning in starting wildfires was also taken into account.
- There have been 132 recorded hail, lightning, and severe wind events in Gilpin since 1972.
- Lightning events have caused 1 injury since 1996.
- 13% of Medicare beneficiaries in the County rely on electricity-dependent medical equipment to live independently in their own homes making them vulnerable to lightning and severe wind events that may result in power outages.
- Related hazards: Wildfire; Avalanche.

4.11 Landslide, Mud/Debris Flow, and Rockfall

LANDSLIDE, MUD/DEBRIS FLOW, ROCKFALL HAZARD RANKING	
Gilpin County	Low
City of Black Hawk	Low
City of Central City	Medium
Timberline Fire Protection District	Low

4.11.1 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 downslope 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.

Flows and slides are commonly categorized by the form of initial ground failure. Figure 4-31 through Figure 4-34 show common types of slides. The most common is the shallow colluvial slide, occurring particularly in response to intense, short duration storms. The largest and most destructive are deep seated slides, although they are less common than other types.

Figure 4-31 Deep Seated Slide

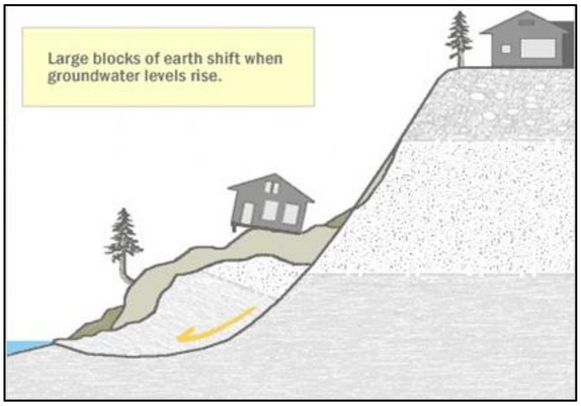


Figure 4-33 Bench Slide

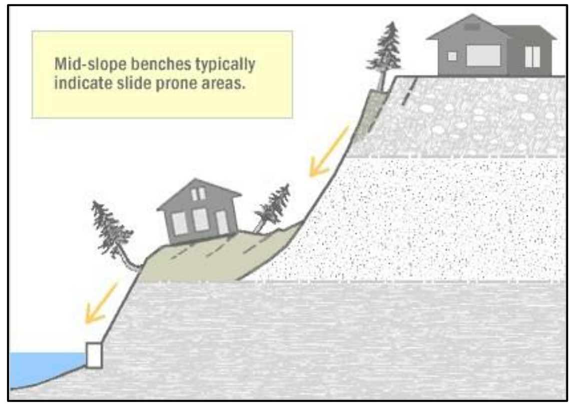


Figure 4-32 Shallow Colluvial Slide

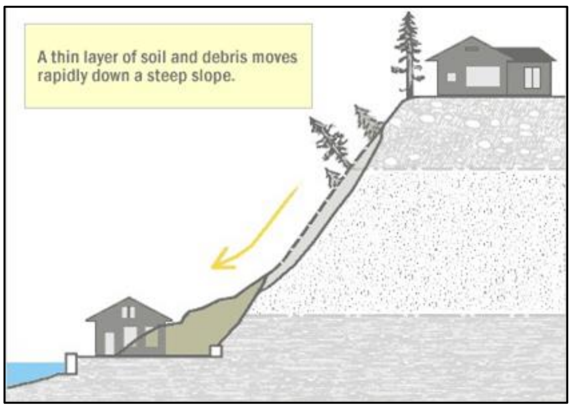
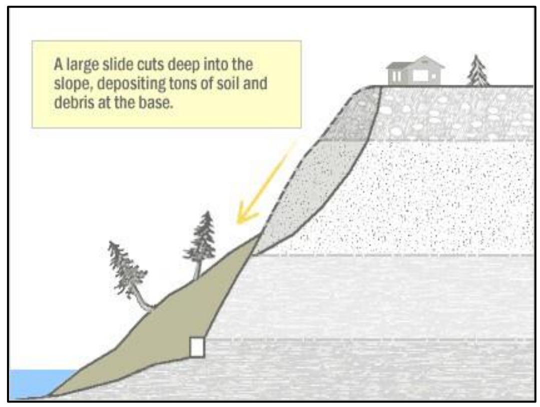


Figure 4-34 Large Slide



Slides and earth flows can pose serious hazard to property in hillside terrain. They tend to move slowly and thus rarely threaten life directly. When they move—in response to such changes as increased water content, earthquake shaking, addition of load, or removal of downslope support—they deform and tilt the ground surface. The result can be destruction of foundations, offset of roads, breaking of underground pipes, or overriding of downslope property and structures.

Mud and Debris Flow

According to the CGS, a mudslide is a mass of water and fine-grained earth that flows down a stream, ravine, canyon, arroyo, or gulch. If more than half of the solids in the mass are larger than sand grains (rocks, stones, boulders), the event is called a debris flow. A debris fan is a conical landform produced by successive mud and debris flow deposits, and the likely spot for a future event. Mud and debris flow problems can be exacerbated by wildfires that remove vegetation that serves to stabilize soil from erosion. Heavy rains on the denuded landscape can lead to rapid development of destructive mudflows.

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. Rockfalls 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 into freeze/thaw cycles. Rockfalls and landslides are influenced by seasonal patterns, precipitation and temperature patterns. Earthquakes could trigger rockfalls and landslides too.

4.11.2 Past Events

There are no recorded landslide mud/debris flow, or rockfall events causing damage in Gilpin County. There have been a number of events in nearby counties, including several in Clear Creek County that affected traffic accessibility to Gilpin County.

Landslide deposits have been identified in several areas (see Subsection 4.11.3), which implies the existence of past landslide events. These areas are located in more mountainous areas of the County away from populated areas. Landslide, mud/debris flow, or rockfall events in Gilpin County are likely to occur because of the steep terrain found throughout the County.

4.11.3 Location

According to the 2018 Colorado State Hazards Mitigation Plan, landslides, mud/debris flows, and rock fall events occur largely in the mountainous areas of the state, such as Gilpin County, with the threat generally increasing with slope angle and susceptibility of the local geology. Additionally, the plan highlighted that:

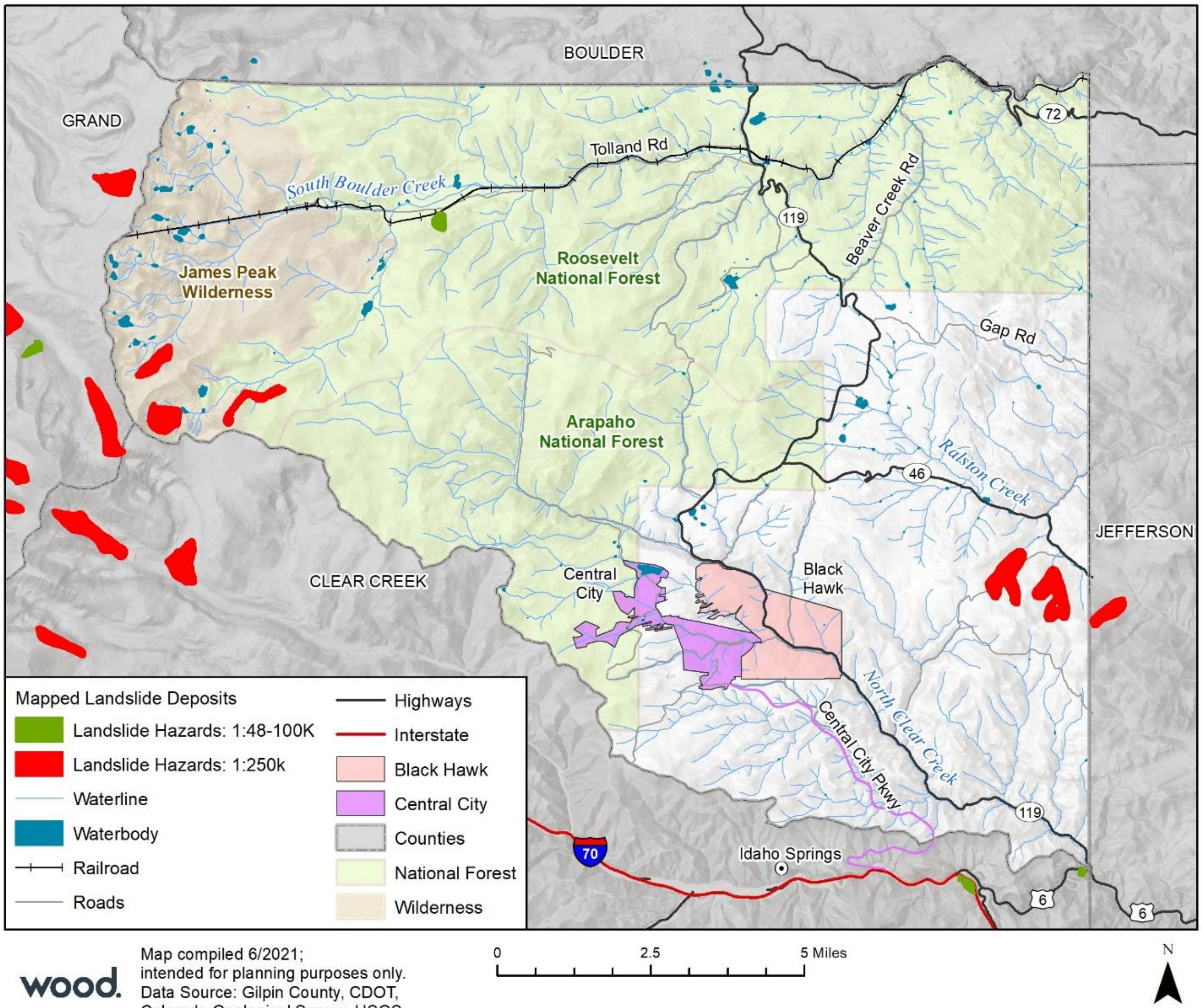
> "*Many of Colorado's landslides occur along transportation networks because soil and rock along the transportation corridor has been disturbed by roadway construction. Construction along roads can occur with or without proper landslide hazard mitigation procedures. The cost to maintain, cleanup, monitor, and repair roads and highways from landslide activity is difficult to assess, but the best records come from CDOT, which is responsible for maintaining Colorado roads and highways*" (Colorado Division of Emergency Management 2018).

The best available predictor of where movement of slides and earth flows might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges. Figure 4-35 below shows the locations of landslide deposits in Gilpin County based on various mapping studies compiled by the CGS. These areas are considered susceptible to future landslides.

The recognition of ancient dormant mass movement sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are vulnerable to construction-triggered sliding.

The geographic location of landslides and rockfalls throughout Gilpin County is isolated.

Figure 4-35 Identified Landslide Hazard Areas in Gilpin County



4.11.4 Magnitude and Severity

Property damages from these hazards is limited in extent and periodic, typically during wet cycles. The damages inflicted on critical facilities and services (critical infrastructure) are primarily highways in the planning region. This can result in a loss or disruption of services to major transportation corridors in and out of the County. By a combination of mitigation efforts and luck there have not been documented deaths from rockfall in Gilpin County, but the potential remains.

Mass movements can occur suddenly or slowly. The velocity of movement may range from a slow creep of inches per year to many feet per second, depending on slope angle, material and water content. Some methods used to monitor mass movements can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to identify what areas are at risk during general time periods. Assessing the geology, vegetation, and amount of predicted precipitation for an area can help in these predictions. However, there is no practical warning system for individual landslides. The current standard operating procedure is to monitor situations on a case-by-case basis and respond after the event has occurred. Generally accepted warning signs for landslide activity include:

- Springs, seeps, or saturated ground in areas that have not typically been wet before.

- New cracks or unusual bulges in the ground, street pavements, or sidewalks.
- Soil moving away from foundations.
- Ancillary structures such as decks and patios tilting or moving relative to the main house.
- Tilting or cracking of concrete floors and foundations.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls, or fences.
- Offset fence lines.
- Sunken or down-dropped road beds.
- Rapid increase in creek water levels, possibly accompanied by increased soil content.
- Sudden decrease in creek water levels though rain is still falling or just recently stopped.
- Sticking doors and windows and visible gaps indicating jambs and frames out of plumb.
- A faint rumbling sound that increases in volume as the landslide nears.
- Unusual sounds, such as trees cracking or boulders knocking together.

4.11.5 Probability of Future Occurrences

Mitigation efforts have been taken to decrease the probability of future occurrences. Rockfalls in canyons and steep slopes typically occur annually during wet cycles and spring during freeze-thaw cycles. Since the hazards are profiled together due to common onset and impacts, the probability of future occurrence is established collectively. Based on the history of landslides, debris flow incidents, and rockfalls in Gilpin County, it can be assumed that landslides, rockfalls, or mud flows will occur somewhere in the County almost annually. Estimating the probability of future events resulting in damage or casualties is more difficult due to the lack of data of past events.

4.11.6 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. All of these factors would increase the probability for landslide and debris flow occurrences.

4.11.7 Vulnerability

Population

While past landslide, debris flow, or rockfall events in Gilpin County have not resulted in any fatalities or serious injuries, the potential for both exists. As shown in Table 4-39, some residents of the unincorporated county live in areas at risk of these hazards. These estimates were calculated by taking the number of residential parcels exposed (see Table 4-40) multiplied by the average household size for each community.

Exposure is the greatest danger to people in remote locations in areas of steep slopes and higher precipitation areas in the western to central portion of the County. People who travel along these roadways or highways that are susceptible to landslides and rockslides are also exposed.

Table 4-39 Population Exposed to Landslide Areas

Jurisdiction	Population
Unincorporated County	31

Source: Gilpin County Assessor, Wood GIS Analysis

Residents could be impacted if local streets are impaired by landslide events. Tourism populations could also be impacted if Highway 6 and Highway 119 are closed. These highways are the major transportation routes that connect the Interstate 70 corridor with the Cities of Black Hawk and Central City. Both cities provide huge economic impacts to the local and state economy through gambling and tourism. It is most likely, however, that individuals exposed to landslide, mud/debris flow, and rockfall hazards would be in recreation areas or driving on roadways.

Property

Loss estimations for the landslide hazards are not based on modeling using damage functions, because no such damage functions have been generated. There are no reports of property damage or injury in association with landslides, mud/debris flows, and rockfalls in Gilpin County. Areas of higher susceptibility are mainly located away from population centers in the western mountainous areas of the County in the Front Range Mountains. Property exposure to landslide hazard areas is minimal. Black Hawk and Central City are not located in areas prone to landslides. Access to those locations could be impacted however, if landslides were to occur on Highway 6 and Highway 119.

For the purposes of this analysis, and address point layer in GIS was used to approximate the center of buildings. Geologic hazard data was then overlaid on the address points. For the purposes of this analysis, the hazard zone that intersected an address point was assigned the hazard for the entire parcel. The model assumes that every parcel with a structure value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building.

Table 4-40 Buildings Exposed to Landslide

Jurisdiction	Property Type	Improved Parcels	Building Count
Unincorporated	Residential	9	14

Source: Gilpin County Assessor, Wood GIS Analysis

Critical Facilities and Infrastructure

No critical facilities are found in the highest landslide-prone areas or in areas of previous landslide events. One protective function facility, Timberline Fire Station 8, is located just north of one of the landslide hazard areas that occurred on the eastern portion of the County, just south of Golden Gate Canyon State Park. Several critical facilities are in areas that may have the potential for landslides, mud/debris flows, and rockfalls. A more in-depth analysis of the mitigation measures taken by these facilities to prevent damage from mass movements should be done to evaluate whether they could withstand impacts of a mass movement.

Highly susceptible areas of the County include mountain roads and transportation infrastructure. At this time, all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available. Potential infrastructure exposed to mass movements may include:

- **Roads: Landslides:** mud/debris flow, or rockfalls can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses.
- **Power Lines:** Power lines are generally elevated above steep slopes; the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.

Economy

Landslides can block access to roads, which can isolate residents and businesses and delay commercial, public, and private transportation. This could result in economic losses for businesses. Rockfall impacts on Gilpin County highways and roads have the potential to cause significant indirect economic loss. The most significant road that could be impacted by rockfall and related road closures Colorado State Highway 119, and more commonly US 6 in the Clear Creek Canyon to the east in Jefferson County. Economic losses from this road closure and resulting detours could be estimated with traffic counts and detour mileage.

Historic, Cultural, and Natural Resources

Landslides/rockslides are a natural environmental process. Environmental impacts can include the removal of vegetation, soil, and rock. Landslides that fall into streams 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.

4.11.8 Development Trends

The severity of landslide problems is directly related to the extent of human activity in hazard areas. Adverse effects can be mitigated by early recognition 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. Most of these areas are adjacent to roadway systems that are heavily used.

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 Gilpin and within nearby counties, the amount of traffic within Gilpin County will continue to increase, and thus the amount of people exposed to danger from rockfall hazards may increase. While mitigation projects are in place to reduce dangers to drivers from falling rock along this corridor, more may be necessary in the future.

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.

4.11.9 Risk Summary

- The overall significance of landslides, mud and debris flows, and rockfall is **Low**.
- Landslides, debris flow, and rockfall do occur with some regularity in Gilpin County. The direct effect on the populace is low, but there is potential for severe injury or death from rockfall.
- The secondary effect of closed roads is a more likely consequence, especially if the closed roads cut off emergency personnel from those who need assistance.
- 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.
- Related hazards: earthquake, flood, wildfire.

4.12 Tornado

TORNADO RANKING	
Gilpin County	Low
City of Black Hawk	Low
City of Central City	Low
Timberline Fire Protection District	Low

4.12.1 Description

A tornado is a narrow, violently rotating column of air that extends from the base of a cumulonimbus cloud to the ground. The visible sign of a tornado is the dust and debris that is caught in the rotating column made up of water droplets. Tornadoes are the most violent of all atmospheric storms.

The following are common ingredients for tornado formation:

- Very strong winds in the mid and upper levels of the atmosphere.
- Clockwise turning of the wind with height (i.e., from southeast at the surface to west aloft).
- Increasing wind speed in the lowest 10,000 feet of the atmosphere (i.e., 20 mph at the surface and 50 mph at 7,000 feet).
- Very warm, moist air near the ground with unusually cooler air aloft.
- A forcing mechanism such as a cold front or leftover weather boundary from previous shower or thunderstorm activity.

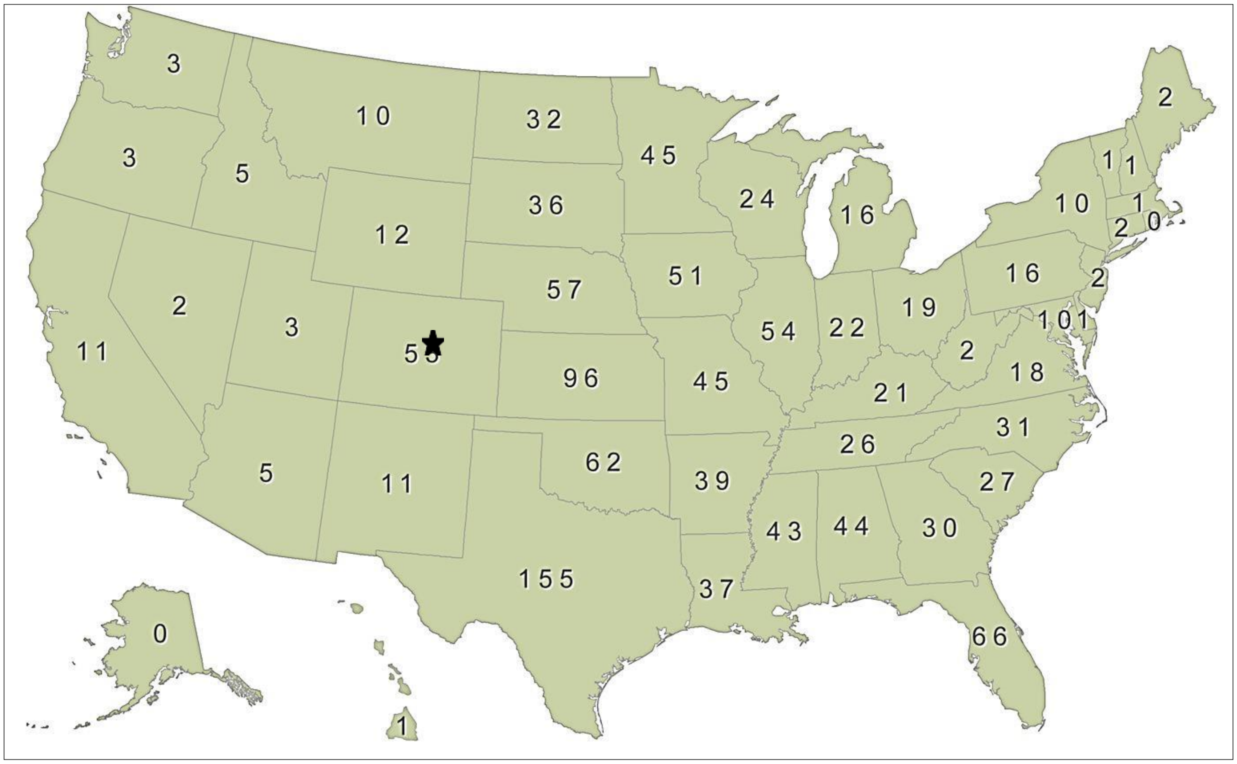
Tornadoes can form from individual cells within severe thunderstorm squall lines. They also can form from an isolated super-cell thunderstorm. Weak tornadoes can sometimes occur from air that is converging and spinning upward, with little more than a rain shower occurring in the vicinity.

The US experiences more tornadoes than any other country. In a typical year, approximately 1,000 tornadoes affect the US. The peak of the tornado season is April through June, with the highest concentration of tornadoes in the central US. Figure 4-36 shows the annual average number of tornadoes between 1991 and 2010. Colorado experienced an average of 53 tornado events annually in that period. Colorado ranks 9th among the 50 states in frequency of tornadoes, but 38th for the number of deaths. Nationwide, Colorado ranks 31st for injuries and 30th for the cost of repairing the damages due to tornadoes. When these statistics are compared to other states by the frequency per square mile, Colorado ranks 28th for injuries per area and 37th for costs per area.

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.

Figure 4-36 Annual Average Number of Tornadoes in the US (1991-2010)



★ Gilpin County

Source: National Weather Service

4.12.2 Past Events

There are no recorded tornadoes in Gilpin County from 1970 to 2022 according to the NOAA storm prediction center. High mountainous areas such as Gilpin County are less prone to tornadoes, although they can still occur.

4.12.3 Location

There are no recorded tornadoes in the planning area. If a tornado were to occur, they would likely be small and short-lived with very minimal property damage.

4.12.4 Magnitude and Severity

Tornadoes have been reported nine months of the year in Colorado, with peak occurrences between May through August. Statewide, June is the month with the most recorded tornadoes. There are no recorded tornadoes in Gilpin County, between 1950 and 2020.

Tornadoes are potentially the most dangerous of local storms. If a major tornado were to strike within the populated areas of Gilpin County, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings may be damaged or destroyed. Historically, tornadoes have not typically been severe or caused damage in the planning area. There have been no reported tornadoes and the likelihood of a tornado occurring is very minimal.

In 2007, the NWS began rating tornadoes using the Enhanced Fujita Scale (EF-scale). The EF-scale is a set of wind estimates (not measurements) based on damage. Its uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to the 28 indicators listed in Table 4-41. These estimates vary with height and exposure. Standard measurements are taken by weather stations in open exposures. Table 4-42 describes the EF-scale ratings versus the previous Fujita Scale used prior to 2007.

Table 4-41 Enhanced Fujita Scale Damage Indicators

No.	Damage Indicator	No.	Damage Indicator
1	Small barns, farm outbuildings	15	School – 1-story elementary (interior or exterior halls)
2	One or two-family residences	16	School – junior or senior high school
3	Single-wide mobile home	17	Low-rise (1-4 story) building
4	Double-wide mobile home	18	Mid-rise (5-20) building
5	Apt, condo, townhouse (3 stories or less)	19	High-rise (over 20 stories) building
6	Motel	20	Institutional bldg. (hospital, govt. or university)
7	Masonry apt. or motel	21	Metal building system
8	Small retail building (fast food)	22	Service station canopy
9	Small professional (doctor office, bank)	23	Warehouse (tilt-up walls or heavy timber)
10	Strip mall	24	Transmission line tower
11	Large shopping mall	25	Free standing tower
12	Large, isolated (big box) retail building	26	Free standing pole (light, flag, luminary)
13	Automobile showroom	27	Tree – hardwood
14	Automobile service building	28	Tree – softwood

Source: National Weather Service

Table 4-42 The Fujita Scale and Enhanced Fujita Scale

	Fujita Scale		Derived		Operational EF-Scale	
F Number	Fastest ¼ mile (mph)	3-second gust (mph)	EF Number	3-second gust (mph)	EF Number	3-second gusts (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Notes:
EF Enhanced Fujita
F Fujita
mph Miles per Hour

Source: National Weather Service

The NOAA's storm prediction center issues tornado watches and warnings for Gilpin County:

- **Tornado Watch:** Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information.

- **Tornado Warning:** A tornado has been sighted or indicated by weather radar. Take shelter immediately.

Once a warning has been issued, residents may have only a matter of seconds or minutes to seek shelter.

Based on the information in this hazard profile, the overall significance of tornadoes throughout Gilpin County is minimal.

4.12.5 Probability of Future Occurrences

Tornadoes have been reported 9 months of the year in Colorado, with peak occurrences between May and August. Statewide, June is by far the month with the most recorded tornadoes. There have been no recorded tornadoes between 1950 and 2020. Due to the lack of historical data for tornadoes in the planning area, the probability of future occurrences is low.

4.12.6 Climate Change Considerations

Climate change impacts on the frequency and severity of tornadoes are unclear. NASA's Earth Observatory has conducted studies which aim to understand the interaction between climate change and tornadoes. Based on these studies meteorologists are unsure why some thunderstorms generate tornadoes and others don't, beyond knowing that they require a certain type of wind shear. Tornadoes spawn from approximately one percent of thunderstorms, usually super-cell thunderstorms that are in a wind shear environment that promotes rotation. Some studies show a potential for a decrease in wind shear in mid-latitude areas. The level of significance of this hazard should be revisited over time.

4.12.7 Vulnerability

Population

It can be assumed that the entire planning area is exposed to some extent to tornadoes. Certain areas are more exposed due to geographic location and local weather patterns.

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 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 after 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 who are out in the open, in cars, or who do not have access to basements, cellars, or safe rooms.

Property

All property is vulnerable during tornado events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Mobile homes are more vulnerable to the impacts of a tornado event compared to housing types due to methods of construction. Statewide, mobile homes represent about 4% of total housing. While in Gilpin, 2.4% of total housing stock is mobile homes and 0% in both the City of Blackhawk and City of Central City. If an EF3 or higher tornado were to hit populated areas of the County substantial damage to property would be likely.

Tornadoes have not been reported in Gilpin County. There is no estimate of annualized loss because no tornadoes have occurred, resulting in no property damage loss.

Critical Facilities and Infrastructure

All critical facilities and infrastructure are likely exposed to tornadoes, though the likelihood of damage to any critical facilities or infrastructures from a tornado is extremely limited. The most common problems associated with this hazard are utility losses. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function. Roads may become impassable due to downed trees or other debris.

Tornadoes 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. Any facility that is in the path of a tornado is likely to sustain damage.

Additionally, fires may result from damages to natural gas infrastructure. Hazardous materials may be released if a structure is damaged that houses such materials or if such a material is in transport.

Economy

Tornadoes can impact exposed critical infrastructure; depending on the impact and the function, this could cause a short-term economic disruption. The most common problems associated with tornadoes and damaging winds are loss of utilities. Downed power lines can cause power outages, leaving large parts of the County isolated, and without electricity, water, and communication. Damage may also limit timely emergency response and the number of evacuation routes. Downed electrical lines following a storm can also increase the potential for lethal electrical shock and can also lead to other hazard events such as wildfires.

Historic, Cultural and Natural Resources

Environmental features are exposed to tornado risk, although damages are generally localized to the path of the tornado however, if tornadoes impact facilities that store HAZMAT areas impacted by material releases may be especially vulnerable. Historic buildings built prior to modern building codes would be more prone to damage

4.12.8 Development Trends

All future development will be affected by tornadoes, particularly development that occurs at lower elevations. Development regulations that require safe rooms, basements, or other structures that reduce risk to people would decrease vulnerability. Tornadoes that cause damage have never been recording in the County, so mandatory regulations may not be cost-effective.

4.12.9 Risk Summary

- The overall significance of tornado is **Low**.
- There have been no recorded tornado events in the County since 1950.
- The 2016 HMP stated that there was no exposure to tornadoes in the City of Black Hawk. The 2023 Planning Team felt there was little scientific basis for this statement, since while they are unlikely the possibility of a tornado cannot be completely ruled out.
- Elderly and individuals who depend on electricity for medical needs are vulnerable to power outages caused by a tornado. 13% of Medicare beneficiaries in the County rely on electricity-dependent equipment.
- All property is potentially vulnerable during tornado events, but mobile homes are disproportionately at risk due to the design of the homes. 2.4% of total housing in the County are mobile homes.
- Due to the low probability and generally low intensity, tornadoes are considered a low significance hazard.
- Related Hazards: Severe Wind.

4.13 Wildfire

WILDFIRE HAZARD RANKING	
Gilpin County	High
City of Black Hawk	Medium
City of Central City	High
Timberline Fire Protection District	High

4.13.1 Description

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, and arson.

Fire hazards present a considerable risk to vegetation and wildlife habitats. Short-term loss caused by a wildfire can include the destruction of timber, wildlife habitat, scenic vistas, and watersheds. Long- term effects include smaller timber harvests, reduced access to affected recreational areas, and destruction of cultural and economic resources and community infrastructure. Vulnerability to flooding increases due to the destruction of watersheds. The potential for significant damage to life and property exists in areas designated as WUI (Wildland-Urban Interface) areas, where development is adjacent to densely vegetated areas.

Generally, there are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

- **Fuel:** Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles, leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Structures such as homes and associated combustibles are also potential fuel sources. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for fire spread. "Ladder fuels" are fuels low to the ground that can spread a surface fire upward through brush and into treetops. These fires, known as crown fires, burn in the upper canopy of forests and are nearly impossible to control. The volume of available fuel is described in terms of fuel loading. Many parts of the planning area are extremely vulnerable to wildfires, as a result of dense vegetation combined with urban interface living. Non-native species have become invasive in the area, specifically, Tamarisk and Russian Olive. These species burn readily and pose a threat to homes and other structures in the lower reaches of the County and into municipalities.
- **Topography:** An area's terrain and land slopes affect its susceptibility to wildfire spread. Both the fire intensity and the rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement and types of vegetation throughout a hillside can also contribute to increased fire activity on slopes. In addition, topography impacts the ability of firefighters to combat the blaze by hampering access for equipment, supplies, materials and personnel.
- **Weather:** Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfires. High temperatures and low relative humidity dry out the fuels that feed the wildfire, increasing the odds that fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater the wind, the faster a fire will spread, and the more intense it will be. In addition to wind speed, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Lightning also ignites wildfires, which are often in terrain that is difficult for firefighters to reach. Drought conditions contribute to wildfire vulnerability and susceptibility. During periods of drought,

low fuel moisture and lack of precipitation increase the threat of wildfire. There are no known effective measures for human mitigation of weather conditions. Careful monitoring of weather conditions that drive the activation and enforcement of fire safety measures and programs, such as bans on open fires, are ongoing weather-related mitigation activities.

Wildfires are of significant concern throughout Colorado. According to the Colorado State Forest Service, vegetation fires occur on an annual basis; most are controlled and contained early with limited damage. For those ignitions that are not readily contained and become wildfires, damage can be extensive. According to the 2018 State of Colorado Hazard Mitigation Plan, a century of aggressive fire suppression combined with cycles of drought and changing land management practices has left many of Colorado's forests, including those in Gilpin County, unnaturally dense and ready to burn. Further, the threat of wildfire and potential losses is constantly increasing as human development and population increases and the WUI expands. Another contributing factor to fuel loads in the forest are standing trees killed by pine bark beetles, which have been affecting the forests of Colorado since 2002, becoming more widespread and a serious concern. According to the 2021 Gilpin County Hazard Mitigation Community Survey (see Appendix C), Gilpin County residents believe that wildfire is the greatest threat to their safety.

Fire Protection in Gilpin County

Fire protection in Gilpin County is divided between fire protection districts, volunteer fire departments, Bureau of Land Management (BLM), and the USDA Forest Service. Emergency services within Gilpin County are provided by the Black Hawk Fire Department, the Central City Fire Department, and the Timberline Fire Authority (formed by dissolution and inclusion of Colorado Sierra Fire District and High Country Fire District). Multiple community wildfire protection plans are in place, as discussed in Subsection 2.10.

According to Gilpin County's 2013 CWPP, the elevation in Gilpin County ranges between 6,960 feet to 13,294 feet. Below tree line, most of the land is forested with about 52% managed by state or forest service agencies. Most of the towns and subdivisions are in the elevation range of 8,000 to 9,000 feet

Vegetation Classes in Gilpin County

The most commonly used fuel modeling methodology uses thirteen unique fuel models presented in four fuel groups: grasslands, shrublands, timber litter and understory, and logging slash. Table 4-43 below lists descriptions of the most commonly observed fuels under this system in Gilpin County.

Table 4-43 Gilpin County Fuels Descriptions

FBFM	Description
1. Short Grass	**Grass Group** – Fire spread is determined by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. These are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third cover of the area. Annual and perennial grasses occur in this model. Fire rate of spread can exceed 3.5 miles per hour (300 chains per hour) with flame lengths over 8 feet.
5. Brush	**Brush Group** – Fire spread generally occurs in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. Fires are generally not very intense. Usually shrubs are short and almost totally cover the area. Young green stands with no dead wood would qualify:
6. Intermediate or Dormant Brush	**Shrub Group** – Fire spreads though the shrub layer with flammable foliage but requires moderate winds to maintain the foliage fire. Fire will drop to the ground in low wind situations. Shrubs are mature with heights less than 6 feet. These stands include oakbrush and mountain mahogany less than 6 feet tall. Fire rate of spread can be rapid with flame lengths of 6 to 10 feet.
8. Closed or Short-Needle Timber Litter–Light Fuel Load	**Timber Group** – These fuels produce slow-burning ground fires with low flame lengths. Occasional "jackpots" in heavy fuel concentrations may occur. These fuels pose a fire hazard only under severe weather conditions with high temperatures, low humidity, and high winds. These are mixed conifer stands with little undergrowth. Rate of spread is up to 106 feet per hour with flame lengths of one foot.
9. Hardwood or Long-Needle or Timber Litter–Moderate Ground Fuel	**Timber Group** – Fires run through the surface litter faster than in FBFM 8 and have longer flame lengths. These are semi-closed to closed canopy stands of long-needle conifers, such as ponderosa pine. The compact litter layer is mainly needles and occasional twigs. Concentrations of dead-down woody material contribute to tree torching, spotting, and crowning. Fire rate of spread is up to 27 chains per hour with flame lengths of 5 feet.
10. Mature/ Overmature Timber and Understory	**Timber Group** – Surface fires burn with greater intensity than the other timber litter models. Dead and down surface timber litter is heavier than other timber models and the stands are more prone to hard-to-control fire behavior such as torching, spotting, and crown runs.

Source: Gilpin County Community Wildfire Protection Plan

4.13.2 Past Events

There have been no large wildfire events (ten acres or more) recorded in Gilpin County.

In April 2012, a small wildfire was identified in Golden Gate Canyon State Park, in the far southern portion of the County. The wildfire was thought to have been caused by lightning. The wildfire never grew above five acres and there were only voluntary evacuations in parts of Gilpin and Jefferson Counties. Figure 4-37 shows the location of the Golden Gate Canyon State Park wildfire in April 2012.

Figure 4-37 Location of Golden Gate Canyon State Park Wildfire in April 2012

Wildfires larger than 0.1 acres in size that were recorded in Gilpin County between 1987 and 2016 are listed in Table 4-44 and mapped in Figure 4-38. The largest of these fires was 3.2 acres.

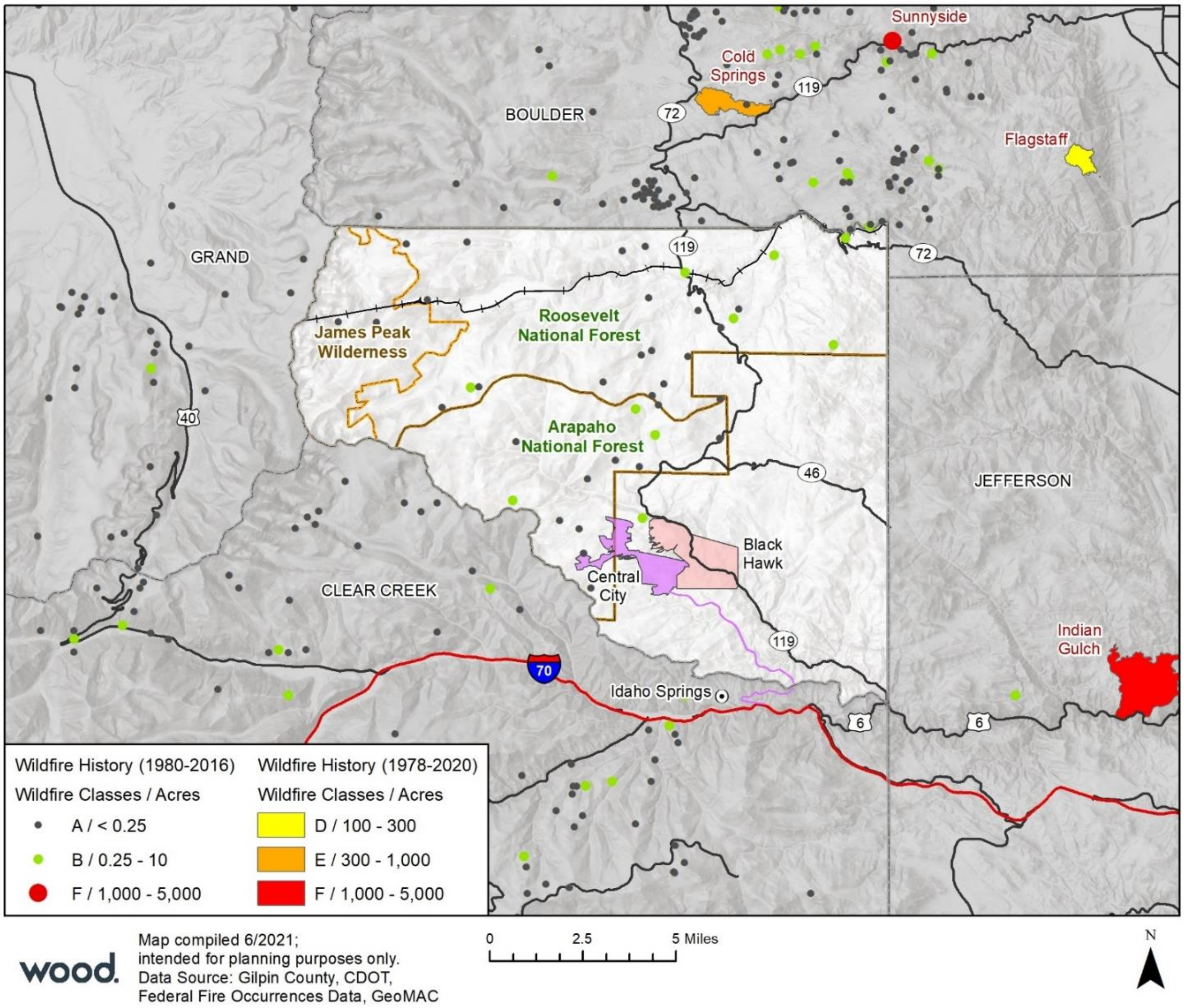
Table 4-44 Gilpin County Wildfire History

Fire	Month/Year	Acres Burned	Size Class*	Cause
175 Road	2016	3.2	B	Human
Moffet Tunnel	1994	1.2	B	Human
N/A	1986	1	B	Natural
N/A	1989	0.8	B	Natural
N/A	1992	0.5	B	Natural
Apex	2012	0.5	B	Natural
N/A	1990	0.3	B	Natural
Star Peak	1994	0.3	B	Natural
Pinecliffe	2002	0.3	B	Human
South Beaver	2011	0.25	B	Human
Winiger	2000	0.2	A	Natural

Source: Colorado Wildfire Risk Assessment Portal (CO-)WRAP

* Class A fires burned less than 0.25 acres; Class B fires burned 0.25 acres to 10 acres.

Figure 4-38 Gilpin County Fire History, 1952-2020

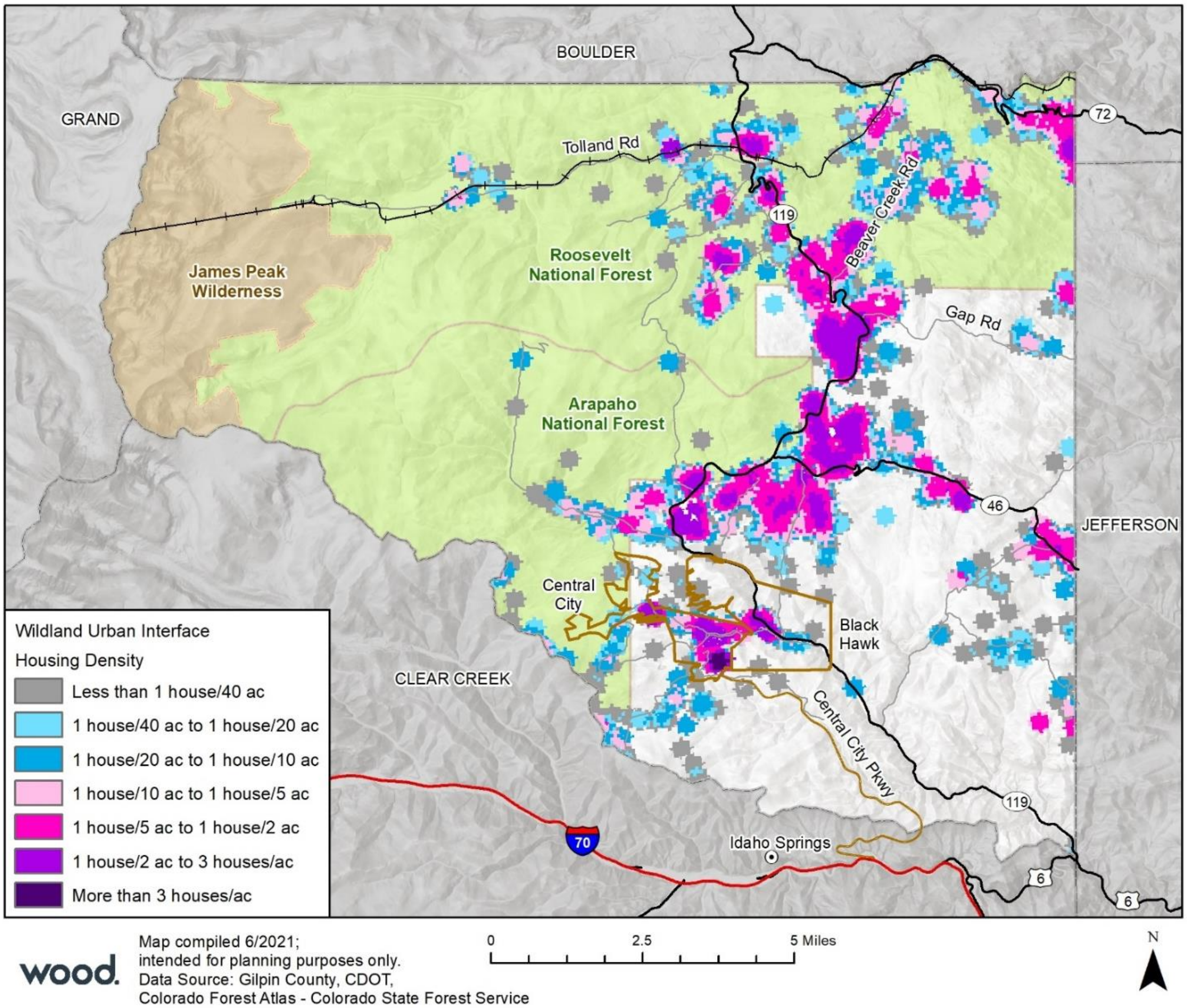


4.13.3 Location

Gilpin County, like much of the Rocky Mountain region, is home to significant holdings of public lands. State and federally managed lands account for nearly 50,000 acres of Gilpin County's total land mass of 96,000 acres. Most of the communities and neighborhoods in Gilpin County share a boundary with state or federal forests. Similar forest management challenges face all land management agencies and include overcrowded even-aged timber stands, hazardous fuel loading, drought stress, insect infestation, as well as the expansion of residential development to the margins of public lands.

The areas of greatest concern for wildfire risk are in the WUI, where development is interspersed or adjacent to landscapes that support wildland fire. Fires in the WUI may result in major losses of property and structures, threaten greater numbers of human lives, and incur larger financial costs. In addition, WUI fires may be more dangerous than wildfires that do not threaten developed areas, as firefighters may continue to work on more dangerous conditions in order to protect structures such as businesses and homes. Colorado overall is one of the fastest growing states in the nation and much of this growth is occurring in the WUI area, where structures and other human improvements meet and mix with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfires. Figure 4-39 shows the Gilpin County housing density within the WUI.

Figure 4-39 Gilpin County Housing Density within the Wildland Urban Interface



The Colorado State Forest Service's Colorado Forest Atlas (formerly known as the Colorado Wildfire Risk Assessment Portal or CO-WRAP) report for Gilpin County and maps the WUI Risk Index, which is a rating of the potential impact of a wildfire on people and their homes. The key input reflects housing density (Figure 4-39). The Colorado Forest Atlas report states that the location of people living in the WUI and rural areas is essential for defining potential wildfire impacts to people and homes. Figure 4-40 shows the WUI Risk Index for Gilpin County.

Wildfire risk represents the possibility of loss or harm occurring from a wildfire. Risk is derived by combining the wildfire threat and the fire effects assessment outputs. It identifies areas with the greatest potential impacts from a wildfire. Wildfire risk combines the likelihood of a fire occurring (threat) with those areas of most concern that are adversely impacted by fire to derive a single overall measure of wildfire risk. Figure 4-41 shows the more general wildfire risks for areas within Gilpin County, not specifically incorporating WUI locations.

Figure 4-40 Wildland Urban Interface Risk Index for Gilpin County

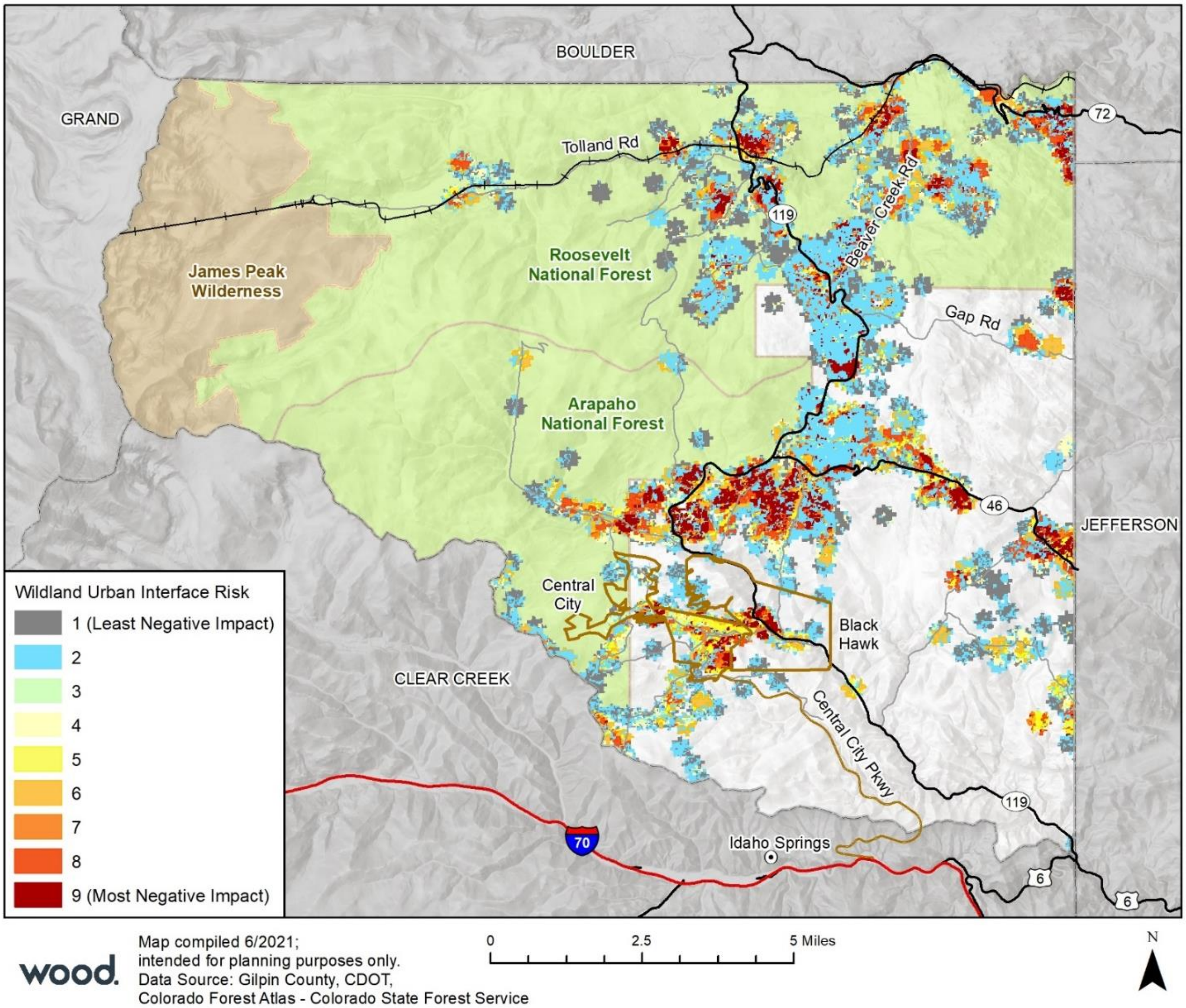


Figure 4-41 Wildland Urban Interface Risk Index for the Cities of Black Hawk and Central City

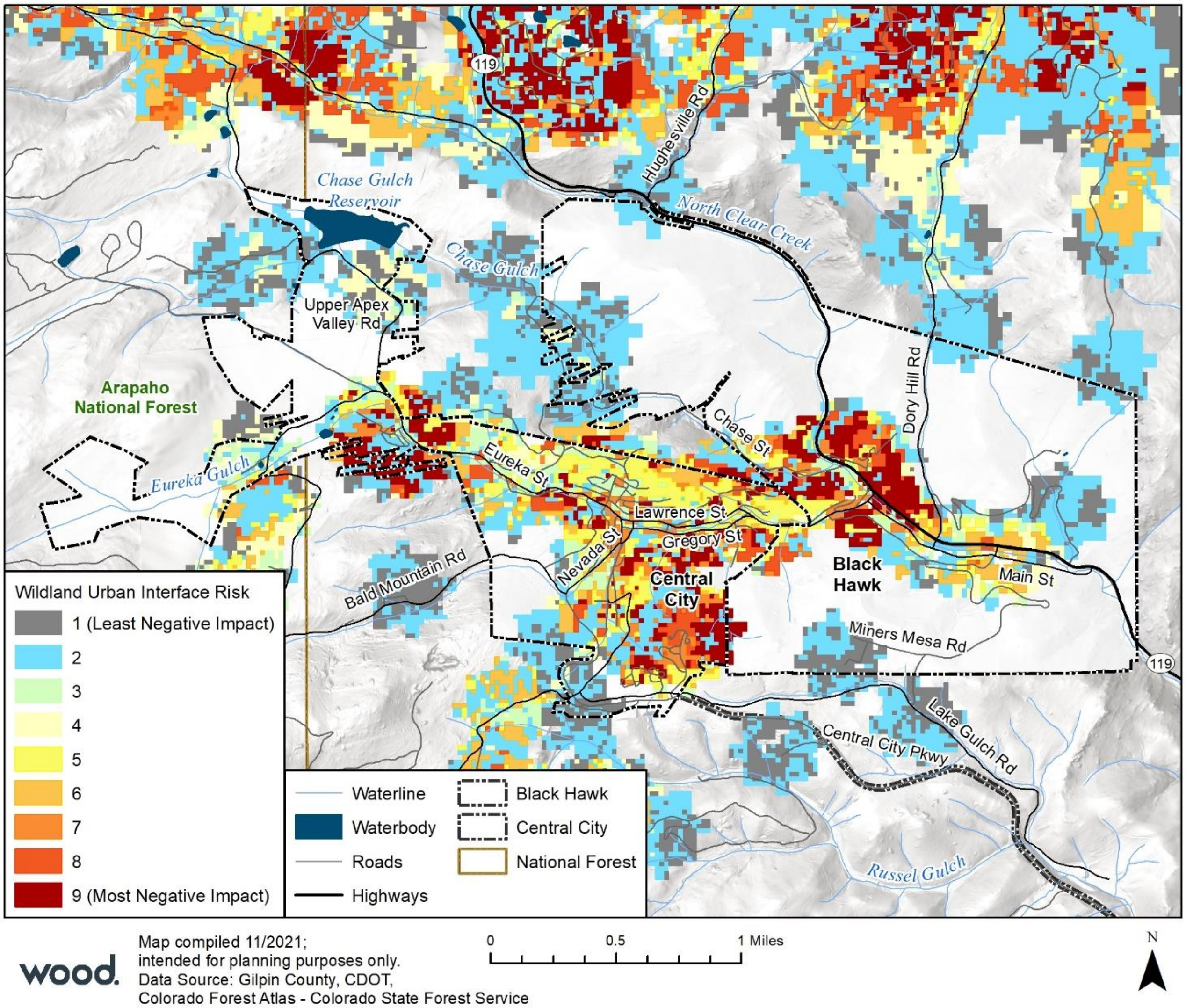


Figure 4-42 Wildfire Risk Areas in Gilpin County

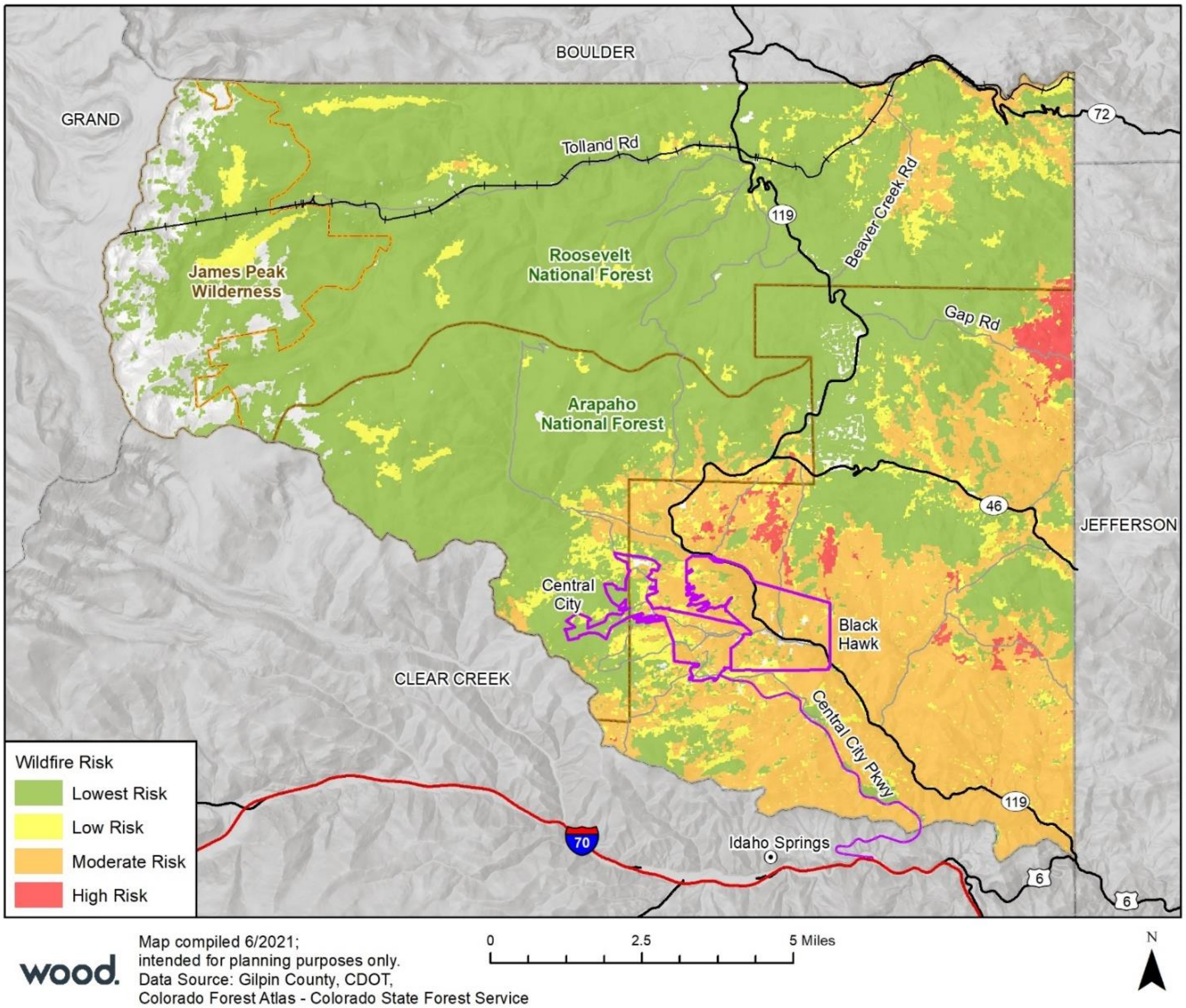


Figure 4-43 Black Hawk and Central City Wildfire Risk

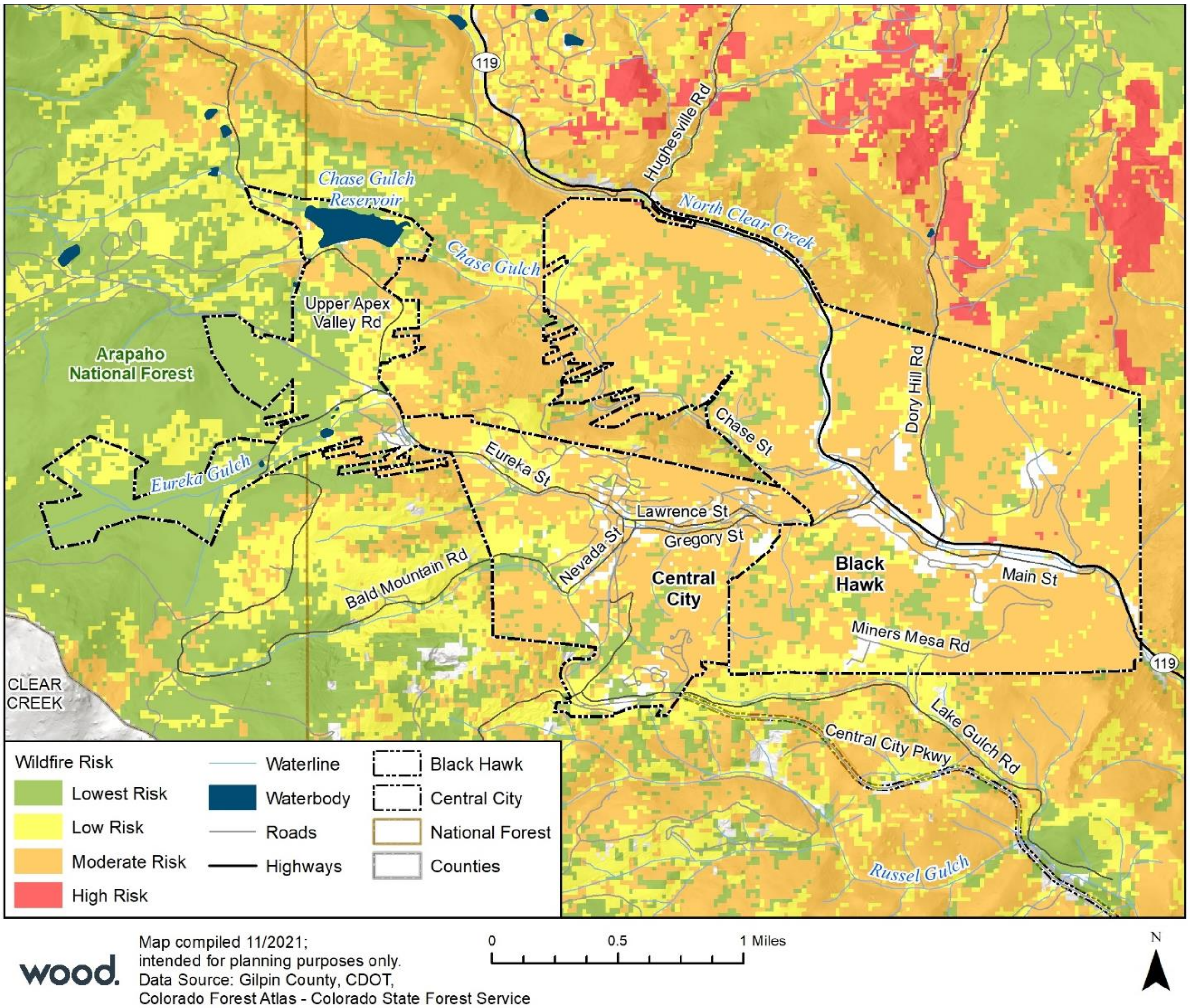


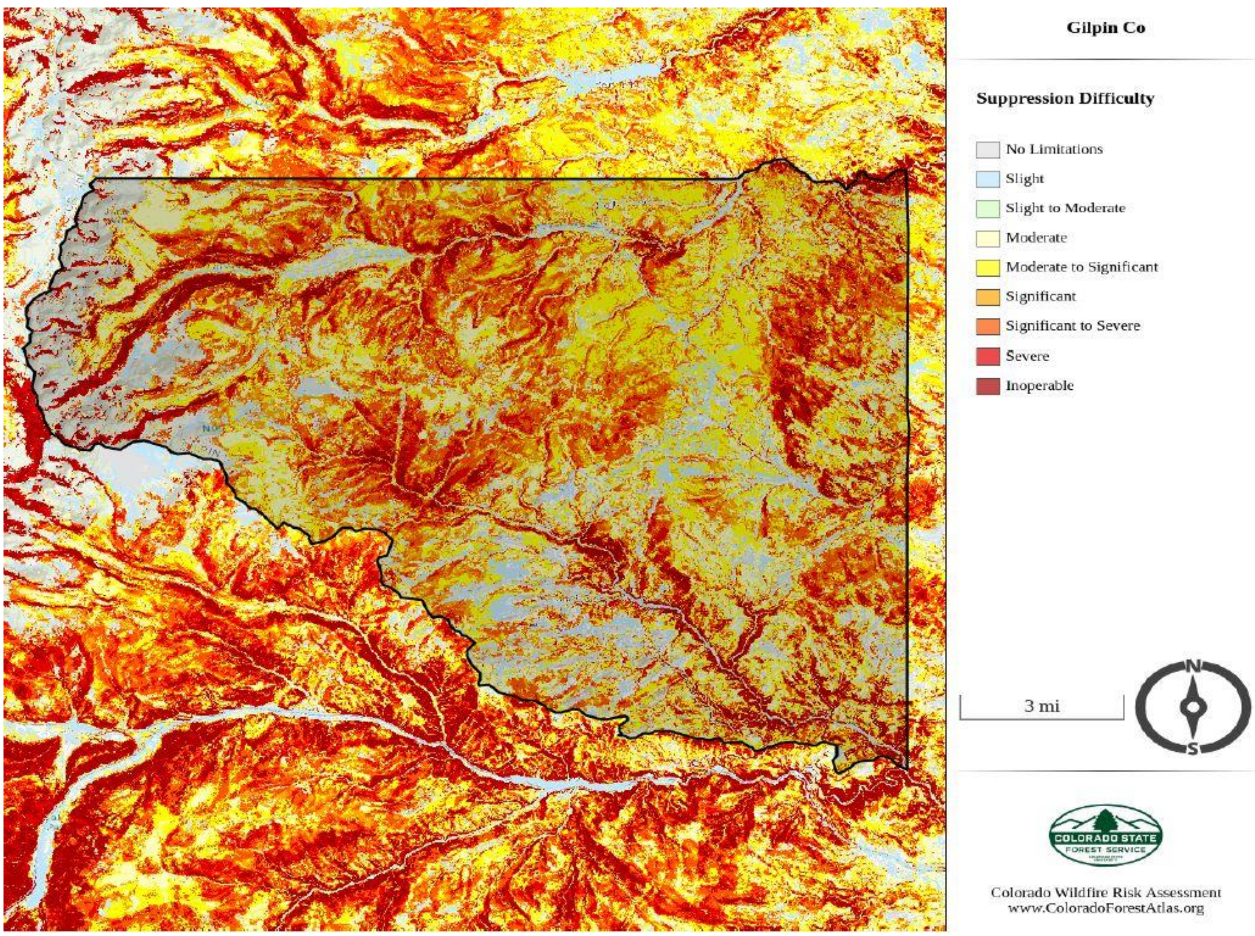
Figure 4-43 above shows that large portions of the incorporated areas of Black Hawk and Central City are within the moderate wildfire risk areas. While Figure 4-41 above shows the lowest risk areas to be the north and west portions of the County, there are other factors which influence the County's wildfire hazard. According to data from the Colorado Forest Atlas for Gilpin County, large portions of the County are in areas with higher suppression difficulty ratings. This is particularly true in the western reaches of the County. This reflects the difficulty in reaching and suppressing a fire given the terrain and vegetation conditions that may impact machine operability. According to Colorado Forest Atlas, "this layer is an overall index that combines the slope steepness and the vegetation/fuel type characterization to identify areas where it would be difficult or costly to suppress a fire due to the underlying terrain and vegetation conditions that would impact machine operability". Table 4-45 below summarizes the percentage of the County's land area which falls into each suppression difficulty class, highlighting that 85% of the County is in moderate or higher suppression difficulty areas. This is illustrated in Figure 4-44 below.

Table 4-45 Suppression Difficulty Rating by Land Area

SDR Class	Acres	Percent
No Limitations	868	0.9%
Slight	4,147	4.5%
Slight to Moderate	8,897	9.6%
Moderate	11,854	12.8%
Moderate to Significant	21,676	23.4%
Significant	11,488	12.4%
Significant to Severe	19,581	21.1%
Severe	8,326	9.0%
Inoperable	5,833	6.3%

Source: Colorado Forest Atlas

Figure 4-44 Suppression Difficulty Rating in Gilpin County



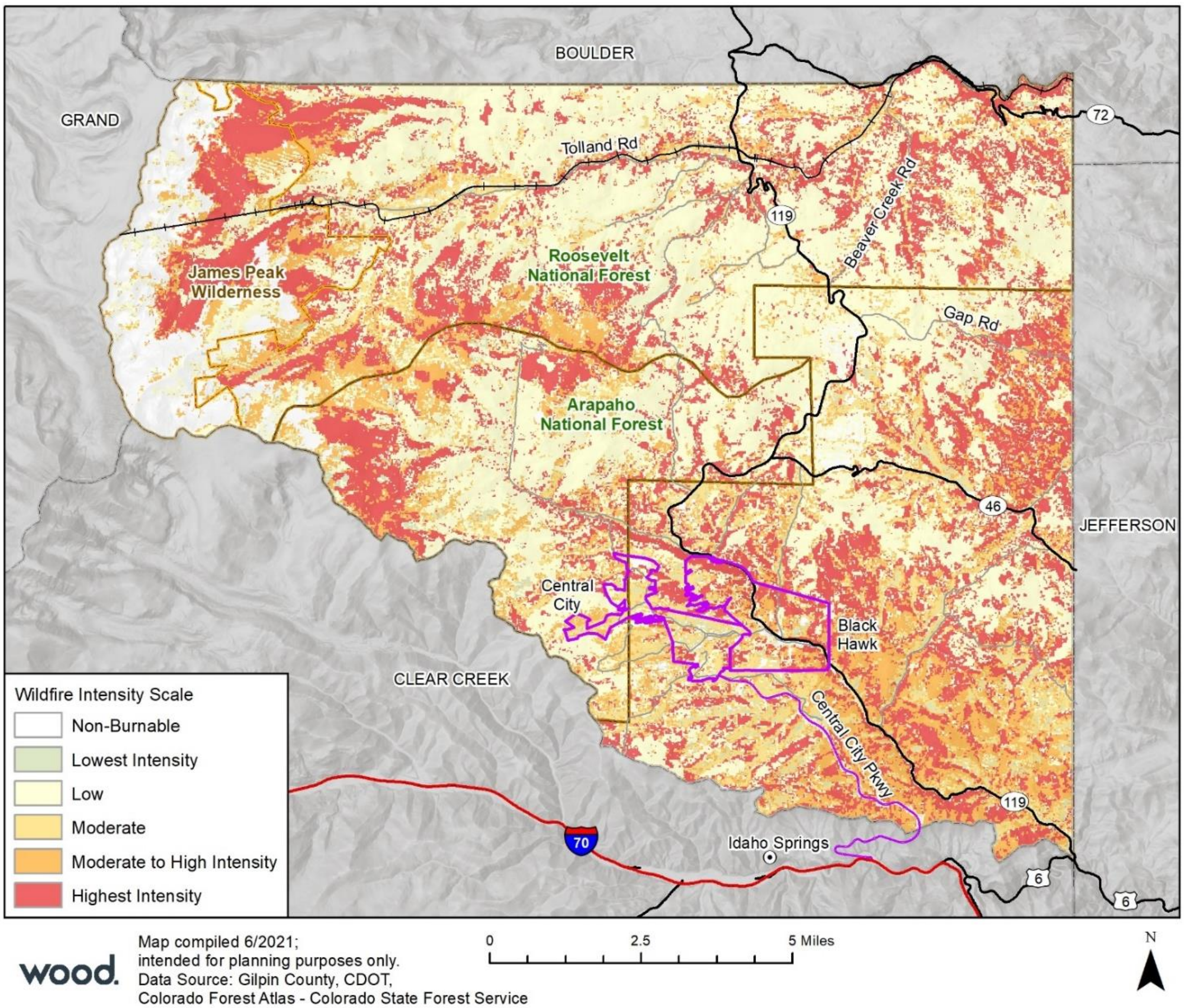
Source: Colorado Forest Atlas

4.13.4 Magnitude and Severity

Wildfires occur naturally and are an important component of the Montane and Subalpine ecosystems that dominate much of Gilpin County. The typical fire season of the study area is defined as June through September when 84% of the fires occur, although wildfires in Colorado can and have occurred in every month. While only 36% of fires in these districts were caused by lightning, over 64% were caused by non-natural ignitions. However, it should be noted that while lightning strikes do occur and start fires, many do not get reported.

The Colorado Forest Atlas conducts a Fire Intensity Scale (FIS) analysis, which uses fuels, topography and weather as inputs to determine the relative intensity (from Class 1, lowest to Class 5, highest) of a potential wildfire. Each classification in wildfire intensity is ten times the intensity of the previous class. According to data from the FIS, the majority of the County has at least a moderate intensity rating with the highest potential wildfire intensity areas in the central and eastern portions of the County, see Figure 4-45. This map highlights the potential intensity that could be observed throughout the County in the event of a wildfire.

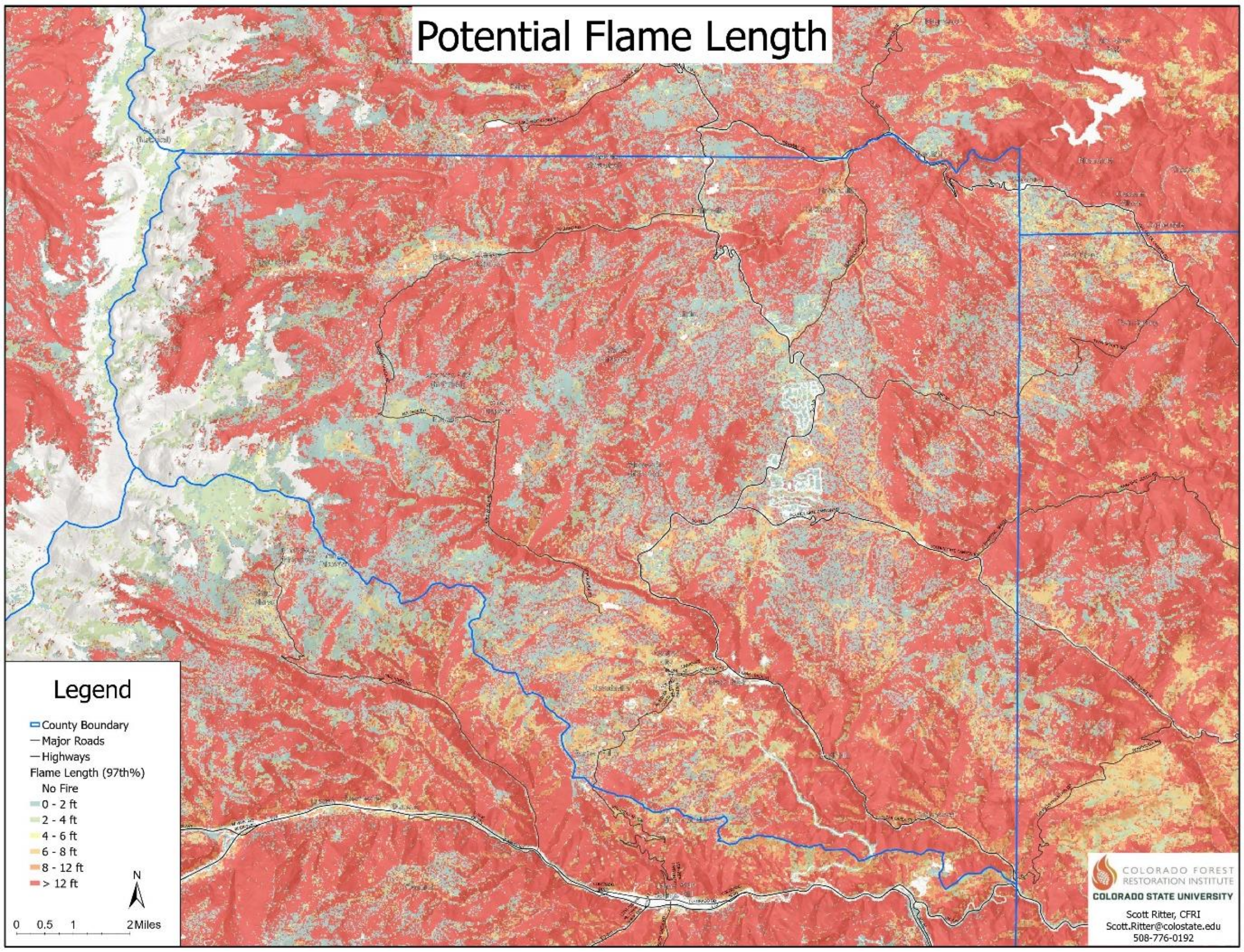
Figure 4-45 Gilpin County Fire Intensity Scale Map



Another factor of the impact of wildfires is the ability to warn and prepare residents ahead of time. Wildfires are often caused by humans, intentionally or accidentally. Because fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable NWS lightning warnings are available on average 24 to 48 hours before a significant electrical storm.

If a fire does break out and spreads rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid expansion of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time. Figure 4-46 shows potential wildfire behaviors in Gilpin County based on the length of flames, which indicates areas more likely to experience crown fires.

Figure 4-46 Gilpin County Fire Behavior



Source: Colorado Forest Restoration Institute

Based on the information in this hazard profile and the potential widespread impacts, the magnitude/severity of severe wildfires is considered critical, causing isolated deaths and multiple injuries; major or long-term property damage that threatens structural stability; or interruption of essential facilities and services for 24 to 72 hours—as well as longer duration economic impact due to interrupted tourism, which plays a major part in the economy of Gilpin County from the casinos in the Cities of Black Hawk and Central City. The overall significance of the hazard is considered severe.

4.13.5 Probability of Future Occurrences

Based on the data provided by Colorado Fire Incident Reporting System (CFIRS), with 15 events from 2002 to 2020, there is roughly an 83% chance of a wildfire in Gilpin County each year.

Additionally, fire occurrence, as provided by Colorado Forest Atlas, has been calculated for the County as the annual probability of any location burning due to a wildfire based on historical ignition patterns. Using this data, fire occurrence was mapped for Gilpin County and is shown in Figure 4-47 below. As shown below, large portions of the County are within areas rated seven and higher on the fire occurrence class scale, including the Cities of Black Hawk and Central City and the majority of the north side of the County along Highway 119. Based on this data the central, northern, and northwestern portions of the County have the highest probability of future occurrence. Figure 4-48 below also includes wildfire burn probability from the USFS for Gilpin County.

Figure 4-47 Gilpin County Wildfire Occurrence

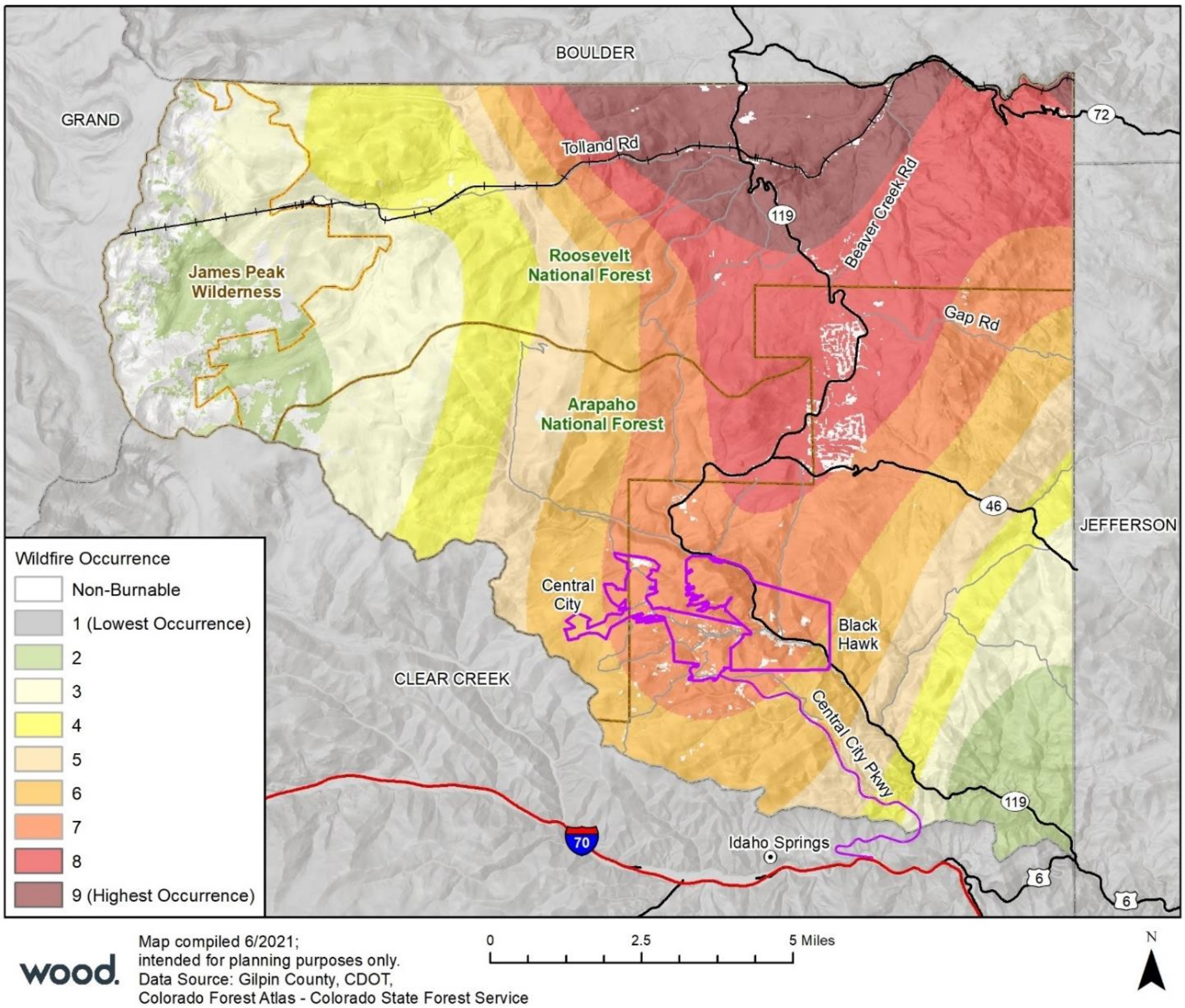
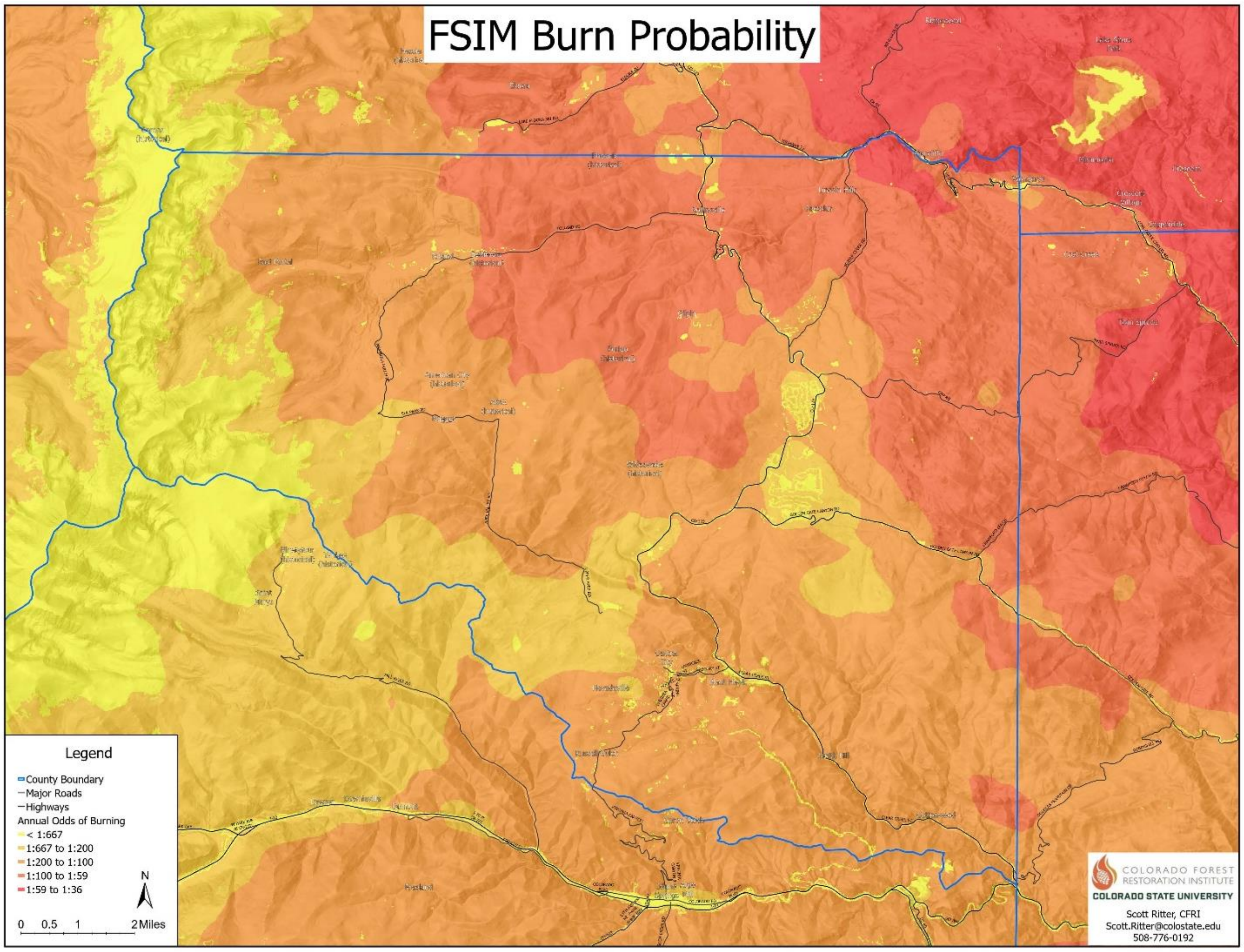


Figure 4-48 Gilpin County Burn Probability



Source: Colorado Forest Restoration Institute

4.13.6 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 County, 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 fires in Gilpin County. 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 is expected to increase due to a lengthening fire season and drier conditions. According to the Intergovernmental Panel on Climate Change's 2019 Special Report on Climate Change and Land:

> *Fire season has already lengthened by 18.7% globally between 1979 and 2013, with statistically significant increases across 25.3% but decreases only across 10.7% of Earth's land surface covered with vegetation; with even sharper changes being observed during the second half of this period. Correspondingly, the global area experiencing long fire weather season has increased by 3.1% per annum or 108.1% during 1979–2013. Fire frequencies under 2050 conditions are projected to increase by approximately 27% globally, relative to the 2000 levels, with changes in future fire meteorology playing the most important role in enhancing global wildfires, followed by land cover changes, lightning activities and land use, while changes in population density exhibit the opposite effects.*

Land use, vegetation, available fuels, and weather conditions (including wind, low humidity, and lack of precipitation) are chief factors in determining the number and size of fires in Colorado each year. Generally, fires are more likely when vegetation is dry from a winter with little snow and/or a spring and summer with sparse rainfall. As a result, climate induced hazards in Colorado (specifically, a pattern of extended drought conditions) have contributed to increased concern about wildfire in Gilpin County.

The frequency, intensity, and duration of wildfires have increased across the Western United States since the 1980s. The US Department of Agriculture's "Effects of Climate Variability and Change on Forest Ecosystems" General Technical Report, published in December 2012, found that the Colorado region, among others, will face an even greater fire risk over time. The report expects Colorado to experience up to a five-fold increase in acres burned by 2050. This project trend is apparent with the historic 2020 fire season, during which the state saw three separate fires become the largest in state history. The report's findings are consistent with previous studies on the relationship between climate change and fire risk. Colorado landscapes, including those that characterize Gilpin County, are expected to become hotter and drier as the planet warms, which in turn is expected to increase regional wildfire risk.

4.13.7 Vulnerability

Wildfire has the potential to cause widespread damage and loss of life in Gilpin County. The significance of this hazard and the availability of digital hazard data in GIS enables a more detailed vulnerability assessment than many hazards. Structures, above-ground infrastructure, critical facilities, and natural environments are all vulnerable to the wildfire hazard. The following sections summarize the results of GIS analysis of Gilpin County with regards to the population, property, critical facilities and infrastructure, government services, economy, and historic, cultural, and natural resources within the County.

Population

Direct threat exists to residents exposed to wildfire risk by residing in the WUI areas, as shown above in Figure 4-41. Population living in WUI areas was estimated using the structure count of buildings in the WUI area and applying the census value of 2.23 persons per household for Gilpin County, 1.94 persons per household for Central City, and 2.02 for Black Hawk. These estimates are shown in Table 4-46.

Table 4-46 Population Within Wildfire Risk Areas

	Lowest Risk	Low Risk	Moderate Risk	High Risk
	Population	**Population**	**Population**	**Population**
Black Hawk	2	10	100	0
Central City	87	114	277	0
Unincorporated	4,273	1,218	1,681	239
Total	**4,362**	**1,342**	**2,058**	**239**

Source: Gilpin County Assessor, Colorado Forest Atlas, Wood GIS Analysis

Smoke and air pollution from wildfires 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.

Wildfire may 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. Loss estimations for the wildfire hazard were modeled by intersecting the Colorado Forest Atlas wildfire risk data with 2020 County tax assessor data for improved parcels and associated address points. Table 4-47 summarizes the estimated exposed value of improvements in each wildfire risk category. Wildfires typically result in total building loss, including contents. Contents values were estimated as a percentage of building value based on their property type, using FEMA/Hazus estimated content replacement values. This includes 100% of the structure value for commercial and exempt structures, 50% for residential structures and 100% for vacant improved land. Improved and contents values were summed to obtain a total exposure value. In all, a total of 3,245 parcels and 3,960 buildings are in areas exposed to wildfire risk, with a total value of over $6.1 billion. The greatest exposure is in the unincorporated parts of the County.

Table 4-47 Gilpin County Exposure and Value of Structures in Wildfire Risk Areas

Jurisdiction	Property Type	Improved Parcel Count	Building Count High	Building Count Moderate	Building Count Low	Building Count Lowest	Total Building Count	Improved Value	Estimated Content Value	Total Value
Black Hawk	Commercial	11	-	10	1	-	11	$21,433,650	$21,433,650	$42,867,300
	Exempt	24	-	27	2	-	29	$3,792,160	$3,792,160	$7,584,320
	Residential	48	-	49	5	1	55	$10,882,580	$54,412,900	$65,295,480
	Total	**83**	**0**	**86**	**8**	**1**	**95**	**$36,108,390**	**$79,638,710**	**$115,747,100**
Central City	Commercial	33	-	29	6	-	35	$32,248,780	$32,248,780	$64,497,560
	Exempt	31	-	25	6	2	33	$4,024,200	$4,024,200	$8,048,400
	Natural Resource	1	-	1	-	-	1	$2,520	$2,520	$5,040
	Residential	227	-	143	59	45	247	$69,354,410	$346,772,050	$416,126,460
	Vacant w/Improvements	1	-	-	1	-	1	$8,420	$8,420	$16,840
	Total	**293**	**0**	**198**	**72**	**47**	**317**	**$105,638,330**	**$383,055,970**	**$488,694,300**
Unincorporated	Agricultural	9	-	1	1	7	9	$2,690,700	$2,690,700	$5,381,400
	Commercial	33	-	5	15	29	49	$7,827,380	$7,827,380	$15,654,760
	Exempt	40	-	24	26	27	77	$66,831,060	$66,831,060	$133,662,120
	Industrial	9	-	2	1	9	12	$1,509,420	$2,264,130	$3,773,550
	Natural Resource	70	5	24	15	33	77	$9,313,280	$9,313,280	$18,626,560
	Residential	2,707	107	754	546	1,916	3,323	$883,412,080	$4,417,060,400	$5,300,472,480
	State Assessed	1	-	1	-	-	1	$10,461,390	$10,461,390	$20,922,780
	Total	**2,869**	**112**	**811**	**604**	**2,021**	**3,548**	**$982,045,310**	**$4,516,448,340**	**$5,498,493,650**
	Grand Total	**3,245**	**112**	**1,095**	**684**	**2,069**	**3,960**	**$1,123,792,030**	**$4,979,143,020**	**$6,102,935,050**

Source: Gilpin County Assessor, Colorado Forest Atlas, Wood GIS Analysis

Critical Facilities and Infrastructure

Critical facilities of wood frame construction are especially vulnerable during wildfire events. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

In the event of wildfire, there would likely be little damage to the majority of infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk to wildfire because most power poles are made of wood and susceptible to burning. In the event of a wildfire, pipelines could provide a source of fuel and lead to a catastrophic explosion.

Table 4-48 identifies critical facilities exposed to the moderate wildfire risk in the County. According to the GIS analysis, there were no facilities located in wildfire risk areas higher than moderate. A total of 60 critical facilities have been identified as located in areas exposed to moderate wildfire risk. 21 of the total facilities are in the unincorporated areas of the County. Note that all of Timberline Fire District's 10 stations are potentially at risk of wildfire, two stations (Stations 9 and 10) are located in areas of moderate or greater wildfire risk.

Table 4-48 Gilpin County Critical Facilities at Moderate Wildfire Risk

FEMA Lifeline	Jurisdiction	Facility Type	Count
Communications	Black Hawk	Land Mobile Private Tower	4
		Microwave Service Tower	1
	Central City	Land Mobile Private Tower	8
		Microwave Service Tower	1
		Paging Tower	1
	Gilpin County	Cellular Tower	1
		Land Mobile Private Tower	6
	Total		**22**
Energy	Gilpin County	Electric Substation	1
		Industrial Facility	1
	Total		**2**
Food, Water, Shelter	Black Hawk	Casino	3
	Central City	Casino	4
		Hotel / Motel	1
		House of Worship	4
		Lodging	1
	Gilpin County	Fair / Exhibition / Rodeo Grounds	1
	Total		**14**
Hazardous Material	Central City	Tier II	1

FEMA Lifeline	Jurisdiction	Facility Type	Count
	Gilpin County	Tier II	1
	Total		**2**
Safety and Security	Black Hawk	Municipal Government Facility	1
		Post Office	1
	Central City	Law Enforcement	3
		Post Office	1
		Trash Transfer Station	1
	Gilpin County	Day Care Facility	1
		Fire Station / EMS Station	2
		School	1
	Total		**11**
Transportation	Black Hawk	Bridge Non-Scour Fair Condition	2
		Bridge Non-Scour Good Condition	1
	Gilpin County	Helispot	3
		Tunnel: Railroad	3
	Total		**9**
	Grand Total		**60**

Source: Colorado Forest Atlas, HIFLD, Wood GIS Analysis

Government Services

Large fires can affect the availability of resources over an extended period of time, which could impact the ability to provide a rapid response and recovery. This particularly applies to Timberline Fire Protection District assets, which can be strained by a large wildfire in the area. Power interruption may occur if facilities are damaged in a wildfire or are not adequately equipped with backup generation.

Economy

Tourism is a vital component of Gilpin County's economy. Wildland fires can have a direct impact on the County's scenery and environmental health, adversely affecting the presence of tourism activities and the ability of the County's residents to earn a living from the related industries. Gilpin County's casinos, scenic beauty, and cultural resources are a main draw for tourism, so the County can suffer economic losses from tourists not coming to the area due to wildfires. Fire suppression may also require increased cost to local and state governments for water acquisition and delivery, especially during periods of drought when water resources are scarce. Fires can cause direct economic losses in the destruction of buildings and their contents.

Historic, Cultural, and Natural 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:

- **Damaged Fisheries:** Critical fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.

- **Soil Erosion:** The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitats.
- **Spread of Invasive Plant Species:** Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.
- **Disease and Insect Infestations:** Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- **Destroyed Endangered Species Habitat:** Catastrophic fires can have devastating consequences for endangered species.
- **Soil Sterilization:** Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost. It can take decades or even centuries for ecosystems to recover from a fire. Some fires burn so hot that they can sterilize the soil.

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.

4.13.8 Development Trends

Gilpin County has a 2013 CWPP, with an update ongoing at the time of the drafting of this plan. The plan was established to assist the County with wildfire preparation and provide effective techniques to combat wildfires while protecting property and persons. The CWPP outlines the importance of community involvement in reducing wildfire risk, particularly in WUI areas. Thinning, landscape fuel reduction, fire fighter training, and locating and updating emergency access routes are just some of the recommendations the CWPP for Gilpin County has established to help control wildfire threat.

According to the Colorado DOLA State Demography Office, Gilpin County’s population is projected to stabilize and begin to decrease slightly through the year 2050. Overall, this could result in decreased wildfire risk for the County. However, any potential migration of existing residents of Gilpin County to more remote areas of the County, as well as visiting tourists, increases the probability of human-caused ignitions from vehicles, grills, campfires, and electrical devices.

4.13.9 Risk Summary

- Overall significance of the hazard is considered **High** for all jurisdictions except for the City of Black Hawk which is Medium risk.
- A total of 3,245 parcels and 3,960 buildings are located in areas exposed to wildfire risk, with a total value of approximately $6.1 billion. The greatest exposure is located in the unincorporated parts of the County.
- Approximately $487 million in property value and 317 structures are also exposed to wildfire risk in Central City.
- The Timberline Fire Protection District provides fire protection services to Gilpin County, including wildfires. The remote and rural nature of the County may present an impediment to response efforts for a large wildfire, resulting in increased risk.
- Wildfires within Gilpin County and in adjacent counties can deter tourism and affect the local economy and air quality.

- Public education and outreach to people living in or near the fire hazard zones should include information about and assistance with mitigation activities such as defensible space, and advance identification of evacuation routes and safe zones.
- Both the natural and human-caused conditions that contribute to the wildland fire hazard are tending to exacerbate through time.
- Conservative forestry management practices have resulted in congested forests prone to fire and disease.
- The continued migration of inhabitants to remote areas of the County increases the probability of human-caused ignitions from vehicles, grills, campfires, and electrical devices.
- Non-native species have become invasive in the area. These species burn readily and pose a threat to homes and other structures in the lower reaches of the County and into municipalities.
- Wildfires could cause a range of secondary hazards, such as contamination of reservoirs, destabilized slopes and landslides, increased erosion, and flooding.
- Related Hazards: Lightning, flood, etc.

4.14 Winter Storm

WINTER STORM HAZARD RANKING	
Gilpin County	High
City of Black Hawk	High
City of Central City	High
Timberline Fire Protection District	High

4.14.1 Description

Winter storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result in injuries and deaths.

Winter storms in Gilpin County, including strong winds and blizzard conditions, can result in property damage, localized power and phone outages and closures of streets, highways, schools, businesses, and non-essential government operations. People can also become isolated from essential services in their homes and vehicles. A winter storm can escalate, creating life threatening situations when emergency response is limited by severe winter conditions. Other issues associated with severe winter weather include hypothermia and the threat of physical overexertion that may lead to heart attacks or strokes. Snow removal costs can also impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

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.

The HPRCC records temperature data for Gilpin County. Table 4-49 contains temperature summaries related to extreme cold for the County between 1991 and 2020. Average maximum temperatures are shown in Table 4-16 in Subsection 4.4.9

Table 4-49 Temperature Data for Gilpin County (1991-2020)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (degrees Fahrenheit)												
Average Minimum Temperature	14	14	20	26	34	42	48	46	39	30	21	14
Average Temperature	25	26	33	38	47	57	63	61	54	43	33	25

Source: HPRCC, County Level Data

Gilpin County receives varying amounts of snow throughout the area. Winter weather patterns flow from the west, over the Front Range Mountains on the western portion of the County. While winter storms bring heavier snowfalls to the Front Range Mountains to the west, snow is not as severe in the Cities of Black Hawk and Central City. Gilpin County receives approximately 142 inches of snow per year. March and November are on average the snowiest months in the County. The Cities of Black Hawk and Central City average each approximately 93 inches of snow per year.

4.14.2 Past Events

A total of 646 winter weather events occurred in the region including Gilpin County between 1996 and 2020. The event types include a combination of "Blizzard," "Heavy Snow," "Winter Weather," and "Winter Storm." Locations for the records are limited to one of four NOAA NCEI-defined zones:

- Jefferson & W Douglas Counties above 6000 feet/Gilpin/Clear Creek/NE Park Counties below 9000 Feet,
- Southern Front Range Foothills/Clear Creek Basin (Zone)/W Jefferson NE Park/E Clear Creek SE Gilpin/SW Douglas (Zone),
- South and Southeast Grand/West Central & Southwest Boulder/Gilpin/Clear Creek/Summit/North and West Park Counties above 9000 Feet, and
- Summit County/Mosquito Range/Indian Peaks/ S Grand / Summit / W Clear Creek / W Gilpin / SW Boulder / NW Park (Zone).

Table 4-50 shows the distribution of weather events throughout Gilpin County.

Table 4-50 Gilpin County Winter Weather Events (1996-2020)

Location	Event Type	Number of Events
Jefferson & W Douglas Counties above 6000 feet/Gilpin/Clear Creek/NE Park Counties below 9000 Feet	Heavy Snow	39
	Winter Storm	65
	Winter Weather	46
Southern Front Range Foothills/Clear Creek Basin (Zone)/ W Jefferson / NE Park / E Clear Creek / SE Gilpin / SW Douglas (Zone)	Heavy Snow	35
	Winter Storm	11
South and Southeast Grand/West Central & Southwest Boulder/Gilpin/Clear Creek/Summit/ North and West Park Counties above 9000 Feet	Heavy Snow	226
	Winter Storm	91
	Winter Weather	91
Summit County/Mosquito Range/Indian Peaks/S Grand / Summit / W Clear Creek / W Gilpin / SW Boulder / NW Park (Zone)	Heavy Snow	23
	Winter Storm	19

Source: National Centers for Environmental Information

According to the National Centers for Environmental Information, only one of the winter weather events resulted in reported property damage; additional details are below.

- **March 17, 2003:** FEMA-EM-3185. A very moist, intense and slow-moving Pacific storm system made its way across the four corners area and into southeastern Colorado from March 17 to the 19, allowing for a deep easterly upslope flow to form along Jefferson and West Douglas Counties above 6000 feet/Gilpin/Clear Creek/Northeast Park Counties below 9000 feet. The storm dumped heavy wet snow that caused roofs of homes and businesses to collapse as well as downed trees, branches, and power lines. Up to 135,000 people lost power at some point during the storms and it took several days, in some areas, to restore power. The areas hardest hit by heavy snow were the northern mountains east of the Continental Divide, the Front Range Foothills and Palmer Divide, where snowfall totals ranged from 3 feet to over 7 feet. FEMA obligated over $6.1 million public assistance funds to help with emergency snow removal with this event.
- **December 18-19, 2006:** FEMA - EM-3270. On December 19th, 2006, the NWS issued several snow advisories indicating that the majority of the Colorado was to be covered with 18-24 inches of snow within the following 24 hours. FEMA obligated over $8.6 million public assistance funds to help with emergency snow removal with this event.

4.14.3 Location

The entire County is susceptible to severe winter storms, although severe winter weather is primarily found in the higher elevations of the County and in the Front Range Mountains in the northern and western portion of the County.

4.14.4 Magnitude and Severity

The magnitude/severity of severe winter weather is considered moderate to critical in Gilpin County. The annual rate of occurrence for the region is 27 events per year, with the average loss expectancy of approximately $23,994/event for all 646 events that have occurred in the region between 1996 and 2020. Therefore, the annualized loss for winter weather regionally is approximately $647,833. However, the loss expectancy is based on the one winter storm event that resulted in significant property loss of $15,500,000 regionally. Most winter weather events do not cause significant damage but do require community resources, such as snow removal services, and impact the local economy through transportation delays and closures.

In 2001, the NWS implemented an updated wind chill temperature index (see Figure 4-49). This index describes the relative discomfort or danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4-49 National Weather Service Wind Chill Chart

Temperature (°F)

Wind (mph) / Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes / 10 minutes / 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NWS, www.nws.noaa.gov/om/windchill/index.shtml

A wind chill watch is issued by the NWS when wind chill warning criteria are possible in the next 12 to 36 hours. A wind chill warning is issued for wind chills of at least -25°F on the plains and -35°F in the mountains and foothills.

4.14.5 Probability of Future Occurrences

Severe winter storms happen nearly every year in Gilpin County and the probability is considered highly likely, with nearly 100% chance of occurrence in any given year. Severe winter weather occurs most frequently in December, January, February, and March, and can occur October through April.

4.14.6 Climate Change Considerations

Climate change has the potential to exacerbate the severity and intensity of winter storms, including potential heavy amounts of snow. 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, as well as impacts on the ski industry.

The effects of climate change in Colorado have already been observed. The following climate change observations are noted in the 2018 Colorado State Hazard Mitigation Plan:

- Snowpack, as measured by April 1, 2018, snow-water equivalent (SWE), has been mainly below average since 2000 in all of Colorado's river basins, but long-term (30-year, 50-year) declining trends have been detected.
- The timing of snowmelt and peak runoff has shifted earlier in the spring by 1 to 4 weeks across the state's river basins over the past 30 years, due to the combination of lower SWE since 2000, the warning trend in spring temperatures, and enhanced solar absorption from dust-on-snow.

4.14.7 Vulnerability

Population

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.

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 646 total winter weather events that have occurred in the County between 1996 and 2020, only one of the reported events resulted in property damage. The winter storm event occurred on March 17, 2003 and resulted in regional damages worth $15,500,000.

Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from severe winter weather, mostly associated with secondary hazards. Colorado State Highway 119 begins in the southeastern corner of the County, running north/south through the County into adjacent Boulder County. This route could cause hazardous conditions to motorists if blizzard or severe winter weather conditions occur. Portions of State Highway 119 are narrow and curved, and a major accident 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, State Highway 119 is the major highway that runs through the County. Other major routes such as Highway 46, Highway 72, Gap Road, and South Beaver Creek Road are vital to transportation within and through Gilpin County. Accidents on the highway can cause a major disruption in the flow of goods and services in and out of the County.

Historic, Cultural and Natural Resources

While winter storms are part of the natural environment, natural habitats such as streams and trees can still sustain damage. Flooding events caused by snowmelt can produce river channel migration or damage riparian habitat.

4.14.8 Development Trends

All future development will be exposed to severe winter storms. The vulnerability of community assets to severe winter storms is increasing through time as more people enter the planning area. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The planning partners have adopted the International Building Code. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of severe weather.

4.14.9 Risk Summary

- The overall significance of winter storm is **High**.
- The potential for road closures on State Highway 119, State Highway 46, State Highway 72, Gap Road, and South Beaver Creek Road is a significant vulnerability.
- Severe winter weather can isolate residents and travelers by closing roads into and out of the County.
- The County has experienced 646 severe winter weather events in the past 24 years.
- Most winter storms have not resulted in reported damages, but those that do can be significant.
- Related Hazards: Avalanche, Severe Wind.

4.15 Active Threat

ACTIVE THREAT HAZARD RANKING	
Gilpin County	High
City of Black Hawk	High
City of Central City	High
Timberline Fire Protection District	High

4.15.1 Description

An active threat can encompass a variety of malicious acts including explosive attacks, conventional firearm attacks, explosives, vehicle attacks, or even chemical/biological/ radiological/nuclear (CBRN) attacks. Typically, an active threat is a very short-lived incident meant to inflict as many casualties as possible, although recovery from an incident can last days or even months.

The Federal Bureau of Investigation (FBI) defines an active shooter as "one or more individuals actively engaged in killing or attempting to kill people in a populated area. Implicit in this definition is the shooter's use of one or more firearms. The "active" aspect of the definition inherently implies the ongoing nature of the incidents, and thus the potential for the response to affect the outcome." The FBI further defines a mass killing as an incident resulting in three or more fatalities.

The US Department of Homeland Security notes that "in most cases, active shooters use firearms(s) and there is no pattern or method to their selection of victims…situations are unpredictable and evolve quickly…and are often over within 10 to 15 minutes." However, the presence or suspected presence of secondary devices can lengthen the duration of the event until the attack site is determined to be clear. Although this definition focuses on an active shooter, the elements remain the same for most active threat situations.

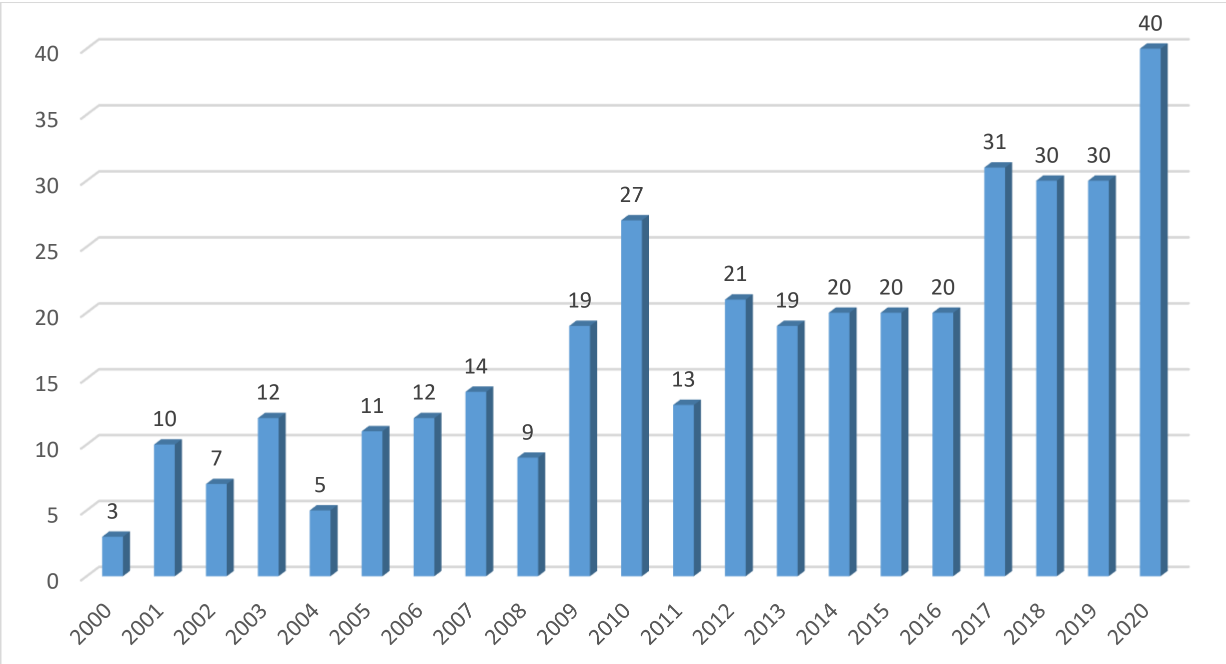
While many terrorist attacks can also be described as active shooter incidents, here the term is used to refer to non-politically motivated incidents such as recent tragic incidents at schools, places of worship, and workplaces; these attacks are also sometimes called mass shootings. Active shooters typically use firearms (although for the purposes of this plan, the definition of active threat is broad and intended to include attacks such as vehicle and knife attacks). The motivations for committing such acts range from retribution for a perceived injustice; to acts of violence against racial minorities, LGBTQ persons, or others; to promoting a specific social or political goal. Typically, active shooters are not interested in taking hostages or attaining material gain, and frequently are not even interested in their own survival. Unlike organized terrorist attacks, most active shooter incidents are carried out by one or two individuals.

For the purposes of this hazard profile, normal law enforcement incidents such as barricaded suspects, hostage negotiations, high risk warrant searches, bomb threats, and other criminal activities are not included.

4.15.2 Past Events

The FBI report Active Shooter Incidents, 20-Year Review 2000-2019 identified 333 active shooter incidents over that 20-year period. Subsequent FBI data shows 40 such incidents in 2020. These incidents are shown by year in Figure 4-50; there is an obvious upward trend in the number of incidents per year from the chart.

Figure 4-50 Active Shooter Incidents in the US, 2000-2020



Source: FBI reports Active Shooter Incidents, 20-Year Review 2000-2019 & Active Shooter Incidents in the United States in 2020

The FBI report listed 13 active shooter incidents in Colorado. between 2000-2020; Colorado ranks 7th highest in number of incidents compared to other states. Table 4-51 lists active shooter incidents that have occurred in Colorado in the last 20 years. While none of these incidents occurred within Gilpin County, several took place in nearby jurisdictions.

Table 4-51 Active Shooter Incidents in Colorado, 1999-2020

Year	Incident	Fatalities
1999	Columbine High School	15
2006	Platte Canyon High School	2
2007	New Life Church Shooting	4
2010	Deer Creek Middle School	0
2012	Aurora Theater Shooting	12
2013	Arapahoe High School Shooting	2
2015	Colorado Springs Shooting	4
2019	STEM School Shooting, Highlands Ranch	1
2021	King Soopers Shooting, Boulder	10

Source: News media

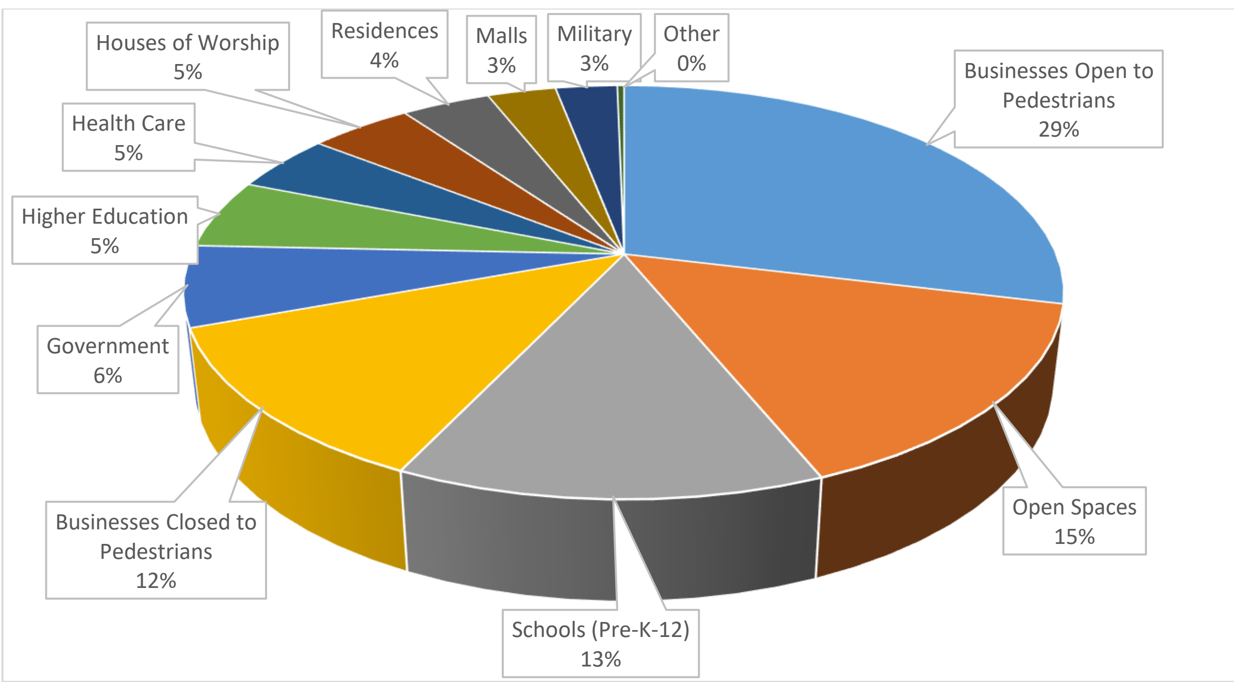
School violence is sometimes considered as a subset of active shooter incidents (although not all school incidents involve the use of firearms). The US Secret Service conducted a study of incidents of "targeted school violence" in the US from 2008 to 2017, which they defined as "any incident in which (i) a current or recently former K-12 school student (ii) purposefully used a weapon (iii) to cause physical injury to, or the death of, at least one other student and/or school employee (iv) in or on the immediate property of the school (v) while targeting in advance one or more specific and/or random student(s) and/or employee(s)." The study excluded spontaneous incidents that resulted from unplanned fights or were tied to other criminal acts such as gang violence or drug trafficking. The Secret Service study found 41 incidents that met the criteria from 2008 to 2017, an average of 4 per year. As with active shooter incidents, the number of incidents has increased. From 2008 through 2012, the nation saw an average of 2.6 incidents per year; from 2013 through 2017, that number had risen to 5.4 per year. 61% of attacks used firearms, while 39% used knives. In the 41 attacks, 98 victims were harmed, including 79 injured and 19 killed; these average out to 1.9 persons injured and 0.5 killed per incident.

Turning briefly to the threat of terrorism, the Global Terrorism Database (GTD) catalogues more than 190,000 terrorist attacks dating back to 1970. GTD data shows that despite public perception the number of terrorist attacks on US soil has decreased over recent decades. From an average of 147.5 incidents per year in the 1970s, the frequency of attacks declined to 51.8 per year in the 1980s, then to 37.0 per year in the 1990s, and to 22.8 per year in the 2000s. An increase in attacks from 2015 through 2018 brought that average back up to 39.6 incidents per year for 2011 through 2018 (the most recent year the GTD has analyzed), but this is still well below the frequency seen in the 70s and 80s.

4.15.3 Location

Active threats can take place anywhere. While the trend in active threats has been to target high population areas, soft target venues, gaming and resort facilities, businesses, and schools, incidents across Colorado and the nation shows they can happen anywhere, as shown in Figure 4-51. While the entire County is potentially at risk of active shooter incidents, the extent of most individual incidents is limited.

Figure 4-51 Active Shooter Incident Locations, 2000-2019

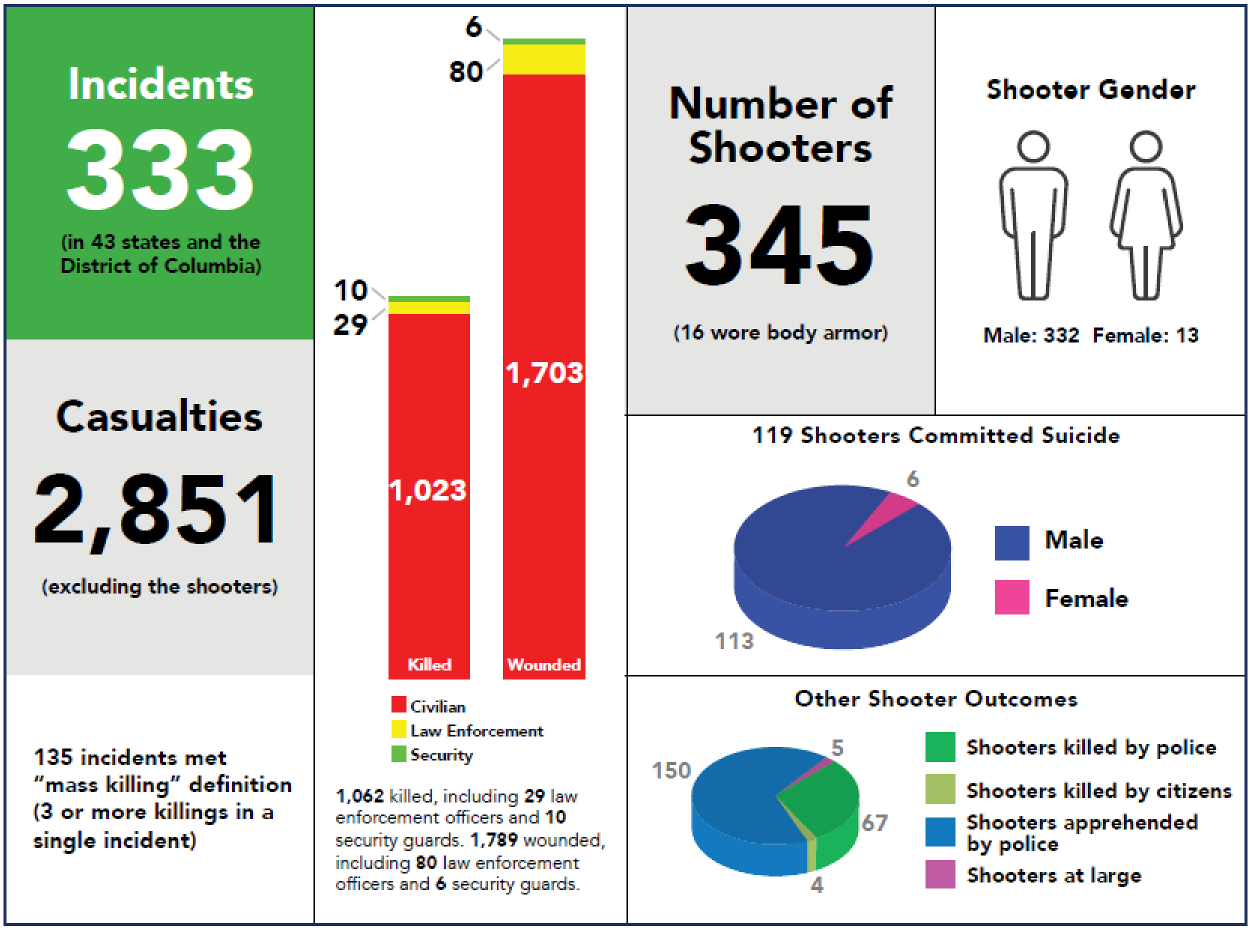


Source: FBI report Active Shooter Incidents, 20-Year Review 2000-2019

4.15.4 Magnitude and Severity

Active threats can be measured in multiple ways including length of incident, casualties, and number of perpetrators. Figure 4-52 summarizes the outcomes of the 333 incidents from 2000-2019. Casualties for active threat incidents vary widely, with an average of three killed and five wounded per incident, excluding the shooter.

Figure 4-52 Active Shooter Incident Outcomes, 2000-2019



Source: FBI report Active Shooter Incidents, 20-Year Review 2000-2019

Although an active threat may only directly impact one specific piece of infrastructure (i.e., a school, theater, or concert venue), it indirectly impacts the community in many ways. Ongoing closures for investigation, local and national media logistics, VIP visits, mental health concerns, and aversions to similar infrastructure and subsequent impacts to businesses can manifest after an active threat. The psychological impact of these types of incidents is often even worse than the direct impacts and can continue to affect a community for years. Thus, the overall significance of this hazard is critical.

4.15.5 Probability of Future Occurrences

The probability of occurrence for an active threat can be difficult to quantify, largely due to different definitions of what constitutes an active threat. The 373 active shooter incidents in the FBI report average out to 17.8 incidents per year between 2000-2020; but the increased frequency of incidents means the average for 2011-2020 is actually 24.4 per year. Based on the 13 incidents in Colorado from 2000-2020, there is roughly a 62% chance of an active shooter incident occurring somewhere in the State in a given year. While the odds of an attack specifically in Gilpin County are significantly lower, it should be noted that attacks in neighboring counties can still have significant impacts in Gilpin County. The overall probability is estimated to be occasional.

4.15.6 Climate Change Considerations

There is no established link between climate change and human-caused hazards such as active threats.

4.15.7 Vulnerability

The consequences from an active threat can range from single fatalities to the destruction of critical infrastructure.

Population

Most terrorist attacks are primarily intended to kill and injure as many people as possible. Physical harm from a firearms attack or explosive device is not completely dependent on location, but risk is greater in areas where higher numbers of people gather. If a biological or chemical agent were released indoors, it could result in exposure to a high concentration of pathogens, whereas an outdoors release could affect many more people but probably at a lower dose. Symptoms of illness from a biological or chemical attack could go undetected for days or even weeks. Local healthcare workers may observe a pattern of unusual illness or early warning monitoring systems may detect airborne pathogens. People could also be affected by an attack on food and water supply. In addition to impacts on physical health, any terrorist attack would likely cause significant stress and anxiety.

Similarly, most active shooters primarily target people, attempting to kill or injure large numbers of individuals. The number of injuries and fatalities are highly variable, dependent on many factors surrounding the attack including the location, the number and type of weapons used, the shooter's skill with weapons, the amount of people at the location, and law enforcement response time. Statistics indicate an average of 6.5 casualties per active shooter incident. Psychological effects of the incident on not only victims and responders, but also the general public, may last for years.

Responders may be the target of secondary attacks meant to exploit the response system. Unless the active threat is directed at a government facility or critical infrastructure, it is unlikely that continuity of operations will be significantly impacted. Potential impacts may include:

- Call priority: Low priority calls for service may be delayed until the incident is over. Property crimes, minor injuries, and transports via ambulance will see an increased response time.
- Delivery of services at government facilities may be impacted if a shelter in place/lockdown/lockout is implemented.

Property

Active shooter incidents rarely result in significant property damage. However, active threats can close down property and facilities for days or even months for investigation or rehabilitation of the site. As examples, the Aurora Theater was closed for 6 months after that shooting incident, and transformer replacement after the Metcalf Sniper Attack took 5 months.

Critical Facilitates and Infrastructure

As noted above, active shooter incidents rarely result in significant property damage, but can close down facilities and infrastructure for days or even months for investigation or rehabilitation of the site.

Public confidence in the government is directly related to the ability to respond to an active threat. The response to the Parkland shooting was widely seen as a failure of both policy and procedure, resulting in multiple lawsuits, a vote of no confidence in the Sheriff, and intense media scrutiny.

Economy

Direct economic impacts from most active shooter attacks are minimal. However, indirect costs can be substantial, including:

- Responder costs, including overtime, equipment, resource expenditure, etc.,
- Facility damage,
- Loss of revenue,
- Legal fees,
- Mental health/other healthcare related costs,
- VIP visits/security, and/or
- Policy/legislative changes to increase security.

Some statistics from active threats show the different costs, including rebuilding costs. San Bernardino "had to pay $4 million for the response…Connecticut gave the city of Newtown $50 million just for the costs of rebuilding…the costs from the 1999 shooting at Columbine High School came to roughly $50 million." (Delgadillo, 2018)

Historic, Cultural and Natural Resources

While historic and cultural facilities are often seen as likely terrorism targets, they are not often targeted by non-political active threats. Most active shooter attacks do not cause widespread damage to the environment. Atypical attacks utilizing CBRN materials could significantly impact the environment. Unless an attacker targets a hazardous materials site (fixed facility or rail), or infrastructure such as wastewater or water purification sites, it is unlikely to result in significant impacts to the environment.

4.15.8 Development Trends

The link between increased development and terrorist attacks is uncertain at best. Many terrorist attacks have targeted larger metropolitan areas, so a larger population could potentially make public events more attractive targets. Population growth and development could expose more people and property to the impacts of an explosive or CBRN attack.

4.15.9 Risk Summary

- The overall significance of active threats to Gilpin County is **Medium**.
- Changes since 2016: active threats were not profiled in the 2016 Plan.
- While the number of terrorist attacks on US soil has been declining since the 1970s, active shooter incidents and school violence have risen in recent years.
- Effects on people: The primary aim of most active shooters is to injure and kill as many people as possible.
- Effects on property: Active shooter incidents rarely cause significant property damage.
- Effects on economy: Most active shooter incidents have minimal impacts on the economy.
- Effects on critical facilities and infrastructure: Crime scene concerns can lead to the loss of use of critical facilities for days or weeks.
- Related Hazards: Cyber Attack, Hazardous Materials Incident.

4.16 Cyber Threat

CYBER THREAT HAZARD RANKING	
Gilpin County	High
City of Black Hawk	High
City of Central City	High
Timberline Fire Protection District	High

4.16.1 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 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. An emerging threat that is in effect a DDoS attack is the hijacking of virtual public or private meetings which has been observed in recent years. With the necessity to hold virtual correspondence that arose from the COVID-19 pandemic, a new vulnerability also emerged in the form of individuals either taking over meetings with multiple users, or hijacking the meeting from the original organizers and denying them the ability to conduct their meeting.
- **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."

4.16.2 Past Events

The cybersecurity firm Symantec reports there were a total of 1,209 data breaches worldwide in 2016. While the number of breaches has remained relatively steady, the average number of identities stolen has increased to almost one million per incident. The report also found that one in every 131 emails contained malware, and the company's software blocked an average of 229,000 web attacks every day.

The nonprofit Privacy Rights Clearinghouse maintains a timeline of 9,741 data breaches resulting from computer hacking incidents in the United States from 2005-2019. 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 Gilpin County residents. Attacks happening outside of the state can also impact local businesses, personal identifiable information, and credit card information. Table 4-52 shows several of the more significant cyber attacks in Colorado in recent years.

Table 4-52 Major Cyber Attacks Impacting Colorado, 2005-2020

Date Reported	Target	Total Records	Description
July 21, 2005	University of Colorado, Boulder	49,000	Data exposure/ personal identifiable information
August 2, 2005	University of Colorado, Denver	36,000	Data exposure/ personal identifiable information
July 17, 2007	Western Union, Greenwood Village	20,000	Credit card breach
April 22, 2014	Centura Health, Englewood	12,286	Health information breach
July 3, 2017	PVHS-ICM Employee Health and Wellness, Fort Collins	10,143	Data exposure/health information
February, 2018	CDOT	N/A	Data encryption/ ransomware
August, 2019	Regis University	N/A	DDoS
December, 2019	Southeast Metro Storm Water Authority (SEMSWA)	N/A	Ransomware
June, 2020	Colorado Information Analysis Center (CIAC)	Unknown	Data Breach
July 2021	City of Lafayette	Unknown	Ransomware

Source: Privacy Rights Clearinghouse

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. However, according to a 2016 study by Kaspersky Lab, roughly one in five ransomware victims who pay their attackers never recover their data.

Recent years have seen an increase in ransomware attacks, particularly against local government systems. The City of Atlanta was hit by a major ransomware attack in 2018, recovery from which wound up costing a reported $2.6 million, significantly more than the $52,000 ransom demand. A similar attack against the City of Baltimore in 2019 affected the city government's email, voicemail, property tax portal, water bill, and parking ticket payment systems, and delayed more than 1,000 pending home sales. In March 2019, Orange County, North Carolina was attacked with a ransomware virus, causing slowdowns and service problems at key public offices such as the Register of Deeds, the Sheriff's Office, and County libraries. The attack impacted a variety of County services, including disrupting the County's capability to process real estate closings, issue marriage licenses, process fees or permits, process housing vouchers, and verify tax bills.

A large, sophisticated malware attack, known as Olympic Destroyer, was launched against the 2018 Winter Olympics in PyeongChang, South Korea. The attack initially took down servers, email, Wi-Fi, and ticketing systems, which could have severely disrupted the games. Fortunately, the organizing committee had a robust cybersecurity group that was able to quickly restore most functions.

4.16.3 Location

The geographic extent is significant.

Cyber attacks can and have occurred in every location regardless of geography, demographics, and security posture. 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 city. All servers in the planning area are potentially vulnerable to cyber attacks.

4.16.4 Magnitude and Severity

The potential magnitude and severity of cyber attack is critical.

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, the October 21, 2016 Dyn attack, 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 60,000, 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.

4.16.5 Probability of Future Occurrences

The probability of future cyber attacks is occasional.

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.

Perhaps of greatest concern to the participating jurisdictions are ransomware attacks, which are becoming increasingly common. It is difficult to calculate the odds of Gilpin County or one of its municipal governments being hit with a successful ransomware attack in any given year, but it is safe to say it is likely to be attacked in the coming years.

The possibility of a larger disruption affecting systems within the city 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 city cannot be ruled out.

4.16.6 Climate Change Considerations

There are no known effects of climate induced impacts on human-caused hazards such as cyber attacks.

4.16.7 Vulnerability

Population

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.

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.

Property

The vast majority of cyber attacks affect only data and computer systems and have minimal impact on general property.

Critical Facilitates and Infrastructure

The vast majority of cyber attacks affect only data and computer systems. However, 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 Colonial Pipeline in 2021 caused 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. Many city and county government departments have the option to move to a paper method including permitting, DMV services, payments to and from the city, and payroll. However, access to documents on the network, OneDrive access, and other operations that require collaboration across the city will be significantly impacted.

Cyber attacks can interfere with emergency response communications, access to mobile data terminals, and access to critical preplans and response documents. 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

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.

Historic, Cultural and Natural Resources

The vast majority of 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.

4.16.8 Development Trends

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.

4.16.9 Risk Summary

- Overall significance is **High**.
- Changes since 2016: cyber attacks were not profiled in the 2016 Plan.
- Ransomware attacks on government servers have been increasing sharply in recent years.
- There have been 69 significant data breaches reported in Colorado between 2005 and 2019.
- Cyberattacks can have debilitating economic impacts and decrease in public confidence.
- Related Hazards: Critical Facilities Outages.

4.17 Pandemic

PANDEMIC HAZARD RANKING	
Gilpin County	Medium
City of Black Hawk	Medium
City of Central City	Medium
Timberline Fire Protection District	Medium

4.17.1 Description

A pandemic can be defined as a disease 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 trigger a pandemic declaration:

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.

Since March 2020, Gilpin County, the nation, and the world are dealing with the COVID-19 pandemic (caused by the SARS-CoV-2 virus), confirming that pandemic is a key public health hazard in the planning area. This hazard risk assessment includes an analysis of pandemic risk across Gilpin County and an analysis of the impacts of the hazards profiled in this plan on public health.

Unlike seasonal flu, a 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 SARS-CoV-2 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 with roughly one in five requiring hospitalizations in the United States and a fatality rate between 1-2%. Because the virus can be transmitted by people who are asymptomatic, containing the spread has been a significant challenge across the globe.

4.17.2 Past Events

Since the early 1900s, five lethal pandemics have swept the globe:

- **1918-1919 Spanish Flu:** The Spanish Flu was the most severe pandemic in recent history. The number of deaths was estimated to be 50-100 million worldwide and 675,000 in the United States. Its primary victims were mostly young, healthy adults. At one point, more than 10 percent of the American workforce was bedridden.
- **1957-1958 Asian Flu:** The 1957 Asian Flu pandemic killed 1-2 million people worldwide, including about 70,000 people in the United States, mostly the elderly and chronically ill. Fortunately, the virus was quickly identified, and vaccine production began in May 1957.
- **1968-1969 H3N2 Hong Kong Flu:** The 1968 Hong Kong Flu pandemic killed 34,000 Americans. Again, the elderly were more severely affected. This pandemic peaked during school holidays in December, limiting student-related infections, which may have kept the number of infections down.

Also, people infected by the Asian Flu ten years earlier may have gained some resistance to the new virus.

- **2009-2010 H1N1 Swine Flu:** This influenza pandemic emerged from Mexico in early 2009 and was declared a public health emergency in the US on April 26. By June, approximately 18,000 cases had been reported in the US and the virus had spread to 74 countries. Most cases were fairly mild, with symptoms similar to the seasonal flu, but there were cases of severe disease requiring hospitalization and a number of deaths. The CDC estimates that 43-89 million people were infected worldwide, with an estimated 8,870 to 18,300 H1N1 related deaths, including 12,469 deaths in the United States.
- **2020-Ongoing COVID-19:** The COVID-19 or novel coronavirus outbreak began in December 2019 and was declared a pandemic in March of 2020. By October 30th, 2020, 45 million cases have been reported around the world with over 1 million deaths, including 9 million cases and 229,000 deaths in the US. As of February 24th, 2022, this figure has increased to over 430 million cases and 5.92 million deaths reported globally, according to the World Health Organization (WHO). Within the US (as of February 24th, 2022), over 78.6 million cases and 940,000 deaths have been reported; including 918 cases and four deaths in Gilpin County. Several COVID-19 vaccines were approved by the Food and Drug Administration (FDA) in mid-2021. As of February 24th, 2022, 65% of the US population has been fully vaccinated, although vaccine hesitancy has kept a significant portion of the population from getting vaccinated. In addition, many other countries do not have access or the capabilities to disseminate vaccines as the US does; thus, the pandemic is expected to continue indefinitely.

4.17.3 Location

Pandemics occur not only on a county or state level, but on a national and global scale. It is likely that most communities in Gilpin County would be affected, either directly or by secondary impacts. Some indirect consequences may be the diversion of resources that may be otherwise available. In general, it is likely that the more-populated municipal areas may be affected sooner and may experience higher infection rates.

4.17.4 Magnitude and Severity

The magnitude of a public health emergency will range significantly depending on the transmissivity and mortality rate of the virus. For example, pandemic influenza is easily transmitted from person-to-person, however advances in medical technologies have greatly reduced the number of deaths caused by influenza over time.

Preparing for, responding to, and recovering from a pandemic requires a strategy that includes a holistic suite of public health activities designed to lessen the impact on morbidity and mortality. These activities include education, vaccination, prophylaxis, isolation/quarantine, a robust contact tracing program, and the closure of public facilities. In addition, clear, concise communication with the public and with other agencies remains a critical component, as does the ability of the involved agencies to achieve collaboration and coordination. By their very nature, most pandemics, once started, will not be stopped until they have run their course. This course can be shortened and weakened by a number of factors, with vaccination being the most effective method for protecting the population. Pandemic plans describe strategies of preparedness, response, and recovery to attempt to decrease illnesses and deaths during the pandemic period to manageable levels (i.e., that do not overwhelm the critical infrastructures of the State), and to promote community resiliency and rapid recovery.

4.17.5 Probability of Future Occurrences

Today, a much larger percentage of the world's population is clustered in cities, making them ideal breeding grounds for epidemics. Additionally, the explosive growth in air travel means the virus could spread around the globe within hours. Under such conditions, there may be very little time for counties, states, and countries to prepare. Most experts believe we will have just one to six months between the time that a dangerous new influenza strain is identified and the time that outbreaks begin to occur in the United States. Outbreaks are expected to occur simultaneously throughout much of the nation, preventing shifts in human and material resources that normally occur with other natural disasters. These and many other aspects make pandemics unlike any other public health emergency or community disaster. Pandemics typically last for several months to 1-2 years and have even longer lasting effects on the economy and communities.

As described by the WHO, the Pandemic Intervals Framework (PIF) is a six-phased approach to defining the progression of a pandemic. This framework is used to guide pandemic planning and provides recommendations for risk assessment, decision making, and action. These intervals provide a common method to describe pandemic activity which can inform public health actions. The duration of each pandemic interval might vary depending on the characteristics of the virus and the public health response.

The six-phase approach was designed for the easy incorporation of recommendations into existing national and local preparedness and response plans. Phases 1 through 3 correlates with preparedness in the pre-pandemic interval, including capacity development and response planning activities, while Phases 4 through 6 signal the need for response and mitigation efforts during the pandemic interval. Phase 6 was reached in Gilpin County during the COVID-19 outbreak.

Pre-Pandemic Interval

Phase 1 is the natural state in which influenza viruses circulate continuously among animals but do not affect humans.

Phase 2 involves cases of animal influenza that have circulated among domesticated or wild animals and have caused specific cases of infection among humans.

Phase 3 represents the mutation of the animal influenza virus in humans so that it can be transmitted to other humans under certain circumstances (usually very close contact between individuals). At this point, small clusters of infection have occurred.

Pandemic Interval

Phase 4 involves community-wide outbreaks as the virus continues to mutate and become more easily transmitted between people (for example, transmission through the air).

Phase 5 represents human-to-human transmission of the virus in at least two countries.

Phase 6 is the pandemic phase, characterized by community-level influenza outbreaks.

4.17.6 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.

4.17.7 Vulnerability

Population

Pandemics have the ability to affect large segments of the population for long periods of time. 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.

As previously described in the Past Events section above, the COVID-19 pandemic has resulted in over 430 million cases and approximately 5.92 million deaths globally. The US has reported over 78.6 million cases and approximately 940,000 deaths. Gilpin County had reported 918 cases and four deaths as of February 24th, 2022. In addition to the direct impacts, the pandemic has completely disrupted life for many people. Most large gatherings have had to be cancelled, and many schools have closed. Sheltering in place and social distancing have been highly encouraged and, in some places, mandated, leaving some individuals isolated for months.

Property

For the most part, property itself is not generally 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 Facilitates and Infrastructure

In the event of a pandemic, especially one with high transmission rates and mortality rates such as COVID-19, hospitals and morgues will be heavily affected and may be overwhelmed. There are no hospitals or morgues located in Gilpin County, so relying on neighboring communities increases the County's vulnerability.

Outbreaks in small cities and counties may cause medical facilities to reach capacity very quickly. 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.

Economy

The gaming industry is the major economic contributor (income, employment and tax revenue) for the County. According to the ACS five-year estimates, 25.5% of people in Gilpin County are employed in the accommodation and food services industry. Pandemics can have extensive economic impacts, as evidenced by the COVID-19 pandemic and associated restrictions on social gatherings. Social distancing requirements have affected nearly every segment of the local and national economy, most notably the restaurant hospitality, and gaming industries. While specific numbers on revenue losses from COVID-19 are not available, state traffic data showed a 90% decrease in vehicle traffic into the County when the casinos closed in March 2020 due to COVID-19. Additionally, an article from USA Today early in the pandemic noted Gilpin County as the economy most vulnerable to a pandemic-induced recession in the country.

Historic, Cultural and Natural Resources

Impacts to these resources are typically minimal. However, reduced tourism during outbreaks could lead to additional economic impacts.

4.17.8 Development Trends

Population growth and development contribute to pandemic exposure. Future development in and around Gilpin 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.

4.17.9 Risk Summary

- The hazard is considered **Medium** significance across all participating jurisdictions.
- Pandemics affecting the US occur roughly once every 20 years but cannot be reliably predicted.
- Effects on people will vary, but as much as 30% of the population could become ill, and 10% may need to be hospitalized.
- Effects on property are typically minimal, although quarantines could result in short-term closures. Critical facilities may have difficulty maintaining operations due to staffing shortages.
- Lost productivity due to illness and potential business closures could potentially have severe economic impacts. Social distancing requirements and fear of public gatherings could significantly reduce in-person commerce.
- Local economy was significantly impacted by social distancing and quarantine requirements during Covid-19. There is an increased vulnerability to the County with dependence on gaming industry and tourism.
- Ongoing mitigation activities should focus on disease prevention, especially during flu season. This includes, but is not limited to, pre-season community outreach campaigns to educate the public about risks and available support; establishing convenient vaccination centers; reaching out to vulnerable populations and caregivers; and issuing advisories and warnings.

5 Mitigation Strategy

DMA 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 section shall include: *(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.* *(ii) 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.* *(iii) 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 describes the mitigation strategy process and mitigation action plan for the Gilpin County HMP. 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 2016 Plan were reviewed and reaffirmed. The HMPC thought the goals and objectives are still valid and were kept as originally written. The mitigation actions from the 2016 Plan were reviewed and assessed for progress and evaluated for their inclusion in this plan update.

Subsection 5.1 below establishes the goals and objectives of this plan; Subsection 5.2 describes the progress participating jurisdictions have made since the 2016 Plan; Subsection 5.3 outlines the process by which new mitigation actions were identified and prioritized; and Subsection 5.4 lists the updated mitigation action plan.

5.1 Goals and Objectives

Up to this point in the planning process, the HMPC has organized resources, assessed natural hazards and risks, and documented mitigation capabilities. 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 Gilpin 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 the 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.
- 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 re-assessed the goals and objectives from the 2016 Plan. The HMPC determined they were still largely valid. The following are the final goals and objectives for the 2023 Plan.

- **Goal 1: Protection of people, property, and natural, cultural, and environmental resources.**
  - **Objective 1.1:** Develop projects focused on preventing loss of life and injuries from natural hazards.
  - **Objective 1.2:** Identify and prioritize actions to protect critical, essential, and necessary assets and infrastructure.
  - **Objective 1.3:** Protect and enhance natural resources by adopting and implementing sustainable flood management policies, debris management programs, snow removal, tree trimming and replacement, or energy conservation programs.
  - **Objective 1.4:** Identify and expand emergency services protocols for people who are at high risk from hazard events, such as the homeless, elderly, disabled, and oxygen-dependent people.
  - **Objective 1.5:** Identify and provide for necessary construction, renovation, retrofitting or refurbishment to protect vulnerable structures and cultural resources from the effects of natural hazards.

- **Goal 2: Increase awareness of natural hazards and their mitigation.**
  - **Objective 2.1:** Continue to develop and expand public awareness and information programs.
  - **Objective 2.2:** Expand public awareness of flood and flash flood hazards in general and at specific high risk locations.
  - **Objective 2.3:** Expand public awareness of wildfire hazards and measures by which people can protect themselves, their property and their community.

- **Goal 3: Coordinate and integrate hazard mitigation activities.**
  - **Objective 3.1:** Strengthen connections between hazard mitigation activities; and preparedness, response and recovery activities.
  - **Objective 3.2:** Identify systems, and areas of improvement needed, to implement emergency operations plans and services, including Community Emergency Response Team training.
  - **Objective 3.3:** Identify existing local government monitoring and decision-making tools; identify gaps and needed improvements.
  - **Objective 3.4:** Reduce services interruptions and revenue losses to the local community and the region from natural hazards, including traffic interruptions.
  - **Objective 3.5:** Coordinate and share knowledge with local watershed and forest partners to develop large-scale, comprehensive projects, as well as educate the public.

5.2 Progress on Previous Mitigation Actions

A review of 2016 mitigation actions progress reports indicates that Gilpin County and the participating jurisdictions have been successful in implementing actions identified in the 2016 HMP Mitigation Strategy, thus, working diligently towards meeting the 2016 plan goals. Table 5-1 indicates the details for each 2016 mitigation action items that have been completed.

The 2016 mitigation strategy contained 29 separate mitigation actions. As of March 2022, five of these actions have been completed. An additional four actions were deleted as no longer relevant. The remaining 20 actions are continuing into 2023: seven are currently in process, seven are ongoing on an annual basis, and six have not yet been started due to a variety of reasons such as changes in priorities or lack of funding. Many of the ongoing 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 into the future. The following table lists the 2016 actions completed and deleted.

Table 5-1 Completed and Deleted Actions

ID	Hazard(s)	Mitigation Action	Action Status Notes
GC-1	All Hazards	**Emergency Preparedness Guide.** Develop an Emergency Preparedness Guide for community residences on how to prepare for natural disasters and for homeowners to mitigate homes from natural disasters. The guide will need to be printed for distribution at public meetings.	Completed. This project has been completed and printed professionally. This has been distributed to local residents at large community events and through mailers.
GC-5	All Hazards	**Early Warning and Notification.** Develop protocol that will alert residents and visitors to the County by various forms of communications, all social media (Facebook, Twitter, and website). Develop a campaign to get more Gilpin County residents to sign up for *Hyper Reach*	Completed. Using the County Fair as a booster for registration, OEM has made an effort to accomplish this. Draft Alert and Warning Plan to be developed by Dec. 2021 for Emergency Operations Plan (EOP).
GC-9	Erosion, Flood, Lightning, Severe Wind, Wildfire, Winter Storm	**Implement Integrated Public Alert & Warning System (IPAWS).** Plan and implement technology improvements to allow for FEMA's IPAWS system. IPAWS advanced remote warning system targets all people in the immediate area who have the technology (cellular) to get the warnings.	Completed.
GC-10	All Hazards	**Create Multi-Agency Coordination (MAC) Group.** Develop a county wide MAC as part of the Emergency Services Council to work collaboratively prioritizing goals, plans, projects, equipment, training, etc. that will enhance EM for government agencies, special districts, businesses and for the citizens	Completed.
C 3*	Dam Failure, Erosion, Flood,	**Construct New On/Off Ramps onto Central City Parkway for Evacuations.** Work on voter approval for a Capital	Completed

ID	Hazard(s)	Mitigation Action	Action Status Notes
	Landslide, Subsidence, Wildfire, Winter Storm	Improvements mill levy. Construct new on/off ramps onto the Central City Parkway for an enhanced option for evacuation efforts**.**	
B 2	Dam Failure	**Chase Gulch Dam Monitoring Plan.** Develop monitoring plan for early notification of dam failure.	Deleted
B 5	Severe Wind, Winter Storm	**Historical Structural Evaluation and Resolution**. Review Historical Grant paperwork to determine which, if not all, residences have undergone preservation actions ensuring renovation codes were met for wind impact and snow load impact standards. Severe wind and snow load potential will be considered as part of grant review for future grant allocations.	Deleted
B 7*	Erosion, Subsidence	**Map Underground Mines**. Develop up to date map of existing mining areas to determine impact on transportation avenues and structures. Community has multiple inactive mines and mining areas. Community has only three roads leading in or out and within the last four years, one was blocked for >7 days due to a under road mine collapse. This was primary mutual aid route for public safety from and to nearest neighbor.	Deleted
B 8	Erosion, Subsidence	**Identify Road Mitigation Projects**. Identify responsible party (owner) of the inactive mines. Develop plan of action to mitigate road collapses from mining areas.	Deleted

5.2.1 Continued Compliance with the National Flood Insurance Program

The 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 FIS. The study 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 100- and 500-year floodplains are shown on FIRM, 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.

Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

As referenced in Table 4-30, Gilpin County, and the Cities of Black Hawk and Central City joined the NFIP in 1986, 1984, and 2010 respectively. Structures permitted or built in the County before the jurisdictions joined the NFIP are called pre-FIRM structures, and structures built afterwards are called post-FIRM. Post-FIRM structures built in compliance with the floodplain regulations are mitigated to withstand floods up through the 100-year event. The insurance rate is different for the two types of structures, as pre-FIRM are at higher risk of flooding. The effective date for the current countywide FIRM is October 16, 1984. The FIRMs are currently being updated and the preliminary maps presented to the County and jurisdictions are currently pending; the pending maps are expected to be effective in April 2023.

The County and participating communities are currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff. Maintaining compliance with the NFIP is an important component of flood mitigation and risk reduction.

Given the flood hazard and risk in the planning area and recognizing the importance of the NFIP in mitigating flood losses, an emphasis is placed on continued compliance with the NFIP by Gilpin County and the NFIP participating jurisdictions of Black Hawk and Central City. As NFIP participants, these communities 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 zoning ordinance.

5.3 Identification and Analysis of Mitigation Actions

To identify and select mitigation measures to support the mitigation goals, each hazard identified in Chapter 4: Risk Assessment was evaluated. The HMPC analyzed a comprehensive set of viable mitigation alternatives for both new and existing buildings and infrastructure 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 CRS program:

- **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 the mitigation strategy meeting. Another reference handout document titled "Mitigation Ideas" developed by FEMA was distributed to the HMPC via an online link. 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 in the meeting include the four 'A's' of mitigation:

- **Alter** the physical nature of the hazard. wildfire defensible space and fuels treatments, snow fences etc.
- **Avert** the hazard away from people, buildings, and infrastructure: engineered solutions, drainage, and channel improvements, floodproofing, fuel breaks.
- **Adapt** to the hazard: 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 F. 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 the existing actions in the 2016 plan and analyze the other possible mitigation alternatives. With an understanding of the alternatives, a brainstorming session was conducted to generate a list of preferred mitigation actions. The result was new and updated project ideas with the intent of meeting the identified goals and mitigating identified hazards.

5.3.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria STAPLEE, sustainable disaster recovery criteria, and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- **S**ocial: Does the measure treat people fairly?
- **T**echnical: Will it work? (Does it solve the problem? Is it feasible?)
- **A**dministrative: Is there capacity to implement and manage the project?
- **P**olitical: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support the project?
- **L**egal: Does your organization have the authority to implement? Is it legal? Are there liability implications?
- **E**conomic: 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?
- **E**nvironmental: 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 STAPLEE). 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 meeting, the HMPC reviewed and discussed the 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 2016 HMP that are continuing in the updated plan were revisited during a HMPC meeting. New actions identified for 2023 also were prioritized based on discussions and review with the STAPLEE considerations in mind.

5.4 Mitigation Action Plan

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.

The total number of actions identified by each jurisdiction is summarized in Table 5-2, including those actions completed, deleted, or continued from the 2016 HMP.

Table 5-2 Mitigation Actions Summary by Jurisdiction

Jurisdiction	# of Actions in 2016 HMP	# of Actions Completed	# of Actions Deleted	# of Actions Continued	New Actions Added	# of Actions in 2023 HMP
Gilpin County	10	4	0	6	16	22
Black Hawk	9	0	4	5	5	10
Central City	10	1	0	9	7	16
Timberline Fire	NA	NA	NA	NA	7	7
TOTAL	**29**	**5**	**4**	**20**	**35**	**55**

The results of the project identification and prioritization exercise for each participating jurisdiction are summarized in Table 5-3 through Table 5-5. These projects detail specific actions for reducing future hazard-related losses within Gilpin County. The projects are organized by jurisdictions and include notes about the department and partners necessary to implement the project, estimated cost, potential funding sources, timeline, which goal(s) that the projects support, and their relative level of priority high, medium, and low. The tables also provide status/implementation notes that describe progress made on the actions so far, using the following categories, and, where applicable, notes if there were changes in the priority level from the previous plan:

- **Not Started:** Work has not begun.
- **In Progress:** Work has begun but not completed.
- **Annual Implementation:** Ongoing with no specific end date.
- **Completed:** The action has been finished.
- **Deleted:** The action is no longer relevant due to changing priorities, lack of funds, etc.

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 an asterisk '*' in the action identification number. 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. Actions that protect critical infrastructure note which lifeline category is protected using the following abbreviations:

- COM: Communications.
- ENG: Energy.
- FWS: Food, Water, Shelter.
- HAZ: Hazardous Waste.
- H&M: Health & Medical.
- S&S: Safety & Security.
- TRN: Transportation.
- NA: Not Applicable.

Table 5-3 2023 Gilpin County Mitigation Action Plan

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Funding	Priority	Timeline	Status & Implementation Notes
G 1*	**Community outreach program.** Develop a comprehensive training program to educate community members on how to prepare for a natural disaster and for homeowners to mitigate their homes from natural hazards.	Avalanche, Dam Failure, Drought, Earthquake, Erosion, Expansive Soils, Extreme Heat, Flood, Hail, Landslide, Lightning, Severe Wind, Subsidence, Tornado, Wildfire, Winter Storm, Active Threat, Cyber Attack, Pandemic	Goals 1,2,3. Lifelines NA	OEM	< $10,000; County Budget, EMPG, HMA Grants, or a private partner	High	2023-2024	**In Progress.** Gilpin OEM has been working with volunteer teams in Gilpin County to build the initial phases of a Community Emergency Response Team (CERT) program.
G 2	**Lightning awareness program.** Develop a comprehensive education program to assist community members and visitors on the hazards of potential severe lightning and thunderstorms. Develop an informational pamphlet to be disseminated to campgrounds, at State Park visitors' centers, and at trail heads.	Lightning	Goals 1,2. Lifelines NA	OEM	< $10,000; County Budget, EMPG, HMA Grants, or a private partner	Low	2024-2027	**Not Started.**
G 3*	**Firewise community outreach program.** Develop a comprehensive education program to assist community members on the importance of fire mitigation on their own properties. Work in partnership with insurance companies and local fire departments to provide the cost benefit to home owners.	Wildfire	Goals 1,2,3. Lifelines NA	OEM, Timberline Fire, CSU Extension	< $10,000; County Budget, EMPG, HMA Grants, or a private partner	Medium	2023-2028	**In progress.** OEM works with both CSU extension and the fire departments to implement the best practices for wildfire protection methods - still underway.

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Funding	Priority	Timeline	Status & Implementation Notes
G 4*	**Encourage defensible space on private property.** Gilpin County will develop an education program and pamphlet on the benefit of developing defensible space on property. Public education is an important process in reducing the potential loss of life and property with a successful wildfire mitigation program. Gilpin County will attempt to secure grant money and partners to assist residents with the financial cost associated with wildfire mitigation.	Erosion, Flood, Landslide, Severe Wind, Wildfire, Winter Storm	Goals 1,2. Lifelines NA	OEM, Timberline Fire	< $10,000; County Budget, EMPG, Forest Service grants, and or private partners	Medium	2023-2028	**Not Started.** In progress with CSU extension and educating communities at local events, i.e. County fair and Home Owners Association (HOA) meetings.
G 5*	**Improve access and egress points in at risk subdivisions.** Work with Gilpin County HOAs and subdivisions on improving their access and egress points. Some of these projects would require easements and permission from landowners	Avalanche, Flood, HAZMAT, Landslide, Wildfire, Winter Storm, Active Threat	Goals 1,2,3. Lifelines TRN	OEM, Timberline Fire	$10,000 to $100,000; grants and or private partners	High	2023-2032	**In Process.** Some improvements have been made, but a lot more work is needed.
G 6	**Develop sheltering capabilities.** Identify County staff who would not have essential duties during an emergency to be trained in shelter operations. Work collaboratively with the Red Cross and other organizations such as faith based to identify more shelter options both physically and for staffing. Identify prominent shelter locations and pursue grants to equip those facilities with shelters and other necessities such as heating and power.	Dam Failure, Earthquake, Flood, Hail, Landslide, Tornado, Wildfire, Winter Storm, Active Threat	Goals 1,2. Lifelines FWS	OEM; Red Cross	$10,000 to $100,000; grants and or private partners	Low	2027-2032	**In Process.** Gilpin OEM has received numerous grants and support from the Red Cross to increase sheltering capability in the County. OEM now has a trailer to house supplies and has two Red Cross approved sheltering sites.
G 7*	**Single lane road improvement.** Work to improve single lane roads to create safer two lane roads. In addition to providing safer travel for the motoring public and	Flood, HAZMAT, Landslide, Wildfire, Winter Storm	Goals 1,2,3. Lifelines TRN	United Power; Timberline Fire, Subdivisions,	TBD	High	2023-2026	**New in 2023.**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Funding	Priority	Timeline	Status & Implementation Notes
	enhancing evacuation capabilities, the two lane roads become wider fire breaks.			OEM, Public Works				
G 8*	**Clear vegetation & fuels to reduce wildfire risk.** Help communities/ subdivisions reduce fuels such as slash, dead or dying trees. Remove trees near or under powerlines by clear cutting vegetation. Create defensible space around infrastructure. By clear cutting trees near powerlines, it will reduce the risk of wildfire and reduce power outages.	Wildfire	Goals 1,2,3. Lifelines COM, ENG, TRN	United Power; Timberline Fire, Subdivisions, OEM, Public Works	TBD	High	2023-2026	**New in 2023.**
G 9*	**Weed mitigation.** Noxious weeds threaten native wildlife habitats and ecosystems, as well as providing additional wildfire fuels. Controlling their spread is costly and takes manpower and specialized knowledge. Gilpin has a weed management plan and is required to manage List A, B, C weeds. Partner with cities and Colorado State Forest Service (CSFS) to weed, map, and hire contractors to spray weeds and identify future projects.	Wildfire	Goals 1,2,3. Lifelines FWS, TRN	State Forest Service, Gilpin County, Black Hawk, Central City	$75,000. Colorado Dept. of Agriculture grants, possible FEMA grants	Medium	2025-2027	**New in 2023.**
G 10*	**Evacuation route planning.** Identify evacuation routes for relevant hazards, determine which roads will be blocked and which will be designated as evacuation and response ingress routes.	Avalanche, Flood, HAZMAT, Landslide, Wildfire, Winter Storm, Active Threat	Goals 1,2,3. Lifelines TRN	GCSO, CSP, BHPD, BHED, CCFD, BHFD, CCFD, BHPW, CCPW, GCPW, CPAW, CDOT	Staff Time	Low	2025-2027	**New in 2023.**
G 11*	**Maryland Mountain Quartz Valley Open Space (MMQVOS) Park fuels reduction.** Identify and map areas for fuels reduction in MMQVOS, focusing on areas adjacent to residential and commercial improvements.	Wildfire	Goals 1,2,3. Lifelines NA	Timberline Fire, Public Works	<$10,000. General Fund / Dept Budget	Low	2025-2027	**New in 2023.**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Funding	Priority	Timeline	Status & Implementation Notes
G 12	**Maryland Mountain fuels reduction.** Reduce wildfire fuels adjacent to residential and commercial improvements. Improve forest health to reduce risk of fire and infestation.	Wildfire	Goals 1,2,3.	Timberline Fire, Public Works	>$100,000.00. General Fund / Dept - Budget/ Grants	High	2023 - 2024	**New in 2023.**
G 13	**Wildfire mitigation crew.** Develop a sustainable wildfire mitigation crew that operates in Gilpin County during the summer months for fuels reduction. This will be a joint implementation strategy between the local fire departments and OEM.	Wildfire	Goals 1,2. Lifelines COM, S&S	Gilpin OEM; Timberline Fire	$100,000 - $1,000,000. FEMA HMA Grants	High	2023	**New in 2023.**
G 14	**Redundant power for Gilpin County Justice Center.** The Gilpin County Justice Center houses the County jail, Sheriff's Office and the Gilpin County emergency operations center. Currently half of the building is powered by an external generator. The goal of this project is to build a permanent generator or upgrade the current one to support the entire facility during a power outage.	Flood, Lightning, Severe Wind, Wildfire, Winter Storm, Cyber Attack	Goals 1,2. Lifelines ENG, COM, S&S	Gilpin OEM; Gilpin County Sheriff, Gilpin County	$10,000 - $100,000. FEMA HMA Grants	High	2023-2025	**New in 2023.**
G 15	**Tolland Road Bridge Repair/ Replacement.** This bridge over South Boulder Creek is scour critical and has been evaluated as being in only Fair condition. The bridge is of steel material and stringer/multi-beam design type and is owned and maintained by the County. This project will conduct an assessment of the bridge to determine if it is more cost-effective to conduct repairs on the existing bridge or repair it, and then take action accordingly.	Erosion, Flood, Severe Wind	Goals 1,3. Lifelines TRN	Public Works;	TBD but probably more than $1,000,000. CIP funds, FEMA HMA Grants	Medium	2023-2025	**New in 2023.**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Funding	Priority	Timeline	Status & Implementation Notes
G 16	**Abandoned mine prioritization and reclamation.** Identify, prioritize, and reclaim mines in Gilpin County to ensure public safety, protect water quality, and reduce erosional and hazardous material risks.	Erosion, HAZMAT, Subsidence	Goals 1,3. Lifelines FWS, HAZ, S&S	Trout Unlimited; Division of Reclamation Mining and Safety, CDPHE, US EPA; Boulder Watershed Collective, Clear Creek Watershed and Forest Health Partnership, Upper Clear Creek Watershed Association, Colorado School of Mines	$100,000 - $1,000,000. State Grants	High	Identification & prioritization 2022-2023; reclamation on prioritized sites 2023-2026.	**New in 2023.**
G 17	**Cyber security infrastructure development.** Gilpin County currently has been identified as a community that could be targeted for a cyber attack, due to our inefficient security systems and lack of safety net systems a development and implementation of a full cyber security system is needed.	Cyber Attack;	Goals 1,2,3. Lifelines COM	Gilpin OEM; Teryx	$10,000 - $100,000. Capital improvement budget	High	2023	**New in 2023.**
G 18	**Update the County Community Wildfire Protection Plan (CWPP).** The current CWPP was approved in 2012. An updated plan has been identified as necessary to identify and prioritize new wildfire mitigation projects and to ensure the county's wildfire risk is minimized.	Wildfire	Goal 1. Lifelines S&S	Gilpin County OEM, CSFS	< $10,000; General Fund	Medium	Short Term	**New in 2023.**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Funding	Priority	Timeline	Status & Implementation Notes
G 19*	**Undergrounding utility lines.** Beginning a countywide imitative to underground all above ground utility lines would greatly reduce the county's vulnerability to a number of hazards, as well as potentially prevent numerous cascading hazards.	Wildfire, severe wind, winter storm, earthquake	Goal 1, 3. Lifelines S&S, ENG, COM	Gilpin County OEM, CSFS, United Power, Xcel Energy	More than $1,000,000. FEMA HMA Grants	Medium	Long Term	**New in 2023.**
G 20	**Implementing an informal push notification system for non-emergency situations.** Creating a voluntary app or other platform for residents to sign up to receive notifications and information regarding non-emergency situations, such as road closures/reopening's, heavy traffic, wildlife collisions, etc.	All hazards	Goal 1, 2, 3 Lifelines S&S, COM, TRN	Gilpin County OEM	$10,000 - $100,000. General Funds	Low	Short Term	**New in 2023.**
G 21	**Create and implement an all-hazards education outreach campaign.** Involve citizens in a program to educate about the hazards that are present in Gilpin County and what steps can be taken by citizens to reduce or mitigate their individual risk.	All hazards	Goal 2, 3 Lifelines S&S, COM	Gilpin County OEM	$10,000 - $100,000. General Funds	Medium	Short Term	**New in 2023.**
G 22	**Water Conservation Community Development Program:** Gilpin County and Central City will develop a joint community development program that would help ensure water saving measures that would be implemented in both zoning and building programmatic areas. This would include regulations or architectural design ideas that would incorporate zero scaping into suggested planning and future developmental areas for the county and city.	Drought	1, 2, 3; FWS	Gilpin County OEM, Central City Water Department	Staff Time; Department Budgets	Medium	2023-2025	**New in 2023**

Table 5-4 2023 City of Black Hawk Mitigation Action Plan

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
B 1*	**Early Warning and Notification.** Encourage local residents and businesses to register for Code Red Emergency Notification System. Ensure or develop internal business notification plans to achieve early notification of potential hazard with appropriate action plan.	Avalanche, Dam Failure, Drought, Earthquake, Erosion, Expansive Soils, Extreme Heat, Flood, Hail, Landslide, Lightning, Severe Wind, Subsidence, Wildfire, Winter Storm	Goals 1, 2.	Emergency Management	< $10,000; General Fund	High	Short Term	**In Progress**
B 2	**Flash Flood Warning Signage.** Evaluate potential danger areas for high water along pedestrian walkways. Place Flash Flood Warning signage for pedestrians near walkways.	Flood	Goals 1, 2.	Emergency Management, Public Works	< $10,000; General Fund, Grants	Medium	Short Term	**Not Started.**
B 3*	**Identify Flood Management Projects.** Evaluate potential danger areas for high water along pedestrian walkways and identify flood management projects and pedestrian prevention devices (gates) to prevent passage.	Flood	Goals 1.	Emergency Management, Public Works	$10,000 to $100,000; General Fund, Grants	Medium	Long Term	**Not Started.**
B 4	**Develop and Implement Sheltering Plan.** Coordinate meeting with American Red Cross and Business Improvement District to provide sheltering arrangements for visitors including special need and high risk adults, who do not have the fiscal ability to get a hotel room or when visitors exceed available rooms during hazard events.	Dam Failure, Flood, Hail, Landslide, Lightning, Severe Wind, Wildfire, Winter Storm	Goals 1, 2.	Emergency Management	< $10,000; General Fund	Medium	Short Term	**Not Started.**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
B 5	**Ready, Set, Go Program Implementation.** Evaluate community based upon Ready Set Go criteria; Hold community meetings with Colorado Division of Fire Prevention & Control (CDFPC) Wildland Fire Management Office (FMO); Provide Defensible Space evaluations to residents; Apply for funding to remove fuels in identified high priority areas. Arrange community preparedness day for mitigation projects and debris removal.	Severe Wind, Wildfire, Winter Storm	Goals 1, 2, 3.	Emergency Management, Fire Department	$10,000 to $100,000; General Fund, Mitigation Grants, State and Federal fire mitigation grants	Medium	Long Term	**In Progress**
B 6	**Community Wildfire Protection Plan.** Develop a CWPP to determine risks associated with wildfire to the City. Use CWPP to develop wildfire mitigation strategies.	Wildfire, Landslide	Goal: 1 Lifelines S&S	Emergency Management, Fire Department	$25,000 to $75,000; General Fund, Grants	High	Short Term	**New in 2023**
B 7*	**Wildfire Fuels Reduction-Maryland Mountain.** Develop and implement wildfire fuels treatment strategies for areas adjacent to high-use areas, high-value improvements, and historic structures in the Maryland Mountain Open Space Park.	Wildfire, Landslide	Goal 1, 3 Lifelines S&S, FWS, ENG	Emergency Management, Fire Department	$10,000 to $100,000; General Fund, FEMA Grant funding	High	Long Term	**New in 2023**
B 8	**Work with OEM on an all-hazards education outreach campaign.** Involve citizens in a program to educate about the hazards that are present in Gilpin County and what steps can be taken by citizens to reduce or mitigate their individual risk.	All hazards	Goal 2, 3 Lifelines S&S, COM	Gilpin County OEM	$10,000 - $100,000. General Funds	Medium	Short Term	**New in 2023**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
B 9	**Critical Infrastructure Wildfire Protection.** Develop and implement wildfire fuels treatment strategies for areas adjacent to critical city infrastructure such as domestic water pump stations and other improvements.	Wildfire, Landslide	Goal 1, 3 Lifelines S&S, FWS, ENG	Emergency Management, Fire Department	$10,000 to $100,000; General Fund, FEMA Grant funding	High	Long Term	**New in 2023**
B 10	**Maryland Mountain fuels reduction.** Reduce wildfire fuels adjacent to residential and commercial improvements. Improve forest health to reduce risk of fire and infestation.	Wildfire	Goals 1,2,3.	Fire Department, County Public Works	>$100,000.00. General Fund / Dept - Budget/ Grants	High	2023 - 2024	**New in 2023**

Table 5-5 2023 City of Central City Mitigation Action Plan

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
C 1*	**Build a Hardened Fire Station/Emergency Services Facility.** Go before the voters to ask for a mill levy increase for capital improvements; grants; local and private partnership to build a new hardened facility that can house modern fire apparatus, fire personnel housing, community education trainings, and an emergency operation center.	Avalanche, Dam Failure, Drought, Earthquake, Erosion, Expansive Soils, Extreme Heat, Flood, Hail, Landslide, Lightning, Severe Wind, Subsidence, Tornado, Wildfire, Winter Storm	Goal: 1,3.	Fire Department, Emergency Management, Community Planning and Development	>$100,000; Mill Levy Increase; Grants; Local and Private Partnerships	High	Long Term	**Not Started**
C 2	**Wildland Fire Awareness Program.** Central City is a small mountainous community that is in a wildland urban interface. Educate residences through social media (website, Facebook, etc.). Distribute wildland fire mitigation pamphlets, through the building permit process.	Wildfire	Goal: 1,2.	Emergency Management, Fire Department, Community Planning and Development	< $10,000; General Fund, Mitigation Grants	Medium	Ongoing	**In Progress**
C 3	**Snow Load Structural Evaluation.** Review past and present building permit applications, to determine if the structures meet current building codes. Structures not meeting current snow load requirements will be considered for grant for future grant allocations. Educate residences of snow load requirements and grant funding process.	Winter Storm	Goal: 1,2.	Community Development	< $10,000; General Fund, Historical Grants	High	Ongoing	**Annual Implementation**
C 4	**Encourage Tree Pruning.** Work with utility companies and property owners to ensure tree pruning is done around overhead utilities. Educate the public on power line safety.	Severe Wind, Wildfire, Winter Storm	Goal: 1,2,3.	Emergency Management, Community Planning and Development	< $10,000; General Fund	Medium	Ongoing	**Annual Implementation**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
C 5*	**Map Underground Mining Areas.** Central City is on the map because of its mining heritage and because of that it has multiple inactive mines including stopes, tunnels, inclines and mining areas consisting of mine tailings. Many of these mines are located or travel under some of our surface roadways. Central City has three main line travel roads leading in or out of our city but our residential streets are also faced with the possibility of collapse. Develop up to date map of existing mining areas to determine impact on transportation roadways and residential and commercial structures.	Erosion, Subsidence	Goal: 1,3.	Emergency Management, Public Works	< $10,000; Capital Funds, Grants and State Mine - Land Bureau	Medium	Long Term	**Annual Implementation**
C 6*	**Identify Transportation and Commercial Structures Mitigation Projects.** Determine the potential impact of any mines on these areas and identify responsible party (owner). Develop plan of action to mitigate potential future impacts within these areas.	Erosion, Subsidence	Goal: 1,3.	Emergency Management, Public Works, Community Development	$10,000 to $100,000; Capital Funds, Grants and State Mine - Land Bureau	Medium	Long Term	**Annual Implementation**
C 7*	**Landslide, Rock fall, Mud and Debris flow Mitigation Plan.** Develop a plan to inspect roadway embankments and slopes to determine the potential impacts before a major issue occurs.	Landslide	Goal: 1,3.	Public Works	$10,000 to $100,000; General Fund, Grants	Medium	Long Term	**Annual Implementation**
C 8	**Develop and Implement Sheltering Plan.** Coordinate meeting with American Red Cross and Short term Business District (Hotels, B&B's etc.) to provide sheltering arrangements for visitors including special needs and high risk adults, who do not have the physical or fiscal ability to get a hotel room or when visitors exceed available rooms.	Dam Failure, Earthquake, Flood, Hail, Landslide, Severe Wind, Tornado, Wildfire, Winter Storm	Goal: 1,2.	Fire Department	< $10,000; General Fund	Medium	Short Term	**Annual Implementation**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
C 9*	**Maintain Storm Drains.** Maintain storm drain conditions that are free of debris so that water will not rise over desired levels and cause damage.	Erosion, Flood, Landslide	Goal: 1,3.	Public Works, Water Department	< $10,000; General Fund	Medium	Long Term	**Annual Implementation**
C 10	**Work with County OEM to update CWPP.** The current County CWPP was approved in 2012. An updated plan has been identified as necessary to identify and prioritize new wildfire mitigation projects and to ensure the county's wildfire risk is minimized. This would greatly benefit the City of Central City.	Wildfire	Goal: 1 Lifelines S&S	Gilpin County OEM	< $10,000; General Fund	Medium	Short Term	**New in 2023**
C 11*	**Implement wildfire fuels management program.** Identify areas where fuels management such as tree thinning, grasslands management, removal of roadside fuels, and trimming beneath utility lines should be pursued. Implement a program for the management of these potentially hazardous fuels.	Wildfire	Goal 1, 3 Lifelines S&S, H&M, HAZ, ENG	Emergency Management, Public Works	< $10,000; General Fund, FEMA Grant funding	Medium	Short Term	**New in 2023**
C 12*	**New water mains for Central City.** Currently the city of Central City often experiences pipes bursting and subsequent flooding and property damage during extreme cold. Replacing aging water infrastructure would help prevent this issue and protect future property losses.	Winter Storm	Goal 1, 3 Lifelines S&S, H&M, TRN	Emergency Management, Public Works	More than $1,000,000. FEMA HMA Grants. Capital Improvements funding	Medium	Long Term	**New in 2023**
C 13	**Curb and gutter improvements throughout Central City.** Identify areas throughout Central City where updated or new curb and gutter infrastructure should be installed to improve stormwater drainage, snowmelt runoff, and reduce erosion.	Flooding, Erosion and Deposition	Goal: 1 Lifelines TRN	Public Works	More than $1,000,000. FEMA HMA Grants. Capital Improvements funding	Low	Long Term	**New in 2023**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
C 14	**Install snow fences along major transportation routes, such as Central City Parkway.** With the high severity of windstorms and winter weather in the county, installing snow fences along major roads to limit blowing and drifting snow over critical roadway segments.	Severe Wind, Winter Storm	Goal 1 Lifelines TRN, S&S	Public Works	< $10,000; General Fund	Low	Short Term	**New in 2023**
C 15	**Work with OEM on an all-hazards education outreach campaign.** Involve citizens in a program to educate about the hazards that are present in Gilpin County and what steps can be taken by citizens to reduce or mitigate their individual risk.	All hazards	Goal 2, 3 Lifelines S&S, COM	Gilpin County OEM	$10,000 - $100,000. General Funds	Medium	Short Term	**New in 2023**
C 16	**Water Conservation Community Development Program:** Gilpin County and Central City will develop a joint community development program that would help ensure water saving measures that would be implemented in both zoning and building programmatic areas. This would include regulations or architectural design ideas that would incorporate zero scaping into suggested planning and future developmental areas for the county and city.	Drought	1, 2, 3; FWS	Central City Water Department, Gilpin County OEM	Staff Time; Department Budgets	Medium	2023-2025	**New in 2023**

Table 5-6 2023 Timberline Fire Mitigation Action Plan

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
T 1	**Firewise community outreach program.** Develop a comprehensive education program to assist community members on the importance of fire mitigation on their own properties. Work in partnership with insurance companies and local fire departments to provide the cost benefit to homeowners.	Wildfire	Goals 1,2,3. Lifelines NA	OEM, Timberline Fire	< $10,000; County Budget, EMPG, HMA Grants, or a private partner	Medium	2023-2028	**New in 2023.** OEM works with both CSU extension and the fire departments to implement the best practices for wildfire protection methods.
T 2	**Encourage defensible space on private property.** Gilpin County will develop an education program and pamphlet on the benefit of developing defensible space on property. Public education is an important process in reducing the potential loss of life and property with a successful wildfire mitigation program. Gilpin County will attempt to secure grant money and partners to assist residents with the financial cost associated with wildfire mitigation.	Erosion, Flood, Landslide, Severe Wind, Wildfire, Winter Storm	Goals 1,2. Lifelines NA	OEM, Timberline Fire	< $10,000; County Budget, EMPG, Forest Service grants, and or private partners	Medium	2023-2028	**New in 2023**
T 3	**Improve access and egress points in at risk subdivision.** Work with Gilpin County HOAs and subdivisions on improving their access and egress points. Some of these projects would require easements and permission from landowners	Flood, HAZMAT, Landslide, Wildfire, Winter Storm, Active Threat	Goals 1,2,3. Lifelines TRN	OEM, Timberline Fire	$10,000 to $100,000; grants and or private partners	High	2023-2032	**New in 2023**
T 4	**Wildfire mitigation crew.** Develop a sustainable wildfire mitigation crew that operates in Gilpin County during the summer months for fuels reduction. This will be a join implementation strategy between the local fire departments and OEM.	Wildfire	Goals 1,2. Lifelines COM, S&S	Timberline Fire; Gilpin OEM	$100,000 - $1,000,000. FEMA HMA Grants	High	2023	**New in 2023**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
T 5	**Backup Power for Fire Stations.** Only four of Timberline's nine fire stations have back up power generators. Due to the remote location of the District and the delicate nature of the power grid, power outages are not uncommon. These can be caused by snow, wind, flood, fire, auto accidents, equipment failure, equipment maintenance, or even intentional system shut down during wildfire incidence. These power outages have a multitude of effects on District response both short and long term. These issues range from delayed response because of difficulty opening fire station doors, potential injuries caused by firefighters dressing in dark fire stations, lack of heat and frozen fire apparatus, and inability to access emergency water storage that needs to be pumped from underground tanks. Not only can these response issues have catastrophic results during power outages, but these strategically placed facilities also cannot be used to shelter stranded or displaced residents or travelers.	Dam/Levee Failure, Earthquake, Extreme Heat, Flood, Landslide, Lightning, Severe Wind, Tornado, Wildfire, Winter Storm, Active Threat, Cyber Attack	Goals 1. Lifelines FWS, S&S	Timberline Fire	$135,000; HMA grants, Assistance to Firefighters grant	Medium	2023-2024	**New in 2023**
T 6	**Improved water access in remote areas.** Obviously, water access is critical when responding to any type of fire. Timberline currently has access to reliable water sources in many parts of the District but there are several areas that need improvement. The current priorities are to replace the failed cistern in Rollinsville, additional water access behind Station 5 in mid-county, new cistern or dry hydrant near Station 8 in lower Golden Gate Canyon and water access in the Virginia Canyon and Bald Mountain Road areas.	Wildfire	Goals 1. Lifelines S&S	Timberline Fire	$110,000; HMA grants	Medium	2024-2026	**New in 2023**

ID	Title and Description	Hazards	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
T 7	**New Fire Station.** Timberline needs an additional fire station strategically placed to serve the Southwest portion of the County. This area was included via election into the District in 2017 and incudes Virginia Canyon, Nevadaville, Bald Mountain, and King Flats. Our response times are currently extended due to a lack of fire station in the area.	Avalanche, Dam/Levee Failure, Earthquake, Flood, Hail, Landslide, Lightning, Severe Wind, Tornado, Wildfire, Winter Storm, Active Threat, Cyber Attack, Pandemic	Goals 1. Lifelines S&S	Timberline Fire	$325,000; HMA grants, Assistance to Firefighters grant	Medium	2023-2028	**New in 2023**

6 Plan Implementation and Maintenance

DMA Requirement §201.6(c)(4)(ii):
[The plan shall include] a plan maintenance process that includes:
(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.
(ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.
(iii) Discussion on how the community will continue public participation in the plan maintenance process.

6.1 Plan Adoption & Implementation

The purpose of formally adopting this Plan is to secure buy-in from Gilpin County and the 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 HMP by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix E: Plan Adoptions and Approval.

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile projects, the HMPC will need to decide which action(s) to undertake first. Two factors will help with making that decision: 1) the priority assigned to the actions in the planning process; and 2) funding availability. Low or no-cost projects most easily demonstrate progress toward successful plan implementation.

Implementation will be accomplished by adhering to the schedules identified for each action (see Subsection 5.4) and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits of each project to the Gilpin 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.

Simultaneously to these efforts, the HMPC will constantly monitor funding opportunities that could be leveraged to implement some of the more costly actions. This will include creating and maintaining a bank of ideas on how to meet required local match or participation requirements. When funding does become available, the HMPC 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.

6.1.1 Implementation and Maintenance of the 2016 Plan

The maintenance and evaluation process described in the 2016 HMP was not followed due to conflicting priorities and events. Annual/interim mitigation team meetings were not conducted. However, the templates for annual status meetings/mitigation action status created in 2016 were useful during the 2023 Plan Update in gaining information on the status of actions. The implementation plan was updated in 2023 to clarify the need for annual/interim meetings and other maintenance activities.

6.1.2 Role of the Hazard Mitigation Committee in Implementation and Maintenance

With adoption of this plan Gilpin County, the Cities of Black Hawk and Central City, and the Timberline Fire Protection District will be tasked with plan implementation and maintenance. The participating jurisdictions, led by the Gilpin County Director of Emergency Management, agree 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 Board of County Commissioners, municipal councils, 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 jurisdictions' websites and in the local newspaper.

6.2 Plan Maintenance/Monitoring Strategy

The Gilpin County HMP is a living document that may be adjusted or updated as conditions change, actions progress, or new information becomes available. This section describes the method and schedule the participating jurisdictions will follow for monitoring, evaluating, and updating the Plan over the next five years. All participating jurisdictions will follow the process and schedule described below.

6.2.1 Monitoring

Monitoring refers to tracking the implementation of the plan over time. Gilpin County OEM will be responsible for reaching out to lead and supporting agencies identified in the mitigation actions table for status on those mitigation actions. OEM will coordinate with Planning Committee members at least annually to identify and track any significant changes in their agencies' mitigation efforts. This meeting will typically be combined with the Multi-Agency Coordinating Committee (MAC) when possible.

Gilpin County OEM will use the following process to track progress, note changes in vulnerabilities, and consider changes in priorities as a result of project implementation:

- A representative from the responsible entity identified in each mitigation action will be responsible for tracking and reporting to the HMPC when project status changes. The representative will provide input on whether the project as implemented meets the defined goals and objectives and is likely to be successful in reducing vulnerabilities.
- If the project does not meet identified goals and objectives, the HMPC may select alternative projects for implementation.
- Projects that were not ranked high priority but were identified as potential mitigation strategies will be reviewed periodically to determine feasibility of future implementation.

- New mitigation projects identified will require an individual assigned to be responsible for defining the project scope, implementing the project, and monitoring the success of the project.
- Mitigation activities not identified as actions in this plan will also be tracked to ensure a comprehensive hazard mitigation program, and to assist with future updates.

As part of this coordination, OEM and the HMPC will also monitor repetitive losses; evaluate changes in hazards, vulnerabilities, or the distribution of risk across the County; and seek to identify new and ongoing mitigation opportunities.

6.2.2 Evaluation

Evaluating refers to assessing the effectiveness of the plan at achieving its stated purpose and goals. Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan, such as:

- Decreased vulnerability because of implementing recommended actions;
- Increased vulnerability because of failed or ineffective mitigation actions; and/or
- Increased vulnerability because of new development (and/or annexation).

The HMPC will meet annually to evaluate the implementation of the plan and consider any changes in priorities that may be warranted. The annual evaluation will not only include an investigation of whether mitigation actions were completed, but also an assessment of how effective those actions were in mitigating losses. A review of the qualitative and quantitative benefits (or avoided losses) of mitigation activities will support this assessment. Results of the evaluation will then be compared to the goals established in the plan and decisions will be made regarding whether actions should be discontinued or modified in any way in light of new developments in the community. Progress will be documented by the HMPC for use in the next plan update. Finally, the Planning Team will monitor and incorporate elements of this Plan into other planning mechanisms, as detailed in Subsection 6.3.

Gilpin County OEM will coordinate with all participating jurisdictions to facilitate an effective maintenance and implementation process. Completed projects will be evaluated to determine how they have reduced vulnerability. 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.

Annual Progress Report

The minimum task of each planning partner will be the evaluation of the progress of its individual action plan during a 12-month performance period. Completion of the annual progress report is the responsibility of each planning partner, not solely the responsibility of Gilpin County OEM. The HMPC will review the annual progress reports in an effort to identify issues needing to be addressed by future plan updates. This review will include the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on the planning area.
- Review of mitigation success stories.
- Review of continuing public involvement.
- Brief discussion about why targeted strategies were not completed.
- Re-evaluation of the action plan to evaluate whether the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding).
- Recommendations for new projects.
- Changes in or potential for new funding options (grant opportunities).
- Impact of any other planning programs or initiatives that involve hazard mitigation.

The Planning Team has created a template to guide the planning partners in preparing a progress report (see Appendix G). The plan maintenance committee (HMPC) will provide feedback to the Planning Team on items included in the template. The Planning Team will then prepare a formal annual report on the progress of the plan. This report should be used as follows:

- Posted on the Gilpin County OEM website.
- Provided to the local media through a press release.
- Presented to planning partner governing bodies to inform them of the progress of initiatives implemented during the reporting period.

6.2.3 Updates

The Gilpin County HMP will be reviewed and revised at least once every five years in accordance with the DMA 2000 requirements and latest FEMA and DHSEM hazard mitigation planning guidance. Updates to this plan will consider:

- Has the nature or magnitude of hazards affecting the County and jurisdictions changed?
- Are there new hazards that have the potential to impact the County and jurisdictions?
- Have growth and development changed the County's or jurisdictions' vulnerabilities?
- Do the identified goals and actions still address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the plan?
- Should additional local resources be committed to address identified hazards?

The HMPC members and those entities identified in Appendix B, will be reconvened for this process by Gilpin County Emergency Management. The updated plan will document success stories where mitigation efforts have proven effective, as well as areas where mitigation actions were not effective, and will include re-adoption by all participating entities following DHSEM/FEMA approval.

6.3 Incorporation into Other Planning Mechanisms

The information on hazards, risk, vulnerability, and mitigation contained in this plan is based on the best science and technology available at the time this plan was prepared. The comprehensive plans, zoning and subdivision regulations, and ordinances of Gilpin County and the partner jurisdictions are considered to be integral parts of this Plan. The County and Cities, through adoption of comprehensive plans and zoning ordinances, can plan for the impact of natural hazards. The plan development process provided the County and the cities with the opportunity to review and expand on policies contained within these planning mechanisms. The plan update provides an opportunity to incorporate hazard information and mitigation principles and practices into other existing planning mechanisms.

6.3.1 Comprehensive Plans

Integrating hazard mitigation into the jurisdiction's comprehensive or general plan is considered a best practice by both FEMA and the American Planning Association. The Gilpin County Master Plan was originally written in 1992 and last updated in 2017; the County's Comprehensive Plan was last updated in 2020. While the documents both have brief mentions to hazard mitigation or some of the hazards analyzed in the HMP, neither have fully integrated the former HMP. Hazard mitigation is, however, more integrated into the Central City Comprehensive Plan.

The participating jurisdictions are committed to creating a linkage between the hazard mitigation plan and their individual comprehensive plans. Other planning processes and programs to be coordinated with the recommendations of the HMP include the following:

- Municipal codes.
- Community design guidelines.
- Water-efficient landscape design guidelines.
- Stormwater management programs.
- Water system vulnerability assessments.
- Community wildfire protection plans.

6.3.2 Threat and Hazard Identification and Risk Assessment (THIRA)

Gilpin County has completed a County level THIRA. CPG201 THIRA establishes Step 1 as "Identify the Threats and Hazards of Concern" and lists HIRAs and HMPs as possible sources of threat/hazard information.

The criteria for selecting which threats/hazards are "of concern" are defined as:

- **Factor #1:** Likelihood of a Threat or Hazard Affecting a Community.
- **Factor #2:** The Impacts of a Threat or Hazard.

Each natural and human-caused hazard profiled in the HIRA (Chapter 4) contains a section analyzing the probability of future events, which provides a data-driven answer to Factor #1. Similarly, the vulnerability assessment section of the hazard profiles address what impacts can realistically be expected from both routine and extreme events of each hazard, which specifically addresses Factor #2.

Step 2 of CPG 201 is to "Give the Threats and Hazards Context" by creating a scenario for each hazard of concern, with specifics like time of day, area, and magnitude of the event, which are then used to establish capability targets for each of the 32 core capabilities. All the hazards profiled in the HIRA contain detailed information to ensure the hazard scenarios are plausible. For some hazards, such as flooding, detailed GIS analysis has been done that can easily be incorporated as THIRA scenarios. Other hazards include details on the most extreme historical events on record that can quickly be updated to modern scenarios.

6.3.3 Response Plans

While the Gilpin County EOP is an all-hazards document, it also contains hazard-specific information and concerns. Hazard information from this HMP update should be incorporated into the next EOP update. At a minimum, all high significance hazards identified in this Plan should be addressed in future EOP updates.

Several other operational or functional response plans are also influenced by information contained in the HMP. These plans include but are not limited to:

- **Damage Assessment Plan**: A review of the vulnerability and estimated losses detailed in the hazard profiles can help identify what areas to initially prioritize following a hazard event. Similarly, a review of Subsection 4.2 Asset Summary can help identify what critical facilities need to be assessed following a hazard event.
- **Evacuation & Sheltering Plan**: A review of the vulnerability and estimated losses detailed in the hazard profiles can help identify what areas are more likely to need evacuation in different hazard scenarios. The Community Profile in Section 2.10 can help identify not only how many people would potentially be impacted by disasters, but how many are likely to need assistance with transportation, special medical or sheltering needs, etc. This review can also help evaluate the impacts of multiple or cascading hazards, so that evacuees are not relocated into an area that puts them at risk from other hazards.

6.3.4 Recovery Plan

If the County (OEM) develops a recovery plan, it should do so using the 2-year state Recovery Roadmap process. The risk and vulnerability data in the HMP will help inform the post-disaster recovery planning process, especially by ensuring that the recovery elements of those plans fully take into account the dangers posed by other hazards, rather than focusing exclusively on the most recent hazard event. The HMP in turn will be revisited during recovery to help identify opportunities to incorporate mitigation in the recovery and rebuilding process, including maximizing FEMA Public Assistance (PA) and HMGP funding where applicable.

The FEMA publication "Pre-Disaster Recovery Planning Guide for State Governments" notes:

> *"…much of the research involved in the development of mitigation plans can be used to inform the pre-disaster recovery planning effort.*
>
> *"The pre-disaster recovery planning process will benefit from and build upon hazard mitigation as:*
>
> - *The mitigation planning process identifies local hazards, risks, exposures, and vulnerabilities;*
> - *Implementation of mitigation policies and strategies will reduce the likelihood or degree of disaster-related damage, decreasing demand on resources post-disaster;*
> - *The process will identify potential solutions to future anticipated community problems; and*
> - *Mitigation activities will increase public awareness of the need for disaster preparedness."*
>
> *"Pre-disaster recovery planning efforts also increase resilience by:*
>
> - *Establishing partnerships, organizational structures, communication resources, and access to resources that promote a more rapid and inclusive recovery process;*
> - *Describing how hazard mitigation will underlie all considerations for reinvestment;*
> - *Laying out a process for implementation of activities that will increase resilience; and*
> - *Increasing awareness of resilience as an important consideration in all community activities."*

6.3.5 Continuity of Operations Plan (COOP)

All departments and agencies of the participating jurisdictions are required to maintain a COOP that details that agency's critical functions and how they will protect those functions in order to continue to provide essential services during a disaster or interruption. By defining and describing the hazards facing the County, including frequency and severity, the HIRA informs agency COOP plans by giving context to what types of disasters or interruptions are most likely to occur. Critical facilities and assets located in hazard areas in Chapter 4 should be prioritized for COOP planning. Hazards that can impact personnel or delivery of services, such as a pandemic, should also be a focus.

6.3.6 Training and Exercise Plan

Training on hazard mitigation principles and procedures should be included in the County's training and exercise planning. Any training and exercise needs identified in the Capabilities Assessment (Chapter 2) and Mitigation Strategy (Chapter 5) should also be included in the County's training and exercise planning.

6.3.7 Public Awareness and Education Programs

The County's ongoing public education and outreach efforts should reflect the hazards and vulnerabilities described in this Plan. In addition to preparing for disasters, public education should include ways in which the public can reduce their vulnerability to natural and human-caused hazards. Furthermore, mitigation activities and success stories should be communicated to the public to show the benefits of effective mitigation planning.

6.3.8 Critical Infrastructure Protection Plan

Critical facilities and assets identified in Subsection 4.2 should be included in a Critical Infrastructure Protection Planning (CIPP), with prioritization given to assets located in hazard-prone areas. Hazardous materials facilities in particular should be viewed both as critical assets in need of protection, and as potential hazards in their own right.

6.3.9 Capital Improvements Plan

High-cost mitigation actions listed in Chapter 5 or identified in the future may be added to the Capital Improvements Plan (CIP) to ensure that hazard mitigation projects continue to receive funding. The prioritization of actions listed in Table 5-3, while not binding on capital improvement planning, can be used to inform the prioritization of those actions. Even projects for which the County intends to seek grant funding may also need to be addressed in the CIP, given that most mitigation grants require significant local matching funds.

6.3.10 Sustainability Plans

Sustainability is a separate area of concern from hazard mitigation, but there are areas where the two fields overlap and influence one another positively or negatively.

Sustainability plans should be reviewed to identify where there may be synergy between sustainability and mitigation/resiliency. For example, sustainability efforts aimed at increasing the County's adaptability to climate change can also make the County more resilient to drought and severe weather. Increasing the percentage of food obtained locally could make the County more resilient to supply-chain interruptions or the impacts of disasters in other states. Adding more trees and grass to urban areas to reduce the heat island effect could help mitigate the impact of extreme weather events, as well as reducing flood risk by increasing the amount of permeable surfaces. This may help raise the priority of some sustainability efforts, as well as suggest complimentary mitigation efforts.

It is equally important to identify areas where sustainability efforts may work to reduce the County's resilience to hazards. For example, a sustainability goal of promoting use of public transit and reducing private car ownership could potentially make it harder to evacuate the public during a disaster if public transit is damaged and offline (as was observed during Hurricane Sandy). Similarly, reduced production of solid waste could lead to a reduction in the number of public resources such as dump trucks, which means that in a disaster those resources would not be available for debris removal and similar tasks. The intent of this review is not to say that sustainability goals should not be pursued, but rather to identify areas of concern that should be considered during implementation of these goals. For example, evacuation plans may need to be revised to reflect a larger percentage of families without cars; or contracts may need to be put in place to obtain additional dump trucks in a disaster.

6.4 Continuing Public Involvement

The public will continue to be apprised of the plan's progress through the Gilpin County OEM's website and by providing copies of annual progress reports to the media. Gilpin County OEM will maintain the HMP on the County's website. This site will not only house the final plan, but it will also become the one-stop shop for information regarding the plan, the partnership and plan implementation. The other participating jurisdictions will link to this page from their own websites. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance and input from the HMPC. This strategy will be based on the needs and capabilities of the planning partnership at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

The update process provides an opportunity to publicize success stories from the Plan implementation and seek additional public comment. When the HMPC reconvenes for the five-year plan 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, town halls and virtual public information sessions, surveys, web postings, and press releases to local media.

APPENDIX A: PLAN ADOPTION AND APPROVAL

PLAN ADOPTION AND APPROVAL

Note: The records of adoption will be incorporated as an electronic appendix. When the plan is adopted in 2023, the adoption date will be noted here, but a scanned version of the adoption resolution will be kept on file with Gilpin County Office Emergency Management. 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.

The Gilpin County Board of County Commissioners hereby adopts the 2022 Office of Emergency Management Hazard Mitigation Plan.

ADOPTED this 6th day of September, 2022, by a vote of 3 to 0.

ATTEST:

Sharon Cate

Sharon Cate, Deputy County Clerk

Sandy Hollingsworth

Sandy Hollingsworth, Chair
Board of County Commissioners

Exhibit 1: Adoption Resolution

(Name of Jurisdiction) City of Central

(Governing Body) City Council

(Address) 141 Nevada St

CITY OF CENTRAL, COLORADO
RESOLUTION NO. 22-49

WHEREAS, City of Central with the assistance from Gilpin County Office of Emergency Management, has gathered information and prepared the *Gilpin County Hazard Mitigation Plan;* and

WHEREAS, the *Gilpin County Hazard Mitigation Plan* has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and

WHEREAS, City of Central is a local unit of government that has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and

WHEREAS, City of Central has reviewed the Plan and affirms that the Plan will be updated no less than every five years;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF CENTRAL adopts the *Gilpin County Hazard Mitigation Plan* as this jurisdiction's Multi-Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

ADOPTED THIS 6TH DAY OF DECEMBER 2022.

CITY OF CENTRAL, COLORADO:

By:________________
Jeremy Fey, Mayor

ATTEST:

By: Reba Bechtel
Reba Bechtel, City Clerk

CITY OF BLACK HAWK ADOPTION RESOLUTION PENDING

TIMBERLINE FIRE PROTECTION DISTRICT
A RESOLUTION TO ADOPT THE
2022 GILPIN COUNTY HAZARD MITIGATION PLAN

WHEREAS, the Timberline Fire Protection District ("District") is a quasi-municipal corporation and political subdivision of the State of Colorado and a duly organized and existing special district pursuant to Title 32, Article 1, Colorado Revised Statutes; and

WHEREAS, the Board of Directors of the Timberline Fire Protection District have reviewed the 2022 Gilpin County Hazard Mitigation Plan which details the mitigation action items within the District that may be eligible for grant funding as set forth therein; and

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Timberline Fire Protection District that the Board, and other agents or employees of the District, namely the Fire Chief, are hereby authorized and directed to take all actions necessary or appropriate to effectuate the provisions of this Resolution, namely the submission and support of the 2022 Gilpin County Hazard Mitigation Plan by the Gilpin County Office of Emergency Management.

Adopted this 29th day of November, 2022.

TIMBERLINE FIRE PROTECTION DISTRICT

By: Richard M. Wenzel III

Richard M. Wenzel III, Chairman

Attest:

Jennifer Hinderman, Secretary

U.S. Department of Homeland Security
Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267

FEMA

R8-MT

March 15, 2023

Gilpin County Office of the County Commissioners
Post Office Box 366
203 Eureka Street
Central City, Colorado 80427

Dear Gilpin County Commissioners:

We are pleased to announce the approval of the Gilpin County Hazard Mitigation Plan as meeting the requirements of the Stafford Act and Title 44 Code of Federal Regulations 201.6 for a local hazard mitigation plan. The plan approval extends to Gilpin County, the City of Central City, and the Timberline Fire Protection District.

The jurisdictions are hereby eligible for FEMA Hazard Mitigation Assistance grant programs. All requests for funding will be evaluated individually according to the specific eligibility and other requirements of the particular programs under which the application is submitted. Approved mitigation plans may be eligible for points under the National Flood Insurance Program Community Rating System.

The plan is approved through March 14, 2028. A local jurisdiction must revise its plan and resubmit it for approval within five years to continue to be eligible for mitigation project grant funding. We have provided recommendations for the next plan update on the enclosed Plan Review Tool.

We wish to thank the jurisdictions for participating in the process and commend your continued commitment to mitigation planning. Please contact Mark Thompson, State Hazard Mitigation Officer, Colorado Division of Homeland Security and Emergency Management at markw.thompson@state.co.us or (720) 630-0770 with any questions on the plan approval or mitigation grant programs.

Sincerely,

Nicole M. Aimone
Acting Mitigation Division Director

Enclosure
cc: Mark Thompson, State Hazard Mitigation Officer, Colorado Division of Homeland Security and Emergency Management

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

<table>
<tr><td>Jurisdiction:
Weber Basin Water Conservancy District</td><td>Title of Plan:
Weber Basin Water Conservancy District Multi-Hazard Mitigation Plan</td><td>Date of Plan:
September 2022</td></tr>
<tr><td>Local Point of Contact:
Mr. Derek Johnson, PE</td><td colspan="2" rowspan="3">Address:
Weber Basin Water Conservancy District
2837 East Highway 193
Layton, Utah 84040</td></tr>
<tr><td>Title:
Engineering Manager</td></tr>
<tr><td>Agency:
Weber Basin Water Conservancy District</td></tr>
<tr><td>Phone Number:
(801) 771-1677</td><td colspan="2">E-Mail:
djohnson@weberbasin.com</td></tr>
</table>

State Reviewer:	**Title:**	**Date:**
Maranda Miller	Mitigation Planning Lead	10/18/2022

<table>
<tr><td>FEMA Reviewer:
Danielle Curtis, IR
Rob Pressly, QC
Rob Pressly, QC</td><td>Title:
CERC Community Planner
FEMA Community Planner
FEMA Community Planner</td><td>Date:
11/18/2022
11/30/2022
1/31/2023</td></tr>
<tr><td>Date Received in FEMA Region VIII</td><td colspan="2">10/18/2022</td></tr>
<tr><td>Plan Not Approved</td><td colspan="2">11/30/2022</td></tr>
<tr><td>Plan Approvable Pending Adoption</td><td colspan="2">1/31/2023</td></tr>
<tr><td>Plan Approved</td><td colspan="2">03/13/2023</td></tr>
</table>

SECTION 1:
REGULATION CHECKLIST

1. REGULATION CHECKLIST **Regulation** (44 CFR § 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Pages 5-7 and Appendix M	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Pages 5-7 and Appendix M	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Pages 6,7, and Appendix M	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	The entirety of Sections 2.0-5.0 (pages 8-91) Plus prior analyses in Appendices B,C,D,E,F,G,H,I,J,K,L; Also refer to additional text on page 6 and 7.	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Page 92	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Page 92	X	
ELEMENT A: REQUIRED REVISIONS			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Sections 2.0-4.0 Pages 8-68	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Pages 8-12	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Sections 3.0-4.0 Pages 26-68	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR § 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Pg 89 (There are no NIFP structures or repetitive flood losses)	X	
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Pages 1-4, 68	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Pg 88 (There are no NIFP structures)	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Section 5.0, pages 68-90, plus Appendices B-L	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Section 5.0, pages 68-90, plus Appendices B-L	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 5.0, pages 68-90, plus Appendices B-L	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 5.0, pages 68-90, (80,90) plus Appendices B-L	X	
ELEMENT C: REQUIRED REVISIONS			
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Page 2, Section 5.0, pages 68-88, Appendix G, and also prioritization changes in Section 2.0 pages 13-26	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Section 5.0, pages 68-90, and Appendix G	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 5.0, pages 68-90, plus Appendices B-L	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR § 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Page 5-6, 90	X	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Not a multi-jurisdictional plan.	N/A	
ELEMENT E: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Strengths
FEMA:

- Stakeholder meeting notes reflect comments worked into the plan update during the development phase. These comments come from a diverse group of stakeholders which is great since it includes a variety of different perspectives.
- Table 6.1 does a nice job outlining the process for maintaining and updating the plan, along with who will be responsible for each activity.

Opportunities for Improvement
FEMA:

- The appendices contain a lot of information about the public process – meetings, stakeholder invites, participants, etc. While this is great to include in detail in the appendix, please be sure to include information on the public process in more detail in the main text of the plan. It can be summarized, but it's important to make this information clear for readers rather than have them search through it in one of the many appendices.

- Public participation is a fundamental element of any planning process. Since the plan noted that no one from the public attended the September 13 meeting, for the next plan update consider expanding opportunities public participation through a wider range of methods. There are a variety of methods to solicit feedback, including a survey or questionnaire. The planning team could use the survey to explore questions related to perceived hazard risk, community assets, methods and techniques preferred for reducing risks, and types of mitigation actions seen as most effective or valuable.

- Appendix M provides a good list of who was invited to participate in the planning process for this update. For the next plan update, please be sure to include language about *how* they were invited (email, social media, advertising). There are screenshots of some social media posts and what appears to be an order for an announcement in the Standard-Examiner, but there's no narrative to support these. For the next plan update please include narrative on stakeholder outreach and engagement in the main document that clearly outlines the process rather than leaving it for interpretation.

- Section 1.2 does a nice job listing the existing plans, studies, reports and technical information used for updating this plan. For the next update, narrative will need to be added (beyond that they have geographic or functional relevance) that explicitly states *how* each of these resources were used (i.e., what kind of information was used) and where information from them may be found in the plan in order to meet the planning requirements. This can be quickly summarized in a table.

Element B: Hazard Identification and Risk Assessment

Strengths

FEMA:

- The plan gives a detailed assessment of key facilities and vulnerable assets for each noted hazard. The asset priority classification table was a great feature!

- The chart of past hazard occurrences describes damage in detail. It includes repair costs, time, and federal funding received.

- Table 2.2 gives a clear snapshot of the overall vulnerability of the WBWCD water system to each hazard.

Opportunities for Improvement

FEMA:

- Section 2.0 Hazard Identification notes that natural hazards that present potential risk to the WBWCD system were identified from FEMA's Local Mitigation Planning Handbook. For the next plan update, pulling hazards from the State's Hazard Mitigation Plan can give more localized insight into the hazards that may pose potential risk.

- Table 2.2 describes the location/area affected as negligible, limited, significant, or extensive. However, this section has no narrative or spatial information to show specific areas that are affected. The maps included in the appendices do help. Consider adding them near the part of the narrative that explains what is shown on the map. This would help to clarify the information presented. It would also help to more clearly describe any unique or varied vulnerabilities within the WBWCD system. In addition, for the hazards that do not have associated maps, please add a written narrative to describe the geographic extent.

- Climate change will alter the risk profile of communities the WBWCD serves, impacting the frequency and intensity of hazards that pose a risk. Future plan updates will need to include an analysis of how climate change will impact future hazard risks. This analysis will also help inform new mitigation strategies. Risk assessments could include consideration for how each hazard may disproportionately impact socially-vulnerable and underserved populations. This will be particularly important to include in the next plan update to meet the forthcoming requirements for the Local Mitigation Planning Policy.

- Information on the magnitude of each hazard was included in different locations throughout the plan. For some hazards like dam failure it was included in Section 3.0, for other hazards like drought it was referred to in an Appendix. Please also be sure to include this information in the main body of the plan. For drought, it is great that the plan references the WBWCD Drought Contingency Plan which includes a scale for measuring drought (page 35), but for the next plan this information will need to be included in the plan. Simply referencing another document and including it the appendix does not truly integrate that information into the plan, and additionally does not make it easy for a reader to access or understand the information.

- For the next plan update, please provide more detail on the scale used to measure extent. For example, the lighting hazard on page 27 references the Lightning Activity Level 4 and links out to the LAL, but does not provide the full scale (LAL 1-6) or the definition of these levels. Additionally, many of the hazards reference ASCE 7 – be sure to provide more information on specifically what criteria are used from ASCE 7. As that seems to refer to structures rather than the hazards (e.g., structural wind loads vs. wind speeds from a storm), consider using different scales for extent. For example, wind can be measured using the Beaufort Wind Scale, severe winter weather can be measures using the Regional Snowfall Index, or snowfall per duration.

Element C: Mitigation Strategy

Strengths

FEMA:

- Mitigation goals and actions directly relate to specific hazards and problems noted in the risk assessment.

- Most of the mitigation actions focus on projects to address current infrastructure. The mitigation action implementation plan has details on how to carry out the plan, the projected schedule and the cost.

- The district does not participate in NFIP. However, the effort to review all mitigation projects and evaluate their impact to any NFIP-identified regulatory floodplains is noteworthy. This shows that the district is dedicated to reducing flood hazard risk. It also shows that the district knows the benefits of regulating land use and development.

Opportunities for Improvement
FEMA:

- For the next plan update, consider adding a wider range of non-structural mitigation actions. These should include potential planning, nature-based actions, and outreach and education efforts.

- Section 5.0 describes the district's current authorities, policies, programs, and resources that could help to build hazard mitigation. The description gives a nice overview of district authorities and policies under Title 17B-1-103 (2). However, it does not fully capture the range of current resources available to build mitigation. It also does not explain how the district uses each to reduce vulnerability. In the next plan update, continue to add to the capabilities section. Add a narrative to further show planning and regulatory capacity. Are there specific actions, plans, or other regulatory tools that support district goals and drive decisions? Explain the administrative and technical capacity. Describe district staff and/or intergovernmental coordination and the skills and tools that can aid mitigation planning. Explain the financial capacity. What resources can the district use to fund mitigation actions? Explain education and outreach capacity. What outreach programs and methods are already in place to carry out mitigation activities and share hazard information? Refer to Task 4 of the Local Mitigation Planning Handbook for more information on community capabilities.

- Most of the mitigation actions in section 5.5.3 Mitigation Project Prioritization, Funding, and Scheduling list potential funding as "local" or "federal." Are there specific federal funding sources being considered, like FEMA's Building Resilient Infrastructure and Communities grant program? If so, please include more details for the next plan update.

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

Strengths
FEMA:

- The 2022 plan reflects changes in priorities and progress in mitigation efforts since the last plan was adopted. The plan records this progression is documented throughout and not just in the planning process. This makes it clear that the district is taking steps with each plan to improve.

- The detailed descriptions on past mitigation actions and status are effective. They give context for the updated mitigation strategy.

- The mitigation strategy reflects the narrative on the impact of past and future development in the district. The narrative shows a vision of long-term resilience.

Opportunities for Improvement
FEMA:

- Posting the plan online may be a good way to get more public participation and feedback throughout the plan maintenance cycle. You could also build a few more specific strategies to support long-term public involvement. Are there yearly events or other public-facing chances to inform the community about the hazard mitigation plan? This would have been great to capture in Section 6.

B. Resources for Implementing Your Approved Plan

FEMA FUNDING SOURCES

Hazard Mitigation Grant Program (HMGP). The HMGP is a post-disaster mitigation program. It is made available to states by FEMA after each Federal disaster declaration. The HMGP can provide up to 75 percent funding for hazard mitigation measures. The HMGP can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard prone areas, flood-proofing or elevation to reduce future damage, minor structural improvements and development of state or local standards. Applicants who are eligible for the HMGP are state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. Applications are submitted to your state and placed in rank order for available funding and submitted to FEMA for final approval. Eligible projects not selected for funding are placed in an inactive status and may be considered as additional HMGP funding becomes available. More information: https://www.fema.gov/hazard-mitigation-grant-program

Building Resilient Infrastructure and Communities (BRIC) Grant Program. The BRIC program supports states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. BRIC is a new FEMA pre-disaster hazard mitigation program that replaces the existing Pre-Disaster Mitigation (PDM) program. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency: https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program. This program provides technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. For more information, please visit: https://www.fema.gov/emergency-managers/risk-management/dam-safety/grants#hhpd

Flood Mitigation Assistance (FMA) Grant Program. FMA provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The FMA is funded annually; no federal disaster declaration is required. Only NFIP insured homes and businesses are eligible for mitigation in this program. Funding for FMA is very limited and, as with the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations. The federal cost share for an FMA project is 75 percent. At least 25 percent of the total eligible costs must be provided by a non-federal source. Of this 25 percent, no more than half can be provided as in-kind contributions from third parties. FMA funds are distributed from FEMA to the state. More information: https://www.fema.gov/flood-mitigation-assistance-grant-program

Fire Management Assistance Grant (FMAG) Program. The FMAG program provides grants to states, tribal governments and local governments for the mitigation, management and control of any fire burning on publicly (non-federal) or privately owned forest or grassland that threatens such destruction as would constitute a major disaster. The grants are made in the form of cost sharing with the federal share being 75 percent of total eligible costs. Grant approvals are made within 1 to 72 hours from time of request. More information: http://www.fema.gov/fire-management-assistance-grant-program

Hazard Mitigation Grant Program (HMGP) Post Fire Grant Program. FEMA's Hazard Mitigation Grant Program (HMGP) has Post Fire assistance available to help communities implement hazard mitigation measures after wildfire disasters. States, federally-recognized tribes and territories affected by fires resulting in an Fire Management Assistance Grant (FMAG) declaration on or after October 5, 2018, are eligible to apply. More information: https://www.fema.gov/grants/mitigation/post-fire

Fire Prevention and Safety (FP&S) Grants. FP&S Grants support projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal is to target high-risk populations and reduce injury and prevent death. Eligibility includes fire departments, national, regional, state, and local organizations, Native American tribal organizations, and/or community organizations recognized for their experience and expertise in fire prevention and safety programs and activities. Private non-profit and public organizations are also eligible. Interested applicants are advised to check the website periodically for announcements of grant availability: https://www.fema.gov/welcome-assistance-firefighters-grant-program

OTHER MITIGATION FUNDING SOURCES

Grant funding is available from a variety of federal and state agencies for training, equipment, and hazard mitigation activities. Several of these programs are described below.

Program 15.228: Wildland Urban Interface Community and Rural Fire Assistance. This program is designed to implement the National Fire Plan and assist communities at risk from catastrophic wildland fires. The program provides grants, technical assistance, and training for community programs that develop local capability, including: Assessment and planning, mitigation activities, and community and homeowner education and action; hazardous fuels reduction activities, including the training, monitoring or maintenance associated with such hazardous fuels reduction activities, on federal land, or on adjacent nonfederal land for activities that mitigate the threat of catastrophic fire to communities and natural resources in high risk areas; and, enhancement of knowledge and fire protection capability of rural fire districts through assistance in education and training, protective clothing and equipment purchase, and mitigation methods on a cost share basis.

Secure Rural Schools and Community Self-Determination Act - Title III- County Funds. The Self-Determination Act has recently been reauthorized and now includes specific language regarding the Firewise Communities program. Counties seeking funding under Title III must use the funds to perform work under the Firewise Communities program. Counties applying for Title III funds to implement Firewise activities can assist in all aspects of a community's recognition process, including conducting or assisting with community assessments, helping the community create an action plan, assisting with an annual Firewise Day, assisting with local wildfire mitigation projects, and communicating with the state liaison and the national program to ensure a smooth application process. Counties that previously used Title III funds for other wildfire preparation activities such as the Fire Safe Councils or similar would be able to carry out many of the same activities as they had before. However, with the new language, counties would be required to show that funds used for these activities were carried out under the Firewise Communities program. For more information, click here.

Community Planning Assistance for Wildfire. Established in 2015 by Headwaters Economics and Wildfire Planning International, Community Planning Assistance for Wildfire (CPAW) works with communities to reduce wildfire risks through improved land use planning. CPAW is a grant-funded program providing communities with professional assistance from foresters, planners, economists and wildfire risk modelers to integrate wildfire mitigation into the development planning process. All services and recommendations are site-specific and come at no cost to the community. More information: http://planningforwildfire.org/what-we-do/

Urban and Community Forestry (UCF) Program. A cooperative program of the U.S. Forest Service that focuses on the stewardship of urban natural resources. With 80 percent of the nation's population in urban areas, there are strong environmental, social, and economic cases to be made for the conservation of green spaces to guide growth and revitalize city centers and older suburbs. UCF responds to the needs of urban areas by maintaining, restoring, and improving urban forest ecosystems on more than 70 million acres. Through these efforts the program encourages and promotes the creation of healthier, more livable urban environments across the nation. These grant programs are focused on issues and landscapes of national importance and prioritized through state and regional assessments. Information: http://www.fs.fed.us/managing-land/urban-forests/ucf

Western Wildland Urban Interface Grants. The National Fire Plan (NFP) is a long-term strategy for reducing the effects of catastrophic wildfires throughout the nation. The Division of Forestry's NFP

Program is implemented within the Division's Fire and Aviation Program through the existing USDA Forest Service, State & Private Forestry, State Fire Assistance Program.

Congress has provided increased funding assistance to states through the U.S. Forest Service State and Private Forestry programs since 2001. The focus of much of this additional funding was mitigating risk in WUI areas. In the West, the State Fire Assistance funding is available and awarded through a competitive process with emphasis on hazard fuel reduction, information and education, and community and homeowner action. This portion of the National Fire Plan was developed to assist interface communities manage the unique hazards they find around them. Long-term solutions to interface challenges require informing and educating people who live in these areas about what they and their local organizations can do to mitigate these hazards.

The 10-Year Comprehensive Strategy focuses on assisting people and communities in the WUI to moderate the threat of catastrophic fire through the four broad goals of improving prevention and suppression, reducing hazardous fuels, restoring fire-adapted ecosystems, and promoting community assistance. The Western States Wildland Urban Interface Grant may be used to apply for financial assistance towards hazardous fuels and educational projects within the four goals of: improved prevention, reduction of hazardous fuels, and restoration of fire-adapted ecosystems and promotion of community assistance. More information: https://www.westernforesters.org/wui-grants

U.S. Fish & Wildlife Service, Rural Fire Assistance Grants. Each year, the U.S. Fish & Wildlife Service (FWS) provides Rural Fire Assistance (RFA) grants to neighboring community fire departments to enhance local wildfire protection, purchase equipment, and train volunteer firefighters. Service fire staff also assist directly with community projects. These efforts reduce the risk to human life and better permit FWS firefighters to interact and work with community fire organizations when fighting wildfires. The Department of the Interior (DOI) receives an appropriated budget each year for an RFA grant program. The maximum award per grant is $20,000. The DOI assistance program targets rural and volunteer fire departments that routinely help fight fire on or near DOI lands. More information: http://www.fws.gov/fire/living_with_fire/rural_fire_assistance.shtml

U.S. Bureau of Land Management, Community Assistance Program. BLM provides funds to communities through assistance agreements to complete mitigation projects, education and planning within the WUI. More information: https://www.blm.gov/services/financial-assistance-and-grants

NOAA Office of Education Grants. The Office of Education supports formal, informal and non-formal education projects and programs through competitively awarded grants and cooperative agreements to a variety of educational institutions and organizations in the United States. More information: http://www.noaa.gov/office-education/grants

NRCS Environmental Quality Incentives Program (EQIP). The Environmental Quality Incentives Program, administered through the NRCS, is a cost-share program that provides financial and technical assistance to agricultural producers to plan and implement conservation practices that improve soil, water, plant, animal, air and related natural resources on agricultural land and non-industrial private forestland. Owners of land in agricultural or forest production or persons who are engaged in livestock, agricultural or forest production on eligible land and that have a natural resource concern on that land may apply to participate in EQIP. Eligible land includes cropland, rangeland, pastureland, non-industrial private forestland and other farm or ranch lands. EQUIP is another funding mechanism for landowner fuel reduction projects. More information: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/

U.S. Department of Agriculture, Community Facilities Loans and Grants. Provides grants (and loans) to cities, counties, states and other public entities to improve community facilities for essential services to rural residents. Projects can include fire and rescue services; funds have been provided to purchase fire-fighting equipment for rural areas. No match is required. More information: http://www.usda.gov/wps/portal/usda/usdahome?navid=GRANTS_LOANS

General Services Administration, Sale of Federal Surplus Personal Property. This program sells property no longer needed by the federal government. The program provides individuals, businesses and organizations the opportunity to enter competitive bids for purchase of a wide variety of personal property and equipment. Normally, there are no restrictions on the property purchased. More information: http://www.gsa.gov/portal/category/21045

Hazardous Materials Emergency Preparedness Grants. Grant funds are passed through to local emergency management offices and HazMat teams having functional and active LEPC groups. More information: http://www.phmsa.dot.gov/hazmat/grants

U.S. Department of Homeland Security. Enhances the ability of states, local and tribal jurisdictions, and other regional authorities in the preparation, prevention, and response to terrorist attacks and other disasters, by distributing grant funds. Localities can use grants for planning, equipment, training and exercise needs. These grants include, but are not limited to areas of Critical Infrastructure Protection Equipment and Training for First Responders, and Homeland Security Grants.

Community Development Block Grants (CDBG). The U.S. Department of Commerce administers the CDBG program which are intended to provide low and moderate-income households with viable communities, including decent housing, as suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development activities, public services, economic development, planning, and administration. Public improvements may include flood and drainage improvements. In limited instances, and during the times of "urgent need" (e.g. post disaster) as defined by the CDBG National Objectives, CDBG funding may be used to acquire a property located in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event. CDBG funds can be used to match FEMA grants. More Information: https://www.hud.gov/program_offices/comm_planning/cdbg

Building Blocks for Sustainable Communities. The EPA Office of Sustainable Communities sometimes offers grants to support activities that improve the quality of development and protect human health and the environment. When these grants are offered, they will always be announced on www.grants.gov. More information: https://www.epa.gov/smartgrowth/building-blocks-sustainable-communities#2016

PUBLICLY AVAILABLE TOOLS

FEMA Community Engagement Prioritization Tool (CEPT).

https://www.fema.gov/floodplain-management/manage-risk/community-engagement-prioritization-tool

FEMA National Risk Index for Natural Hazards (NRI).

https://hazards.geoplatform.gov/portal/apps/MapSeries/index.html?appid=ddf915a24fb24dc8863eed96bc3345f8

FEMA Resilience Analysis and Planning Tool (RAPT).

https://www.fema.gov/emergency-managers/practitioners/resilience-analysis-and-planning-tool

FEMA Flood Assessment Structure Tool (FAST).

https://www.fema.gov/sites/default/files/2020-09/hazus_fast-factsheet.pdf

FEMA HAZUS

https://www.fema.gov/flood-maps/products-tools/hazus

Decision Support System for Water Infrastructure Security (DSS-WISE):

https://dsswiseweb.ncche.olemiss.edu/

CDC/ASTDR Social Vulnerability Index (SVI).

https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

U.S. Census Bureau Community Resilience Estimates

Community Resilience Estimates (census.gov)

OTHER RESOURCES

FEMA: Grant Application Training. Each year, FEMA partners with the State on training courses designed to help communities be more successful in their applications for grants. Contact your State Hazard Mitigation Officer for course offering schedules. Example Courses:

- Unified Hazard Mitigation Grant Assistance Application Development Course
- Benefit Cost Analysis (BCA) Course

FEMA: Community Assistance Visit. It may be appropriate to set up a Community Assistance Visit with FEMA to provide technical assistance to communities in the review and/or updating of their floodplain ordinances to meet the new model ordinance. Consider contacting your State NFIP Coordinator for more information.

FEMA: Building Science. The Building Science branch develops and produces multi-hazard mitigation publications, guidance materials, tools, technical bulletins, and recovery advisories that incorporate the most up-to-date building codes, floodproofing requirements, seismic design standards, and wind design requirements for new construction and the repair of existing buildings. To learn more, visit: https://www.fema.gov/building-science

NOAA/NIDIS: U.S. Drought Portal. NOAA's National Integrated Drought Information System's Drought Portal provides resources for communities to understand their drought conditions, vulnerability, and impacts. The Portal includes data and maps down by city, county, state, zip code, and at watershed global scales. Communities can use this information to inform their hazard mitigation plans with update-to-date data regarding drought conditions, vulnerability, and impacts for sectors such as agriculture, water utilities, energy, and recreation.

EPA: Smart Growth in Small Towns and Rural Communities. EPA has consolidated resources just for small towns and rural communities to help them achieve their goals for growth and development while maintaining their distinctive rural character. To learn more, visit: https://www.epa.gov/smartgrowth/smart-growth-small-towns-and-rural-communities

EPA: *Hazard Mitigation for Natural Disasters: A Starter Guide for Water and Wastewater Utilities.* The EPA released guidance on how to mitigate natural disasters specifically for water and wastewater utilities. For more information, visit: https://www.epa.gov/waterutilityresponse/hazard-mitigation-natural-disasters

National Integrated Drought Information System. The National Drought Resilience Partnership may provide some additional resources and ideas to mitigate drought hazards and increase awareness of droughts. Visit: https://www.drought.gov/drought/what-nidis/national-drought-resilience-partnership.

Beyond the Basics: Best Practices in Local Mitigation Planning. The product of a 5-year research study where the Costal Hazards Center and the Center for Sustainable Community Design analyzed local mitigation plans to assess their content and quality. The website features numerous examples and best practices that were drawn from the analyzed plans. Visit: http://mitigationguide.org/

STAR Community Rating System. Consider measuring your mitigation success by participating in the STAR Community Rating System. Local leaders can use the STAR Community Rating System to assess how sustainable they are, set goals for moving ahead and measure progress along the way. To get started, go to http://www.starcommunities.org/get-started

Flood Economics. The Economist Intelligence Unit analyzed case studies and state-level mitigation data in order to gain a better understanding of the economic imperatives for investment in flood mitigation. To learn more, visit: http://floodeconomics.com/

Headwaters Economics. Headwaters Economics is an independent, nonprofit research group that works to improve community development and land management decisions in the West. To learn more, visit: https://headwaterseconomics.org/

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET													
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N) *=HHPD					
							A. Planning Process*	B. Hazard Identification & Risk Assessment*	C. Mitigation Strategy*	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
1	Weber Basin Water Conservancy District	Special District	Derek Johnson, PE	Weber Basin Water Conservancy District 2837 East Highway 193 Layton, Utah 84040	djohnson@weberbasin.com	(801) 771-1677	Y	Y	Y	Y	Y	Y

APPENDIX B: Hazard Mitigation Planning Committee

Name	Agency/Jurisdiction	Title	Meetings Attended
Gilpin County			
Art Fuqua	Gilpin County	Gilpin County Advisor	Meeting #2,
Tami Archer	Gilpin County	Planner	Kickoff, Meeting #2, Meeting #3
Jeff Heng	Gilpin County, County Manager's Office	Business Analyst	Meeting #3
Brandon Daruna	Gilpin County EMS	Chief	Meeting #2, Meeting #3
Diane Stundon	Gilpin County OEM	Emergency Manager	Kickoff, Meeting #3
Nathan Whittington	Gilpin County OEM	Emergency Manager	Kickoff, Meeting #2,
Laura Jeney	Gilpin County Planning Commission	Chair	Meeting #2,
Roxy Goss	Gilpin County Planning Commission	Commissioner	Meeting #2,
David Rich	Gilpin County Public Works	Deputy Director	Meeting #2, Meeting #3
Sean Wheeler	Gilpin County Sheriff's Office	Division Chief	Kickoff
Kevin Armstrong	Gilpin County Sheriff's Office	Sheriff	Kickoff
City of Black Hawk			
Chris Woolley	Black Hawk Fire Dept.	Fire Chief	Kickoff, Meeting #3
Michelle Moriarty	Black Hawk PD	Chief of Police	Kickoff
City of Central City			
Gary Allen	Central City FD	Fire Chief	Kickoff, Meeting #2, Meeting #3
Timberline Fire Protection District			
Chris Bondus	Timberline Fire Protection District	Deputy Chief	Meeting #2
Paul Ondr	Timberline Fire Protection District	Fire Chief	Meeting #2
Partners/Stakeholders			
Jane Thomas	Clear Creek County OEM	Deputy Director/Coordinator	Meeting #2
Grey La Certe	Colorado DHSEM	Regional Field Manager	Kickoff, Meeting #2, Meeting #3
Mark Thompson	Colorado DHSEM	State Hazard Mitigation Officer	Meeting #2, Meeting #3
Debbie Goerlitz	Colorado DHSEM	Mitigation Project Specialist	Meeting #3
Julie Beyers	Colorado DHSEM	Mitigation Specialist	Meeting #3
Jeremy Reineke	Colorado DRMS	Project Manager	Kickoff

Name	Agency/Jurisdiction	Title	Meetings Attended
Allison Rhea	Colorado Forest Restoration Institute	Research Associate	Kickoff
Matthew Petty	Colorado State Patrol	Sergeant	Meeting #2, Meeting #3
Jennifer Cook	CSU Extension	Director in Gilpin County	Kickoff, Meeting #2, Meeting #3
Erica Crosby	Division of Reclamation Mining and Safety	Senior Project Manager	Kickoff
Logan Sand	FEMA Region VIII	Community Planner	Kickoff
Emily Alvares	FEMA Region VIII	Community Planner	Meeting #3
Erika Roberts	Jefferson County OEM	Emergency Management Coordinator	Kickoff
Hal Grieb	Jefferson County OEM	Director	Meeting #3
Greg Hanson	National Weather Service Boulder	Warning Coordination Meteorologist	Kickoff
William Walker	Xcel Energy	Program Manager, Enterprise Preparedness	Meeting #3

Appendix C: Planning Process Documentation

Gilpin County Hazard Mitigation Plan 2021 Update Kick Off Meeting Agenda

Date: Monday, June 14, 2021 **Time:** 10:00 am – 12:00 pm MST

Webinar Link: https://zoom.us/j/99648284827?pwd=b3k0NlJqK3hicWxiSVRMRTg2bzdpUT09

Toll-free number: 866-670-1764
Conference ID: 996 4828 4827#

Project: Gilpin County Hazard Mitigation Plan Update

Subject/Purpose

The purpose of the meeting is to initiate the process for updating the County's Hazard Mitigation Plan (HMP) and introduce the requirements and schedule. The HMP is intended to identify hazards, assets at risk, and ways to reduce impacts through long-term sustainable mitigation projects.

Attendees: Hazard Mitigation Planning Committee and Stakeholders

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1. Introductions
2. Hazard Mitigation Overview
3. Mitigation Planning Process and Requirements
4. Overview of 2016 Hazard Mitigation Plan
5. Coordination with Other Agencies, Related Planning Efforts, & Recent Studies
6. Planning for Public Involvement
7. Project Schedule and Next Steps
8. Questions

Gilpin County, Colorado Multi-Jurisdictional Hazard Mitigation Plan 2021 Update

Kick-Off Webinar Summary

Monday, June 14, 2021
10:00 am – 12:00 pm MST
Zoom Virtual Meeting

Introductions and Opening Remarks

This document summarizes the kickoff meeting for the Gilpin County Hazard Mitigation Plan update in 2021. The meeting was a webinar/conference call facilitated by Wood Environment & Infrastructure Solutions, Inc. (Wood), the consulting firm working under a contract with Gilpin County to facilitate the planning process and develop the updated County plan. Nathan Whittington with Gilpin County Emergency Management began the meeting with a brief introduction of the plan update. Scott Field, project manager at Wood, then explained the importance of the plan update and thanked everyone for attending. Scott began by asking those attending to virtually introduce themselves by stating their name, title, and agency/jurisdiction using the Chat feature in MS Teams. Twenty-four (24) persons representing a mix of the consultant team, county departments, cities, and school districts were present for the meeting.

1. Scott Field, Wood E&IS
2. Christopher Johnson, Wood E&IS
3. Amy Carr, Wood E&IS
4. Adam Dillon, United Power Electric Cooperative
5. Allison Rhea
6. Chad Buser, US Forest Service
7. Chris Woolley, Black Hawk Fire Department
8. Diane Stundon, Gilpin County OEM
9. Erica Crosby, Division of Reclamation Mining and Safety
10. Erika Roberts, Jefferson County OEM
11. Gary Allen, Central City Fire Department
12. Greg Hanson, National Weather Service Boulder
13. Grey La Certe, Colorado DHSEM
14. Holly Woodings, United Power Operations
15. Jennifer Cook, CSU Extension
16. Jeremy Reineke, Colorado DRMS
17. Kevin Armstrong, Gilpin County Sheriff
18. Lauren Duncan, Trout Unlimited
19. Logan Sand, FEMA Region VIII
20. Michelle Moriarty, Black Hawk Police Chief
21. Nathan Whittington, Gilpin County OEM
22. Tami Archer, Gilpin County
23. Trez Skillern, US Forest Service
24. "swheeler"

Following introductions Scott discussed the agenda items; the key discussion is summarized below, and additional details are within the meeting PowerPoint presentation.

Hazard Mitigation Overview

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. The U.S. Disaster Mitigation Act of 2000 requires state and local governments to adopt a hazard mitigation plan, updated every five years, to maintain eligibility for FEMA mitigation assistance grants.

Scott (Wood) explained the Disaster Mitigation Act of 2000 which requires having an updated plan in place to ensure the County is eligible for pre- and post-disaster hazard mitigation grant funds. 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. The COVID-19 Pandemic is a good example of a circumstance that can cause disruption in our community and to the economy. Scott 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.

Scott stated there are two main types of benefits a community gains from having a FEMA approved hazard mitigation plan (HMP); (1) bringing people together in the community; (2) having an HMP approved by FEMA makes a community eligible for FEMA grants (Pre-Disaster Mitigation, Flood Mitigation Assistance, Hazard Mitigation Grant Program-Post-Disaster). He noted that any funding requests from FEMA needs to be based on the hazards and mitigation strategy in the HMP. He added that information from the hazard mitigation plan, specifically the vulnerability assessment and mitigation strategy, can be used in other hazard related plans such as emergency operations plans.

Hazard Mitigation Planning Process and Requirements

Scott continued the meeting with the specific planning requirements the County will have to meet in order to have a FEMA approved plan. Scott reviewed the Disaster Mitigation Act (DMA) of 2000 Requirements and explained that the Gilpin County Multi-Jurisdictional Hazard Mitigation Plan (HMP) will be updated in accordance with these requirements. The planning process involves a 4 Phase approach with 9 tasks per FEMA guidance updated in 2013. The kickoff meeting is the first step in the process and also covers tasks 1-3 (Determine the planning area and resources; Build the planning team; Create an outreach strategy).

Scott presented a slide with the jurisdictions that are expected to participate in 2021 and will need to re-adopt the plan.

- Unincorporated Gilpin County
- City of Black Hawk
- City of Central City
- Timberline Fire Protection District

Role of the Hazard Mitigation Planning Committee (HMPC)

The first step in getting organized is to determine the hazard mitigation planning committee members, which has already started with those in attendance at the kickoff meeting. Scott presented a slide with a summary of those invited to be on the committee, based on the previous HMP and input from the County.

Scott emphasized that local input, and participation from the county, municipalities, and special districts is required for full approval from FEMA. Participation includes the following:

- Attend meetings and participate in the planning process
- Provide requested information to update or develop jurisdictional information
- Review drafts and provide comments
- Identify mitigation projects specific to jurisdiction, provide status
- Assist with and participate in the public input process
- Coordinate formal adoption

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. Stakeholders have various options and levels of participation including:

- Attend HMPC meetings or stay in loop via email list
- Provide data/information
- Partner on mitigation efforts
- Review draft plan

Plan Update Requirements, Key Elements and Schedule

Aspects of the planning process include:

- Engage the participants to take part in planning process and efforts
- Raise awareness and engage the public
- Update hazards and baseline development data to reflect current conditions
- Update the mitigation strategy
- Document progress and note changes in priorities

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 Gilpin County Hazard Mitigation Plan (2016) providing the baseline for identified hazards and the groundwork for goals, policies and actions for hazard mitigation.

The HMP will be updated over the next six months, with at least two more meetings with the Hazard Mitigation Planning Committee. 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 review by HMPC committee, a second for public review, and a third for state and FEMA review.

The first draft for HMPC review is targeted for September 2021, a public review draft in October followed by a review by Colorado DHSEM in November and then tentatively approved by FEMA in January 2022.

Review of Identified Hazards

Based on hazards from the 2016 County HMP, the list of potential hazards was reviewed. Scott showed a slide that listed the hazards in the 2016 HMP.

- Avalanche
- Dam/Levee Failure
- Drought
- Earthquake
- Erosion and Deposition
- Expansive Soils
- Extreme Heat
- Flood
- Hail
- Landslide, Mud/Debris Flow, Rockfall
- Lightning
- Severe Wind
- Subsidence
- Tornado
- Wildfire
- Winter Storm

The group thought that the original list of hazards was still valid although there was discussion that the levels of significance may have changed since 2016. Scott showed a slide of how the hazards were ranked by significance in the 2016 plan. There will be more detail provided on methodology during the next meeting. Additional comments made during the presentation are noted in the meeting chat log.

Scott noted that every hazard profiled must have at least one mitigation action identified, and each jurisdiction will need at least one new action added to the updated plan.

Scott asked the group to review the list of hazards and comment on how they could be enhanced or updated with:

- Historic incidents
- Incident logs
- Public perception
- Scientific studies
- Other plans and reports (e.g., flood and drainage studies, incident damage assessments, Internet databases)
- Recent disasters

Coordinating with Other Agencies\Related Planning Efforts\Recent Studies

A discussion on recent studies of hazards in other documents and reports followed the identified hazards discussion. Opportunities for coordinating and cross-referencing the HMP were discussed.

Planning for Public and Stakeholder Involvement

Scott noted that a Public survey will be developed to gather input from the public on hazard concerns and mitigation ideas. Advertisement of public survey will be through public information channels, official websites, social media, email blasts etc. He asked for opportunities for outreach at scheduled public meetings or events. Suggestions included discussing the HMP update at City Council and County Commission meetings.

Scott asked for ideas on additional stakeholders to be made aware of the plan update effort. Rural water was suggested in the chat.

Initial Information Needs and Next steps

Scott discussed a slide with initial information needs and next steps. Scott encouraged the group to send by email information on:

- Recent hazard events (since 2016) – damages, incident logs, damage assessments, etc.
- Growth and development trends
- Recent updated plans and policies
- GIS Data

Where available online, Wood will try to obtain the updated plans previously noted. Scott encouraged the group to send other information that might not be readily accessible online.

A GIS needs list was provided to the County to assist with data collection, which is already in progress. The County will provide the meeting summary, handouts, presentation, and sign in sheet by email 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.

Adjourn

The meeting adjourned at 12:00 pm MST.

Attachments:

Zoom Meeting chat log

Attachment: Gilpin County Hazard Mitigation Plan Update

Kickoff Meeting Chat Log

[8/3 8:59 AM] Carr, Amy and 3 others were invited to the meeting.
8/3 8:59 AM] Field, Scott named the meeting to Clinton Kickoff.
[8/3 9:06 AM] Field, Scott named the meeting to Clinton Kickoff.
[Yesterday 4:50 PM] Unknown User Rich Johannsen & Chet Hippler (Guest) has temporarily joined the chat.
[Yesterday 4:51 PM] Unknown User Christy (Guest) has temporarily joined the chat.
[Yesterday 4:54 PM] Unknown User Dan Howard - Clinton County EMA (Guest) has temporarily joined the chat.
[Yesterday 4:55 PM] Unknown User Matt Proctor (Guest) has temporarily joined the chat.
[Yesterday 4:55 PM] Unknown User Janet Burke (Guest) has temporarily joined the chat.
[Yesterday 4:56 PM] Unknown User Dan Vosatka (Guest) has temporarily joined the chat.
[Yesterday 4:56 PM] Unknown User Burns, Nancy (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Bob Milroy (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User T Paarmann (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Joel Atkinson (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Kurt Crosthwaite (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Tom P (Guest) has temporarily joined the chat.
[Yesterday 5:00 PM] Unknown User Ken Schoon (Guest) has temporarily joined the chat.
[Yesterday 5:03 PM] Unknown User BESST (Guest) has temporarily joined the chat.
[Yesterday 5:03 PM] Unknown User Gary DeLacy (Guest) has temporarily joined the chat.
[Yesterday 5:03 PM] Unknown User Joyce Lanning (Guest) has temporarily joined the chat.

[Yesterday 5:09 PM] Dan Vosatka (Guest)

Dan Vosatka- City of Welton: Mayor

[Yesterday 5:09 PM] Joyce Lanning (Guest)
Joyce Lanning - City Clerk - City of Low Moor

[Yesterday 5:09 PM] Bob Milroy (Guest)

Bob Milroy

[Yesterday 5:09 PM] Janet Burke (Guest)
Janet Burke - Lost Nation & Toronto

[Yesterday 5:09 PM] Matt Proctor (Guest)
Matt Proctor DeWitt Public Works

[Yesterday 5:09 PM] Gary DeLacy (Guest)
Gary DeLacy---Clinton Community School District

[Yesterday 5:09 PM] Ken Schoon (Guest)
Ken Schoon - Mayor - City of Goose Lake

[Yesterday 5:10 PM] Dan Howard - Clinton County EMA (Guest)
Dan Howard - Clinton County EMA

[Yesterday 5:10 PM] BESST (Guest)

Scott Besst - DeWitt Fire Department

[Yesterday 5:10 PM] T Paarmann (Guest)

[Yesterday 5:10 PM] Bob Milroy (Guest)
Bob Milroy City of Clinton

[Yesterday 5:11 PM] Christy (Guest)
Christy Stankee, Wheatland

[Yesterday 5:11 PM] Rich Johannsen & Chet Hippler (Guest)
Rich Johannsen - Andover Fire

[Yesterday 5:11 PM] Rich Johannsen & Chet Hippler (Guest)
Chet Hippler - Andover Fire

[Yesterday 5:14 PM] Joel Atkinson (Guest)
joel Atkinson Clinton fire

[Yesterday 5:26 PM] Gary DeLacy (Guest)
Was Mercy One listed as part of the team?

[Yesterday 5:26 PM] Field, Scott
If not we'll reach out to Mercy One - thanks.

[Yesterday 5:28 PM] Gary DeLacy (Guest)
I'm wondering about emergency transportation---evacuation---Clinton MTA or even Clinton Airport?

(1 liked)[Yesterday 5:31 PM] Gary DeLacy (Guest)
I believe Genesis is the medical provider for DeWitt

[Yesterday 5:45 PM] Gary DeLacy (Guest)
Is the Cordova Nuclear Power Plant mitigation plans a subset of the Clinton County Plan?

[Yesterday 5:50 PM] Burns, Nancy (Guest)
Nancy Burns - Clinton County EMA

[Yesterday 5:51 PM] Gary DeLacy (Guest)
Should Alliant or Mid-American Energy be part of this plan? The dericho made this very apparent

[Yesterday 5:56 PM] Dan Vosatka (Guest)
Good point Gary. As the Health and Safety rep for Iowa American Water Company, I recently had my recent hazard risk assessment of our infrastructure and assets in Clinton, and included EMA and Clinton Fire during the process. So it's only fair to return the favor.

[Yesterday 6:16 PM] Ken Schoon (Guest)
Thank you Scott. I hope to send you some information and a report that the City of Goose Lake has gotten in hopes to mitigate some rain water flow issues we have had. Ken Schoon

[Yesterday 6:16 PM] Unknown User Gary DeLacy (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Rich Johannsen & Chet Hippler (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Janet Burke (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Joyce Lanning (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Ken Schoon (Guest) no longer has access to the chat.
[Yesterday 6:17 PM] Unknown User Matt Proctor (Guest) no longer has access to the chat.

[Yesterday 6:17 PM] Unknown User Christy (Guest) no longer has access to the chat.
[Yesterday 6:17 PM] Unknown User T Paarmann (Guest) no longer has access to the chat.
[Yesterday 6:20 PM] Unknown User Dan Howard - Clinton County EMA (Guest) no longer has access to the chat.

Meeting ended 1h 15m 6:15 PM
1h 15m
Meeting Recorded by: Carr, Amy

From:	Field, Scott on behalf of Nate Whittington
To:	"Amy Carr"; Johnson, Christopher A; Field, Scott
Subject:	FW: Hazard Mitigation - Plan Update Risk Assessment Meeting
Start:	Tuesday, August 17, 2021 10:00:00 AM
End:	Tuesday, August 17, 2021 12:00:00 PM
Location:	2960 Dory Hill Rd Black Hawk, CO 80422

-----Original Appointment-----
From: Nate Whittington <nwhittington@gilpincounty.org>
Sent: Wednesday, August 11, 2021 3:02 PM
To: Nate Whittington; Field, Scott
Subject: FW: Hazard Mitigation - Plan Update Risk Assessment Meeting
When: Tuesday, August 17, 2021 10:00 AM-12:00 PM (UTC-07:00) Mountain Time (US & Canada).
Where: 2960 Dory Hill Rd Black Hawk, CO 80422

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

-----Original Appointment-----
From: Nate Whittington
Sent: Wednesday, July 21, 2021 3:12 PM
To: Nate Whittington; Jane Anne Thomas (jthomas@clearcreeksheriff.us <mailto:jthomas@clearcreeksheriff.us>); Hal Grieb; Max Ethridge; Mark Thompson; Todd Farrow (todd.farrow@state.co.us <mailto:todd.farrow@state.co.us>); Greg Hanson (gregory.hanson@noaa.gov <mailto:gregory.hanson@noaa.gov>); Brett Schroetlin; Ed Leblanc; Bill McCormick; Paul Ondr; Brandon Daruna; Angela Gee; Karen Berry; Dam Dillon; Luke Chavez; Bob Jarrett; Lyssa Gray; Erika Roberts; Tracey Kern (tracey.kern@usda.gov <mailto:tracey.kern@usda.gov>); Lauren Duncan; Robert Reid; Stephen Strohminger; Kevin Armstrong; Holly Woodings; Mike Chard (mchard@bouldercounty.org <mailto:mchard@bouldercounty.org>); Sean Stanfield; Chris Woolley - Black Hawk Fire Department (cwoolley@cityofblackhawk.org <mailto:cwoolley@cityofblackhawk.org>); Tonia Kapke; Scott Haas (scott.haas@usda.gov <mailto:scott.haas@usda.gov>); Dan Prenzlow; Patricia Gavelda; Dave Rich; Emily Alvarez; cbondus@timberlinefire.com <mailto:cbondus@timberlinefire.com> ; Jill Carlson; Caitlin Lovett; Jennifer Cook - CSU; Nicole Aimone; Suzanne Boccia - Clear Creek OEM (sboccia@clearcreeksheriff.us <mailto:sboccia@clearcreeksheriff.us>); David MacKenzie; Tami Archer; Kevin Stewart; Sean Wheeler (swheeler@gilpincounty.org <mailto:swheeler@gilpincounty.org>); grey.lacerte@state.co.us <mailto:grey.lacerte@state.co.us> ; Diane Stundon; Michelle Moriarty; Gary Allen (gallen@centralcityfire.org <mailto:gallen@centralcityfire.org>); Matt Petty - Colorado State Patrol (matthew.petty@state.co.us <mailto:matthew.petty@state.co.us>); Craig Eicher
Cc: Roxy Goss; Kurt Duncan; Bob Haxel (hax@mric.net <mailto:hax@mric.net>); Art Fuqua; rea@peakecological.com <mailto:rea@peakecological.com> ; Melissa Harless; Lauren Duncan; Laura Jeney
Subject: Hazard Mitigation - Plan Update Risk Assessment Meeting
When: Tuesday, August 17, 2021 10:00 AM-12:00 PM (UTC-07:00) Mountain Time (US & Canada).
Where: 2960 Dory Hill Rd Black Hawk, CO 80422

This will be in person with the contractor and depending upon the numbers may shift to the community center. Please RSVP so we can determine lunch that will be provided.

There will also be a ZOOM option please see below

Gilpin OEM is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting

https://zoom.us/j/96223513680?pwd=cmlJc0UxK3k5OVZrb3NKZ082b3E1UT09 <https://urldefense.com/v3/__https:/zoom.us/j/96223513680?pwd=cmlJc0UxK3k5OVZrb3NKZ082b3E1UT09__;!!NgwEkeqe!Ffka4ujTMibu28z-hdjRG2ApOorsszQP42Sc9LfR-pDoNhedR5GMhlNVu1Y_SQUffjU$>

Meeting ID: 962 2351 3680

Passcode: 911

One tap mobile

+12532158782,,96223513680#,,,,*911# US (Tacoma)

+13462487799,,96223513680#,,,,*911# US (Houston)

Dial by your location

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

+1 669 900 9128 US (San Jose)

+1 301 715 8592 US (Washington DC)

+1 312 626 6799 US (Chicago)

+1 646 558 8656 US (New York)

Meeting ID: 962 2351 3680

Passcode: 911

Find your local number: https://zoom.us/u/abrinyuOUg <https://urldefense.com/v3/__https:/zoom.us/u/abrinyuOUg__;!!NgwEkeqe!Ffka4ujTMibu28z-hdjRG2ApOorsszQP42Sc9LfR-pDoNhedR5GMhlNVu1Y__1lLvew$>

Gilpin County
Hazard Mitigation Plan Update
Risk Assessment Webinar Agenda

Date: Tuesday, August 17, 2021
10:00 am – 12:00 pm MST

Meeting at: **Gilpin County Justice Center**
2960 Dory Hill Road
Black Hawk, CO 80422

OR

Join on your computer or mobile app
Click here to join the meeting
Or call in (audio only)
(866) 670-1764,,675343882# United States (Toll-free)
Phone Conference ID: 675 343 882#

Subject/Purpose

The purpose of the meeting is to review the highlights of the updated Hazard Identification and Risk Assessment. The meeting will be delivered as a virtual meeting due to the COVID-19 pandemic and social distancing requirements.

Attendees: Hazard Mitigation Planning Committee, Stakeholders and Consultant Team

1. Introductions
2. Review of the hazard mitigation planning process
3. Update on public involvement activities
4. Plan update guide
5. Review of hazards and vulnerability assessment update
6. Review of mitigation goals
7. Next steps
8. Questions and answers

wood.

Summary of the Gilpin County, Colorado
Multi-Jurisdictional Hazard Mitigation Plan Update
Risk Assessment and Goals Meeting

Tuesday, August 17, 2021
10:00-12:00 am MST
Combined In-Person/Virtual Webinar via Teams

Subject/Purpose

This document summarizes the risk assessment meeting held for the Gilpin County Hazard Mitigation Plan (HMP) 2021 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 and revisit the plan's goals. This meeting was delivered as a combination in person and virtual web meeting via Zoom. Scott Field, Project Manager at Wood, began the meeting with introductions. 19 individuals attended the meeting representing a mix of the consultant team, city department representatives, and various stakeholders.

Attendees

- Hazard Mitigation Planning Committee
- 19 people attended including:
    1. Scott Field, Wood E&IS
    2. Christopher Johnson, Wood E&IS
    3. Art Fuqua, Gilpin County
    4. Brandon Daruna,
    5. Chris Bondus, Timberline FPD Deputy Chief
    6. David Rich, Gilpin County Public Works, Deputy Director
    7. Gary Allen, Central City FD, Fire Chief
    8. Grey La Certe, Colorado DHSEM
    9. Holly Woodings, United Power Operations
    10. Jane Thomas, CCC OEM
    11. Jennifer Cook, CSU Extension
    12. Laura Jeney, Gilpin County Planning Commission
    13. Lauren Duncan, Trout Unlimited
    14. Mark Thompson, Colorado DHSEM
    15. Matthew Petty, Colorado State Patrol
    16. Nathan Whittington, Gilpin County OEM
    17. Paul Ondr, Timberline Fire District Chief
    18. Roxy Goss, Gilpin County Planning Commission
    19. Tami Archer, Gilpin County

Introductory Remarks/Review of the planning process

Following introductions, Scott Field reviewed the planning process being followed and discussed the project status and progress made thus far. Highlights include:

- Kickoff meeting June 14, 2021
- GIS analysis and map updates complete
- Risk assessment update in progress
- Plan Update Guide sent out to participating jurisdictions – please return by 8/3
- 2016 Action Status Tracker sent out to participating jurisdictions

Several members of the HMPC also highlighted existing and new plans that could be referenced for the HMP update, including the 2021 Gilpin County Comprehensive Plan, United Power's Wildfire Protection Plan, the County's updated CWPP, and the St. Vrain Watershed Plan.

Update on Public Involvement Activities

Scott shared information on the public involvement activities thus far in the plan. This includes an online public survey which closed on July 31st and received 163 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 related hazards and mitigation efforts. Other higher priority hazards included winter storm, severe wind, drought.

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
Flooding	• There was general surprise about the lack of exposure in Central City to the 1% floodplain, people felt that there was more exposure/previous events in that area • Chris mentioned that the current NFIP maps are fairly outdated, from the 80s and 90s, so that could be the reasoning for the lack of exposure • Ranked medium in 2016, thoughts for 2021? HMPC felt that it is a good ranking to continue
Dam/Levee Failure	• A member of the HMPC asked if the map showed every dam in the county? Scott answered this map is showing all the high and significant hazard dams • Pickle jar dam was pointed out as a potential issue – owned by an HOA in Paradise Valley • Question about "tailing dams" having to do with mining
Drought	• Concerns about water supply and trans-basin diversion. While the front range has not been in drought, the western slope has and that is where a lot of the front range communities' water supplies come from the western slope • Water reductions in other western states may impact the water usage for the coming years – comment from a member of the HMPC on road maintenance and dust mitigation on the 100+ miles of dirt roads in the county, which require water • Comments from Mark Thompson and Nate Whittington that there is 58 million dollars of state HMGP money for mitigation projects

Hazard or Topic	Meeting Discussion and Problem Statements
	• 2016 ranking of Drought is low – HMPC wants to move significance to High
Extreme Heat	• Comments and discussion over the immediate health impacts, lots of increases in the presence of tourists and recreation. While the heat is relative (what might be extreme here may not be "extreme") there could be impacts from people visiting from the Denver metro area where it may be even hotter • HMPC want to move significance to medium, from Low in 2016
Wildfire	• Gilpin county wildfire risk has changed – comment that we need a new database, fires are burning at higher elevations. Look at suppression difficulty data – considering slope, elevation, ease of access • Gilpin County has more Wildland Urban Intermix vs. Interface • United power has a lot of information in a wildfire suppression plan • An updated CWPP would be a good mitigation action
Earthquake	• Consensus is it would be good to keep significance rating as low (low probability, but high consequence) and many of the impacts may be addressed through other mitigation efforts
Erosion and Deposition	• General consensus that this should be higher ranked, move to medium.
Expansive Soils	• Low ranking is appropriate.
Landslides	• There was a rockslide that closed the Central City Parkway • Do we consider the economic impacts of people who may have hit falling rocks with their vehicles? • Mark Thompson added the economic costs, road damage, life safety consideration. Rockslides have a high likelihood for loss of life at some point.
Subsidence	• Central City has had two instances of sinkholes • Good and accurate mapping is very important for backcountry and first responders, they present a hazard for those responding • This information could also inform the method with which the county can respond to various hazards • Suggest moving significance up to medium
Avalanche	• Avalanche in 2001 right on the Boulder county line, caused one fatality • Maybe move significance up to medium
Hailstorm	• No Comments
Lighting	• Nate mentioned this should be ranked high, there are many lightning strikes up here. Huge risk for wildfire starts
Severe Wind	• No Comment
Tornado	• The county experiences more micro-bursts than tornados
Severe Winter Storms	• Discussion again of cascading hazards: trees killed by the chemicals used for de-icing may then become fire hazards in the summer
Pandemic	• Rank hazard Medium
Cyber Threats	• Rank hazard High
Active Threats	• Rank Hazard High

A member of the HMPC asked how do we define "cultural resources" for the purposes of the vulnerability assessment. Scott explained that it is anything that the community views as a resource or asset. Examples would be the archeological sites in Rollinsville, endangered and threatened species, historic properties throughout the county. Nate noted that FEMA wants the county to gauge lifelines/critical infrastructure in green, yellow, red; meaning they want to know what state these items are in as far as stable, potentially in a warning area, or in a critical/compromised state.

Review of Mitigation Goals

Scott led a brief discussion on current goals and objectives, mentioned that there would be a survey coming out looking for suggestions on if/how to update the wording of these goals. They can be adopted as is if the group still feels they are relevant. Mark Thompson suggested that the group find ways to reference/integrate FEMA lifelines in the goals and objectives

Next Steps/Adjourn

The project schedule was reviewed:

Project Milestone	Anticipated Timeline
• Updated HIRA	August
• HMPC Meeting #3	September
• HMPC Review Draft	September
• Public Review Draft	October
• CO DHSEM Review	November
• Final Plan for FEMA Review (estimated)	December
• Final Approved HMP for local adoption	January 2022

Initial information needs and next steps were discussed. Wood has sent a Plan Update Guide requesting input on:

- Recent hazard events (since 2016)
- Growth and development trends
- Recent updated plans and policies
- Status of mitigation actions from the 2016 HMP

From:	Field, Scott on behalf of Nate Whittington
To:	"Amy Carr"; Christopher A Johnson (christopher.johnson3@woodplc.com); grey.lacerte@state.co.us; Craig Eicher; Jill Carlson; Angela Gee; Bill McCormick; Brandon Daruna; Diane Stundon; Patricia Gavelda; cbondus@timberlinefire.com; Michelle Moriarty; Tracey Kern (tracey.kern@usda.gov); Brett Schroetlin; Lauren Duncan; Emily Alvarez; Mark Thompson; Dam Dillon; Sean Wheeler; Erika Roberts; Gary Allen (gallen@centralcityfire.org); Suzanne Boccia - Clear Creek OEM (sboccia@clearcreeksheriff.us); Sean Stanfield; Matt Petty - Colorado State Patrol (matthew.petty@state.co.us); Paul Ondr; Jane Anne Thomas (jthomas@clearcreeksheriff.us); Hal Grieb; Caitlin Lovett; Kevin Armstrong; Tami Archer; Stephen Strohminger; Mike Chard (mchard@bouldercounty.org); David MacKenzie; Ed Leblanc; Field, Scott; Lyssa Gray; Scott Haas (scott.haas@usda.gov); Karen Berry; Dan Prenzlow; Jennifer Cook - CSU; Dave Rich; Greg Hanson (gregory.hanson@noaa.gov); Holly Woodings; Chris Woolley - Black Hawk Fire Department (cwoolley@cityofblackhawk.org); Tonia Kapke; Todd Farrow (todd.farrow@state.co.us); Robert Reid; Kevin Stewart; Luke Chavez; Nicole Aimone
Cc:	Lauren Duncan; Kevin Stewart
Subject:	FW: Hazard Mitigation Plan Update - Mitigation Strategy Meeting
Start:	Tuesday, September 28, 2021 10:00:00 AM
End:	Tuesday, September 28, 2021 12:00:00 PM
Location:	250 Norton Dr, Black Hawk, CO 80422

-----Original Appointment-----
From: Nate Whittington <nwhittington@gilpincounty.org>
Sent: Wednesday, September 1, 2021 3:07 PM
To: Nate Whittington; grey.lacerte@state.co.us; Craig Eicher; Jill Carlson; Angela Gee; Bill McCormick; Brandon Daruna; Diane Stundon; Patricia Gavelda; cbondus@timberlinefire.com; Michelle Moriarty; Tracey Kern (tracey.kern@usda.gov); Brett Schroetlin; Lauren Duncan; Emily Alvarez; Mark Thompson; Dam Dillon; Sean Wheeler; Erika Roberts; Gary Allen (gallen@centralcityfire.org); Suzanne Boccia - Clear Creek OEM (sboccia@clearcreeksheriff.us); Sean Stanfield; Matt Petty - Colorado State Patrol (matthew.petty@state.co.us); Paul Ondr; Jane Anne Thomas (jthomas@clearcreeksheriff.us); Hal Grieb; Caitlin Lovett; Kevin Armstrong; Tami Archer; Stephen Strohminger; Mike Chard (mchard@bouldercounty.org); David MacKenzie; Ed Leblanc; Field, Scott; Lyssa Gray; Scott Haas (scott.haas@usda.gov); Karen Berry; Dan Prenzlow; Jennifer Cook - CSU; Dave Rich; Greg Hanson (gregory.hanson@noaa.gov); Holly Woodings; Chris Woolley - Black Hawk Fire Department (cwoolley@cityofblackhawk.org); Tonia Kapke; Todd Farrow (todd.farrow@state.co.us); Robert Reid; Kevin Stewart; Luke Chavez; Nicole Aimone
Cc: Lauren Duncan; Kevin Stewart
Subject: Hazard Mitigation Plan Update - Mitigation Strategy Meeting
When: Tuesday, September 28, 2021 10:00 AM-12:00 PM (UTC-07:00) Mountain Time (US & Canada).
Where: 250 Norton Dr, Black Hawk, CO 80422

This meeting will be held at the Gilpin County Rec Center in the Multi-Purpose Room. I will be sending out a TEAMS meeting link soon

Gilpin County Mit Strat Meeting

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Agenda

1. Introductions
2. Review of the Hazard Mitigation Planning Process
3. Update Mitigation Goals & Objectives
4. Review Progress on Mitigation Actions from 2016 Plan
5. Review of Mitigation Action Categories
6. Development of New Mitigation Actions
7. Next Steps
8. Questions and answers

Gilpin County Hazard Mitigation Plan 2021 Update

Mitigation Strategy Meeting Summary

September 28, 2021, 10:00 am – 12:00 pm

Introductions

Scott Field, Project Manager, Wood Environment and Infrastructure Solutions (Wood), kicked off the combined in-person/virtual meeting and thanked everyone for their participation. Scott introduced the Wood team and led a roll call of attendees to introduce themselves. In total 22 individuals participated in the webinar, 9 in person and 13 online, representing Gilpin County and participating jurisdictions including municipalities and special districts as well as stakeholders and partner organizations.

Participants:

1. Scott Field, Wood PLC
2. Christopher Johnson, Wood PLC
3. Diane Stundon, Gilpin County OEM
4. Holly Woodings, United Power
5. David Rich, Gilpin Public Works
6. Jennifer Cook, Gilpin CSU Extension
7. Gary Allen, Central City Fire Department
8. Matt Petty, Colorado State Patrol
9. Chris Woolley, Black Hawk Fire Department
10. Emily Alvarez, Community Planner, FEMA Region 8
11. Brandon Daruna, Gilpin County EMS, Chief
12. Debbie Goerlitz, Colorado Department of Public Safety DHSEM, Mitigation Project Specialist
13. Hal Grieb, Emergency Management Director, Jefferson County
14. Mark Thompson, Colorado DHSEM
15. Grey La Certe, DHSEM Field Manager
16. Jeff Heng, Gilpin County, County Manager's Office
17. Scott Haas, US Forest Service – Clear Creek Ranger District, District Ranger
18. Adam Dillon, United Power, Mountain Area Manger
19. Tami Archer, Gilpin County, Planner
20. William Walker, Xcel Energy, Program Manager Enterprise Preparedness
21. Julie Beyers, State of Colorado Mitigation Specialist
22. Paul Ondr

Review of the Planning Process

The FEMA planning process steps were recapped; Wood is currently wrapping up the Risk Assessment process and beginning the mitigation strategy portion. This webinar addressed mitigation strategizing and goal review/development aspects.

The roles of the participating jurisdictions in the HMPC vs. Stakeholders were reviewed, as differentiated under FEMA's eyes. Only the participating jurisdictions, will be specifically addressed in the plan and will be required to meet certain criteria such as attending planning meetings, identifying mitigation actions, and tracking other aspects in order to qualify for funding in the future. While other entities (i.e. everyone else) were key stakeholders that would provide useful input and feedback as well as review the Hazard Mitigation Plan (HMP) drafts.

The progress on the plan update process to date was reviewed. Highlights include:

- Kickoff meeting held June 14th
- Risk Assessment meeting held August 17th
- Online Public Survey closed July 31st
- HIRA Draft out for HMPC review in the coming week

Public Survey Results

In total 163 responses were received in the public survey. Of the respondents a majority, 152 indicated they live in the Unincorporated Gilpin County and 83 persons noted living in community for over 10 years. The survey also asked, "How many times has a natural hazard disrupted your daily life in the last five years?". Most individuals noted their daily life being disrupted 1-5 times in the past five years.

The top five hazards of concern based on this public survey were:

- Wildfire
- Winter Storm
- Severe Wind
- Drought
- Lightning

The final question reviewed was asking the public to indicate the types of mitigation actions that they think should have the highest priority in the plan update. The top five actions indicated by the public were:

- Wildfire Fuels Treatment Projects
- Evacuation Route Development
- Wind Hazard Mitigation
- Public Education/Awareness
- Improving reliability of communications systems

Handouts showing the entire survey results were emailed to the meeting attendees. The HMPC and stakeholders were encouraged to review the survey results and take them into account when developing mitigation goals, objectives, and actions.

2021 Hazard Summary

The Hazard Summary table was briefly reviewed. There was some discussion amongst the group concerning how the impacts of various hazards may differ depending on who is being asked. The group then reviewed the risk summary rankings by jurisdictions. The HMPC will also have an additional opportunity to review the overall significance of each hazard and provide comments while reviewing the draft HIRA.

Mitigation Goals and Objectives

The goals from the 2016 Hazard Mitigation Plan were revisited and results from the Webinar #2 Post Meeting Survey was discussed. Key differences between "goals," "objectives" and "actions" were defined: goals and objectives are usually more general and broad guidelines while actions are specific and project-driven. Projects submitted for grant funding will need to tie back to goals and objectives in the HMP. The 2021 Gilpin County Hazard Mitigation Plan goals and objectives are as follows:

Goals and Objectives:

- Goal 1: Protection of people, property, and natural, cultural, and environmental resources.
    - 1.1: Develop projects focused on preventing loss of life and injuries from natural hazards.
    - 1.2: Identify and prioritize actions to protect critical, essential and necessary assets and infrastructure.
    - 1.3: Protect and enhance natural resources by adopting and implementing sustainable flood-management policies, debris management programs, snow removal, tree trimming and replacement, or energy conservation programs.
    - 1.4: Identify and expand emergency services protocols for people who are at high risk from hazard events, such as the homeless, elderly, disabled, and oxygen-dependent people.
    - 1.5: Identify and provide for necessary construction, renovation, retrofitting or refurbishment to protect vulnerable structures and cultural resources from the effects of natural hazards.
- Goal 2: Increase awareness of natural hazards and their mitigation.
    - 2.1: Continue to develop and expand public awareness and information programs.
    - 2.2: Expand public awareness of flood and flash flood hazards in general and at specific high-risk locations.
    - 2.3: Expand public awareness of wildfire hazards and measures by which people can protect themselves, their property and their community.
- Goal 3: Coordinate and integrate hazard mitigation activities.
    - 3.1: Strengthen connections between hazard mitigation activities; and preparedness, response and recovery activities.
    - 3.2: Identify systems, and areas of improvement needed, to implement emergency operations plans and services, including Community Emergency Response Team training.
    - 3.3: Identify existing local government monitoring and decision-making tools; identify gaps and needed improvements.
    - 3.4: Reduce services interruptions and revenue losses to the local community and the region from natural hazards, including traffic interruptions.

Review of Progress on Existing Mitigation Actions

Prior to the webinar, a Mitigation Action Tracker was sent to the HMPC listing each jurisdictions' 2016 mitigation actions. Each HMPC representative was asked to provide status to provide comments on the status of each action. The Tracker was emailed again following the webinar to fill in some of the missing statuses. The mitigation action statuses are categorized as one of the following: Completed, Annual Implementation, In Progress, Not Started, and Deleted.

Some examples of "Deleted" actions may be due to lack of project applicability over time, or even inability to complete a project in an area where the community does not have control/jurisdiction (e.g. state owned vs. federal land).

Annual Implementation are actions that a jurisdiction is conducting on an ongoing basis, but which the jurisdiction wants to continue forward into the updated plan to maintain visibility on the action.

Mitigation Actions

An overview of a few mitigation actions was given, as well as a discussion on what kinds of activities FEMA considers to be mitigation. There are several ways to categorize mitigation actions. One way to think of mitigation actions is the four A's:

- Altering a hazard,
- Averting a hazard,
- Avoiding a hazard,
- Adapting to a hazard

FEMA suggests these four categories for mitigation actions:

- Plans and Regulations,
- Structure and Infrastructure Projects,
- Education and Awareness, and
- Natural Systems Protection.

The Community Rating Systems also categorizes actions as follows:

- Prevention
- Structural projects
- Public information
- Natural resource protection
- Property protection
- Emergency services

Resources for more details on mitigation action types, categories, and example projects were provided, including a short discussion on climate change and adaptation considerations. Example hazard-specific mitigation projects were discussed including FEMA funding-eligible projects for wildfire, floodin, and other hazards.

Scott asked the group if there were any thoughts or questions about past, present, or potential future mitigation actions. Holly Woodings with United Power noted that a generator was just installed at the Gilpin County school/emergency center. Matt Petty brought up the potential for geothermal retrofits and asked whether that would fall under climate resilient mitigation activities. Emily Alvarez with FEMA Region VIII provided the definition of an "economically disadvantaged community" in the context of BRIC.

Developing New Mitigation Actions

Each participating jurisdiction is required to develop at least one new action for the 2021 plan update. Ideally, jurisdictions should develop actions that address all the hazards addressed in the plan, or at least the High significance hazards, but FEMA Region VIII does not require this. All jurisdictions that participate in the National Flood Insurance Program (NFIP) will need to have a mitigation action addressing continued NFIP compliance.

The following are resources with ideas and examples of mitigation actions and implementation:

- FEMA's Mitigation Idea: https://www.fema.gov/media-library/assets/documents/30627
- Colorado Planning for Hazards Guide: https://planningforhazards.com/home

A link to the New Mitigation Action Survey was shared during the meeting and emailed after. Each HMPC member was asked to fill out the survey with at least one mitigation action. For those in person at the meeting, Scott and Christopher led an exercise for all those present to come up with at least one new mitigation action, and then to prioritize those actions using the STAPLEE criteria.

- New Mitigation Actions Survey: https://forms.office.com/r/sLFtRuDV1q

Next Steps

The next steps in the HMP update process were briefly discussed and the project milestones and prospective timeline for task completions were presented. The Wood team mentioned that the next HMPC meeting will include prioritizing new mitigation actions and reviewing the draft plan. The specific day and time would be set soon.

Project Milestone	Anticipated Timeline
• Updated HIRA for Review	Early October
• HMPC Review Draft	Late October
• Public Review Draft	November
• CO DHSEM Review	December
• FEMA Review (estimated)	January 2022
• Final Approved HMP for local adoption	February 2022

Questions and Answers/Adjourn

The meeting adjourned around 12:00 pm. Points of Contact for this HMP update effort:

Scott Field
Wood E&IS Project Manager
scott.field@woodplc.com
303-742-5320

Nate Whittington
Gilpin County OEM
nwhittington@gilpincounty.org
303-515-4320

Gilpin County Hazard Mitigation Plan Update

Mitigation Strategy Meeting Chat Log

10:06:34 From Christopher Johnson to Everyone:
Thanks for joining everyone. We're working on a couple technical difficulties right now but we'll be getting started in a minute. Thanks for hanging tight!

10:08:13 From Christopher Johnson to Everyone:
In the meantime, for attendance and participation purposes, could I have everyone online type your name, title, and organization/affiliation in the chat. This would be very helpful for us to track who participates. Thank you!

10:08:46 From Emily Alvarez, FEMA R8 (she/her) to Everyone:
Emily Alvarez, Community Planner, FEMA R8 – Mitigation

10:08:49 From Brandon Daruna to Everyone:
Brandon Daruna - Chief - Gilpin EMS

10:09:19 From Debbie Goerlitz to Everyone:
Debbie Goerlitz - Mitigation Project Specialist @ the Colorado Dept. of Public Safety, Div. of Homeland Security & Emergency Mgmt.

10:09:33 From Hal Grieb (JeffCo EM Director) to Everyone:
Hal Grieb Jefferson County Emergency Management Director

10:09:37 From Mark Thompson (DHSEM) to Everyone:
Mark Thompson, DHSEM

10:09:48 From Grey La Certe to Everyone:
Grey La Certe, DHSEM Field Manager

10:10:11 From Jeff Heng to Everyone:
Jeff Heng, County Mgr's office, Gilpin County.

10:10:16 From Scott Haas, USFS to Everyone:
Scott Haas, District Ranger, Clear Creek Ranger District, US Forest Service

10:10:44 From Adam iPhone - 00008020-000470A82E43002E to Everyone:
Adam Dillon Mountain Area Manager United Power

10:11:09 From Tami Archer to Everyone:
Tami Archer, Planner Gilpin County

10:11:55 From William Walker to Everyone:
William Walker Program Manager, Enterprise Preparedness, Xcel Energy

10:12:14 From Julie Beyers - CDPS to Everyone:
Julie Beyers, State of Colorado Mitigation Specialist

10:18:58 From Mark Thompson (DHSEM) to Everyone:
That's a good number of public responses!

10:37:18 From Christopher Johnson to Everyone:
https://www.fema.gov/sites/default/files/2020-08/fema_mitigation-action-portfolio-support-document_08-01-2020_0.pdf

10:37:44 From Christopher Johnson to Everyone:
Here are a coupe of those resources Scott just mentioned

10:46:02 From Emily Alvarez, FEMA R8 (she/her) to Everyone:
"An economically disadvantaged rural community is a community of 3,000 or fewer individuals identified by the applicant that is economically disadvantaged, with residents having an average per capita annual income not exceeding 80% of the national per capita income, based on best available data."

10:48:50 From Mark Thompson (DHSEM) to Everyone:
https://cwcb.colorado.gov/FACE

10:51:21 From Mark Thompson (DHSEM) to Everyone:
A tool to look at how different climate change & population growth scenarios will impact Gilpin County with respect to fire, flood, and drought.

10:52:09 From Mark Thompson (DHSEM) to Everyone:
Sorry, "may" impact.

10:55:15 From Emily Alvarez, FEMA R8 (she/her) to Everyone:
Did anyone else lose the room's audio?

10:55:24 From Hal Grieb (JeffCo EM Director) to Everyone:
yes it froze

10:55:24 From Grey La Certe to Everyone:
Yes

10:55:54 From Christopher Johnson to Everyone:
Sorry about that everyone, the computer running the slides and the OWL conference robot just died

10:56:10 From Christopher Johnson to Everyone:
We're getting the charger plugged in now and then we should be back up and running!

11:02:15 From Christopher Johnson to Everyone:
Everyone can still hear, right?

11:02:54 From Emily Alvarez, FEMA R8 (she/her) to Everyone:
We can hear :)

11:14:21 From Christopher Johnson to Everyone:
https://planningforhazards.com/home

11:14:36 From Christopher Johnson to Everyone:
Link for the DOLA "Planning for Hazards" Guide

11:15:03 From Christopher Johnson to Everyone:
The FEMA Mitigation Action Portfolio was sent earlier in the chat

11:16:14 From Mark Thompson (DHSEM) to Everyone:
Yes

11:25:03 From Christopher Johnson to Everyone:
https://forms.office.com/r/sLFtRuDV1q

11:31:26 From Christopher Johnson to Everyone:
For anyone doing the online version of the forms survey, please go ahead and enter the prioritization of the action

11:32:29 From Christopher Johnson to Everyone:
Also please let me know if you are unable to access it

12:01:02 From Emily Alvarez, FEMA R8 (she/her) to Everyone:
I have to run. Thanks, everyone! :)

Review the proposed new mitigation actions and use the STAPLE/E criteria to begin prioritizing each action. Mark a plus sign (+) or minus sign (-) or blank under each category if you think it is a positive, negative, or neutral for the project.

Action	Hazard	Social	Technical	Admin.	Legal	Economic	Environmental	Other	Total +/-
MM IMPLE.	WILDFIRE	+	+	+	-	+	+		+5
MM PLANNING	WILDFIRE	+	+	+	-	+	+		+5

Review the proposed new mitigation actions and use the STAPLE/E criteria to begin prioritizing each action. Mark a plus sign (+) or minus sign (-) or blank under each category if you think it is a positive, negative, or neutral for the project.

Action	Hazard	Social	Technical	Admin.	Legal	Economic	Environmental	Other	Total +/-
Identify areas for Fuels reduction									
in Maryland Mtn									
Marilyn Mtn Fuels Reduction									+
Evacuation Route									+
Weed Mitigation									
Single Lane Road Improvement									+
Reduce Fuels Wildfire.Mit.									+

Review the proposed new mitigation actions and use the STAPLE/E criteria to begin prioritizing each action. Mark a plus sign (+) or minus sign (-) or blank under each category if you think it is a positive, negative, or neutral for the project.

Action	Hazard	Social	Technical	Admin.	Legal	Economic	Environmental	Other	Total +/-
MC MTN FIRE MITIGATION	FIRE	+		+		+	+		
STUDY ON ↑	FIRE								

Review the proposed new mitigation actions and use the STAPLE/E criteria to begin prioritizing each action. Mark a plus sign (+) or minus sign (-) or blank under each category if you think it is a positive, negative, or neutral for the project.

Action	Hazard	Social	Technical	Admin.	Legal	Economic	Environmental	Other	Total +/-
BH FUELS REDUCTION	+	+	-	-	+	-	+		
TRAFFIC	+	+	-	+	+	+	+		

Review the proposed new mitigation actions and use the STAPLE/E criteria to begin prioritizing each action. Mark a plus sign (+) or minus sign (-) or blank under each category if you think it is a positive, negative, or neutral for the project.

Action	Hazard	Social	Technical	Admin.	Legal	Economic	Environmental	Other	Total +/-
*① MD. Mt Fuels reduction.					✓		✓		
Fuels Reduction Mapping									
② Evacuation Routes identified (Free)		✓			✓			Life safety.	- Add fuels thinning along routes
Weeds - can combine with ①②③ projects.						✓	✓		- combine with other projects.
② Fuels Reduction along Roads and widening									
③ Roadside slash pickup projects + education.		✓				✓	✓		

Example Mitigation Action Items

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Drought	Weather Extremes (hail, lightning, temps,)	Wind/ Tornado	Wildland Fires	Severe Winter Storm
PREVENTION								
Building codes and enforcement		■	■	■	■	■	■	■
Comprehensive Watershed Tax		■						
Density controls	■	■	■				■	
Design review standards		■	■	■		■	■	
Easements		■	■				■	
Environmental review standards		■	■				■	
Floodplain development regulations	■	■	■					
Hazard mapping	■	■	■				■	
Floodplain zoning	■	■	■					
Forest fire fuel reduction			■				■	
Housing/landlord codes			■	■	■			
Slide-prone area/grading/hillside development regulations							■	
Manufactured home guidelines/regulations		■			■	■		
Minimize hazardous materials waste generation			■					
Multi-Jurisdiction Cooperation within watershed	■	■		■				
Open space preservation	■	■					■	
Performance standards	■	■		■	■	■	■	■
Periodically contain/remove wastes for disposal			■					
Pesticide/herbicide management regulations			■					
Special use permits	■	■	■				■	
Stormwater management regulations		■	■					
Subdivision and development regulations	■	■	■	■		■	■	
Surge protectors and lightning protection					■			
Tree Management				■	■	■	■	■
Transfer of development rights		■					■	
Utility location			■		■	■		■

PROPERTY PROTECTION								
Acquisition of hazard prone structures	■	■					■	
Facility inspections/reporting	■	■	■					
Construction of barriers around structures	■	■	■					
Elevation of structures	■	■						
Relocation out of hazard areas	■	■	■				■	
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■
PUBLIC EDUCATION AND AWARENESS						■		
Debris Control		■				■		
Flood Insurance	■	■						
Hazard information centers	■	■	■	■	■	■	■	■
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure	■	■	■		■		■	■
Crop Insurance				■	■			
Lightning detectors in public areas					■			
NATURAL RESOURCE PROTECTION								
Best Management Practices (BMPs)		■	■	■	■		■	
Forest and vegetation management	■	■		■	■		■	■
Hydrological Monitoring	■	■	■	■	■			
Sediment and erosion control regulations	■	■	■	■				
Stream corridor restoration		■						
Stream dumping regulations		■	■					
Urban forestry and landscape management		■		■	■		■	■
Wetlands development regulations		■	■				■	
EMERGENCY SERVICES								
Critical facilities protection	■	■	■	■	■	■	■	■
Emergency response services	■	■	■		■	■	■	■
Facility employee safety training programs	■	■	■		■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■		■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■	■	■	■	■	■	■
Evacuation planning	■	■	■				■	

STRUCTURAL PROJECTS								
Channel maintenance		■						
Dams/reservoirs (including maintenance)	■	■						
Isolate hazardous materials waste storage sties			■					
Levees and floodwalls (including maintenance)		■						
Safe room/shelter					■	■		■
Secondary containment system			■					
Site reclamation/restoration/revegetation		■	■	■				
Snow fences								■
Water supply augmentation				■	■			

Gilpin County Sheriff's Office
July 22, 2021 ·

IF YOU LIVE, WORK, OR PLAY IN GILPIN COUNTY, WE NEED YOUR INPUT!

#GilpinCountyEmergencyManagement & #GilpinCountyCommunityDevelopment , in collaboration with the Cities of Blackhawk, Central City, and the Timberline Fire Protection District, are updating the County's Hazard Mitigation Plan. The Multi-Jurisdictional Hazard Mitigation Plan analyzes the County's vulnerabilities to natural hazards and identifies mitigation actions the jurisdictions in Gilpin County can take to minimize property damage and reduce the loss of life by lessening the impacts of disasters.

If you live, work, or play in Gilpin County, please help us incorporate your experience and opinions into the plan by taking this short online survey. This will help the planning team better understand the vulnerabilities within Gilpin County and its jurisdictions, and to solicit input on ways to best mitigate, or reduce, the impacts of hazards before they occur.

The survey consists of 9 questions and should take less than 10 minutes to complete. Please complete this survey by August 23, 2021. Thank you for your participation!

You can take the survey here by clicking this link: https://forms.office.com/r/JSynCszw1r or go to the Gilpin County Sheriff's Office Website at https://gilpincountysheriff.org

14 3 Comments 7 Shares

Like Comment Share

Gilpin OEM

July 22, 2021 ·

We need your input!

Gilpin County Office of Emergency Management & Gilpin County Community Development , in collaboration with the Cities of Black Hawk, Central City and the Timberline Fire Protection District, are updating the County's Hazard Mitigation Plan. The Multi-Jurisdictional Hazard Mitigation Plan analyzes the County's vulnerabilities to natural hazards and identifies mitigation actions the jurisdictions in Gilpin County can take to minimize property damage and reduce the loss of life by lessening the impacts of disasters.

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You can take the survey here:

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6

7 Shares

Like Comment Share

Central City

July 22, 2021 ·

Input requested for hazard planning.

Gilpin County Sheriff's Office

July 22, 2021 ·

IF YOU LIVE, WORK, OR PLAY IN GILPIN COUNTY, WE NEED YOUR INPUT!

#GilpinCountyEmergencyManagement & #GilpinCountyCommunityDevelopment , in collaboration with ... See more

2

1 Share

Like Comment Share

Timberline Fire Protection District

July 22, 2021 ·

Gilpin OEM

July 22, 2021 ·

We need your input!

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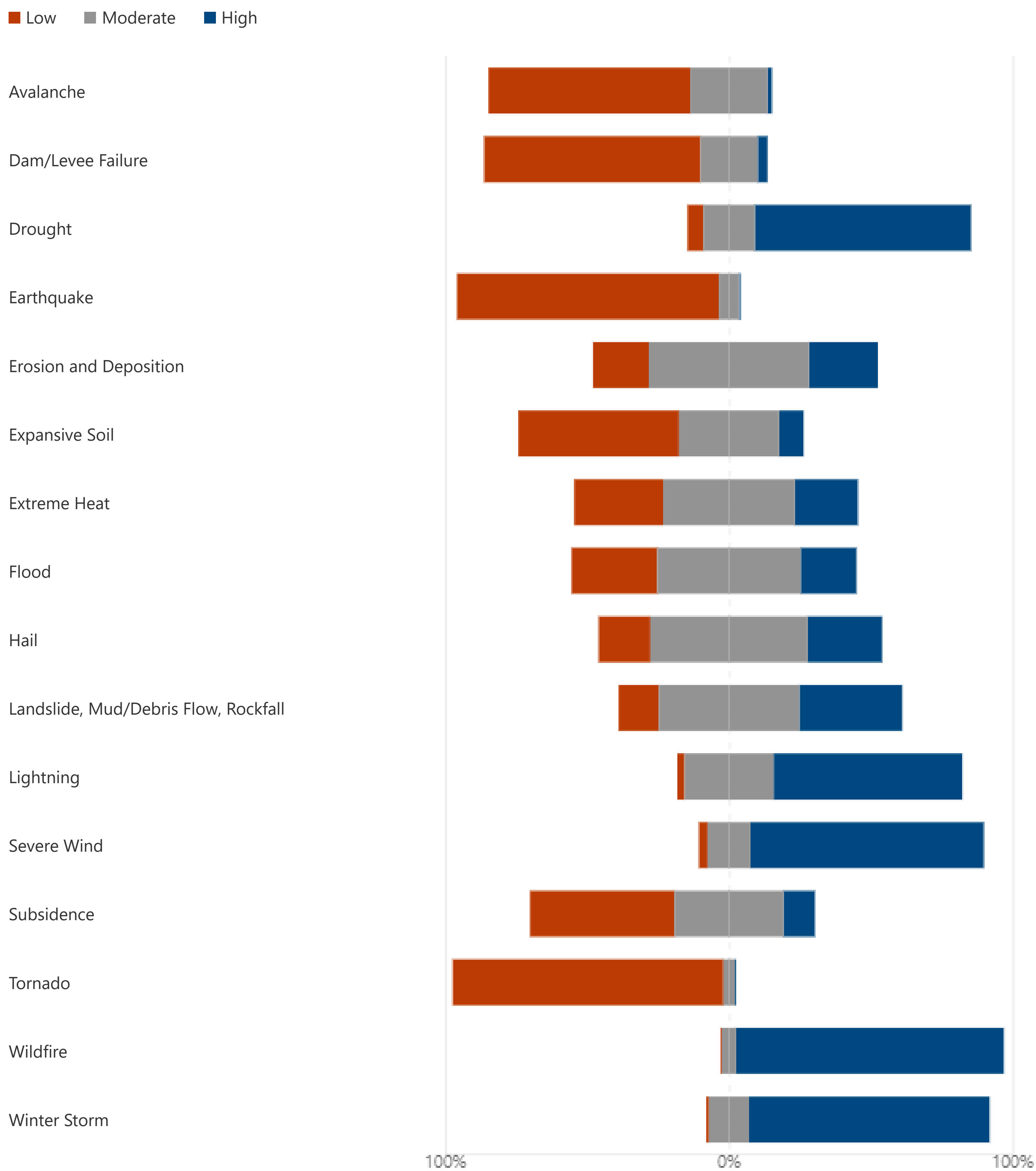
Appendix D: Public Survey Results

Forms(https://www.office.com/launch/forms?auth=2&from=FormsDomain) ?

Gilpin County Hazard Mitigation Plan Update Public Input Survey

163	08:50	Closed
Responses	Average time to complete	Status

1. Please rank how significant each of the following natural hazards is in terms of their impacts on Gilpin County.



2. How many times has a natural hazard disrupted your daily life in the last five years?

0	25
1-2	53
3-5	45
More than 5 times	37
Other	2

3. 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:

73

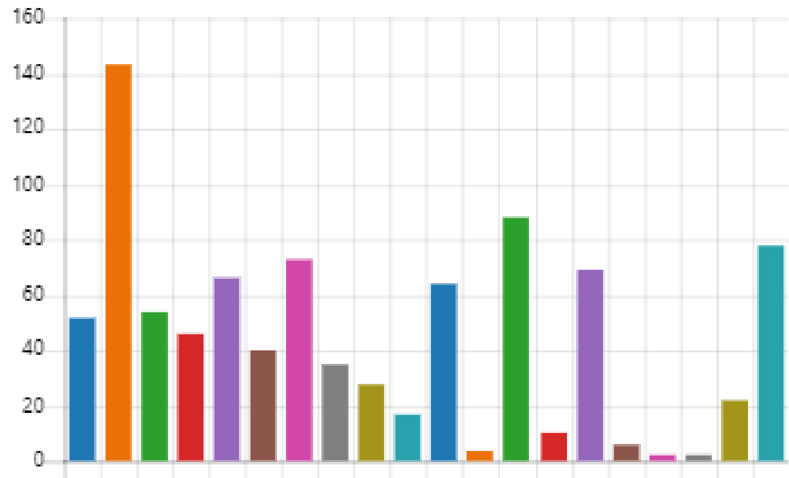
Responses

Latest Responses

23 respondents (**32**%) answered **fire** for this question.

4. The following types of mitigation actions may be considered in Gilpin County. Please indicate the types of mitigation actions that you think should have the highest priority in the Gilpin County Multi-Jurisdictional Hazard Mitigation Plan.

Indoor/Outdoor Warning syst...	52
Wildfire Fuels Treatment proje...	143
Continued Participation in the ...	54
Critical Facilities Protection	46
Generators for Critical Facilities	66
Planning/Zoning	40
Public Education/Awareness	73
Stormwater Drainage Improve...	35
Stream Restoration	28
Education and Discounts on Fl...	17
Water Conservation	64
Floodprone Property Buyout	4
Evacuation route development	88
Dam safety	10
Improve reliability of commun...	69
Levee enhancements/improve...	6
Seismic retrofit to public build...	2
Seismic safety for residential b...	2
Subsidence hazard mitigation	22
Wind hazard mitigation	78



5. Please comment on any other pre-disaster mitigation actions that the planning committee should consider for reducing future losses caused by disasters:

32

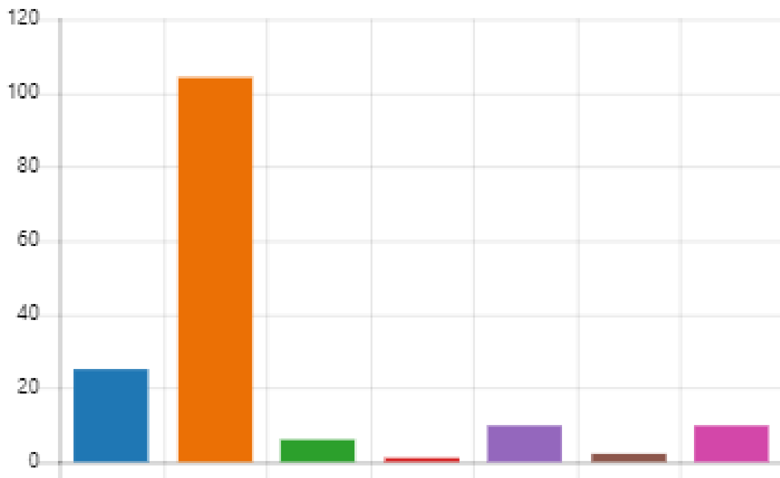
Responses

Latest Responses

4 respondents (**13**%) answered **people** for this question.

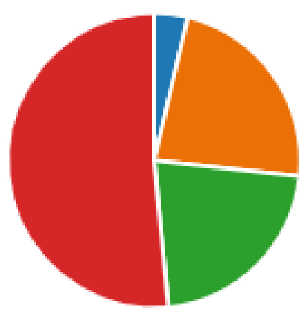
6. Which of the following best describes where you live in Gilpin County?

North County including but n...	25
Mid County including but not ...	104
South County including but n...	6
Within the city limits of Black ...	1
Within the city limits of Centra...	10
Unsure	2
Other	10



7. How long have you lived in this community?

Less than 1 year	6
1-5 years	37
5-10 years	35
over 10 years	83

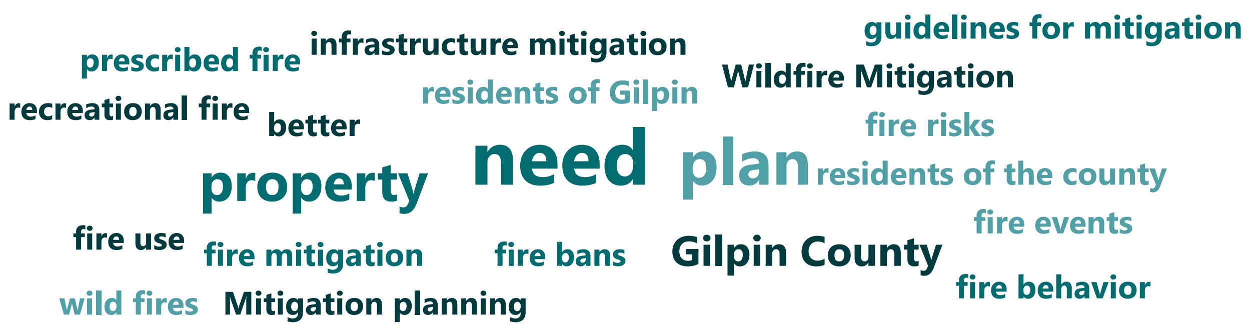


8. Optional: Provide any additional comments you have which you feel are relevant for the Hazard Mitigation plan update:

31
Responses

Latest Responses

7 respondents (**23**%) answered **need** for this question.

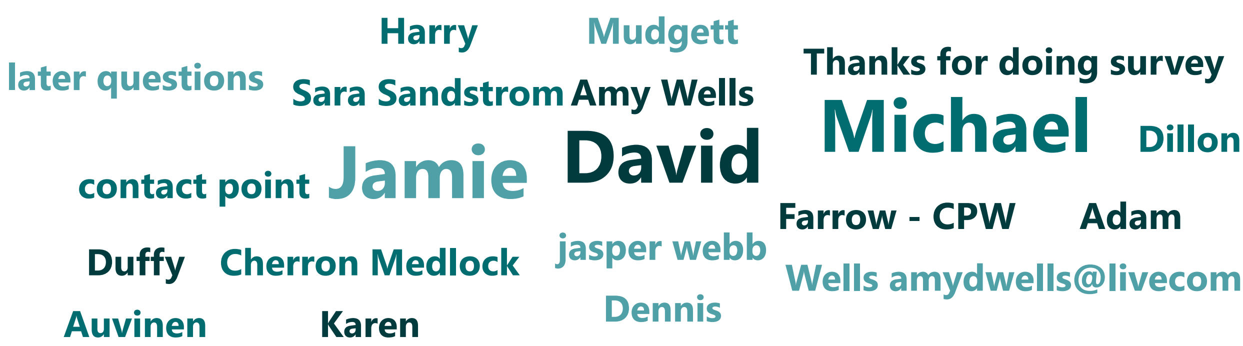


9. Optional: Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to this planning process:

46
Responses

Latest Responses

2 respondents (**4**%) answered **David** for this question.



APPENDIX E: REFERENCES

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APPENDIX F: ACRONYMS AND DEFINITIONS

ACRONYMS

%g	Percentage of gravity
°C	Degrees Celsius
°F	Degrees Fahrenheit
ACS	American Community Survey
BCA	Benefit-Cost Analysis
BCC	Board of County Commissioners
BCEGS	Building Code Effectiveness Grading Schedule
BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure and Communities
CDC	Centers for Disease Control and Prevention
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health & Environment
CERT	Community Emergency Response Team
CDSB	Colorado Dam Safety Division
CFR	Code of Federal Regulations
CGS	Colorado Geological Survey
CIP	Capital Improvement Plan
CIS	Community Information System
CISA	Cyber & Infrastructure Security Agency
COOP	Continuity of Operations Plan
COVID-19	Coronavirus Disease 2019
CRS	Community Rating System
CSFS	Colorado State Forest Service
CWCB	Colorado Water Conservation Board
CWPP	Community Wildfire Protection Plan
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Maps
DHSEM	Division of Homeland Security and Emergency Management
DMA	Disaster Mitigation Act
DMV	Department of Motor Vehicles

DNR	Colorado Department of Natural Resources
DOLA	Colorado Department of Local Affairs
DOT	U.S. Department of Transportation
DR	(Major) Disaster Declaration
DRCOG	Denver Regional Council of Governments
DWR	Colorado Department of Water Resources
EAP	Emergency Action Plan
ECOS	Environmental Conservation Online System
EF	Enhanced Fujita
EM	Emergency Declarations
EMPG	Emergency Management Performance Grant
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flooding Mitigation Assistance
FM	Fire Management Declaration
FPD	Fire Protection District
GIS	Geographic Information System
HAZMAT	Hazardous Materials
Hazus-MH	Hazards, United States-Multi Hazard
HIFLD	Homeland Infrastructure Foundation-Level Data
HHPD	High Hazard Potential Dam
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMPC	Hazard Mitigation Planning Committee

HIRA	Hazard Identification and Risk Assessment
HUD	Housing and Urban Development
HPL	High Potential Loss
IBC	International Building Code
ICC	International Code Council
ISO	Insurance Services Office
LAL	Lightning Activity Level
LEPC	Local Emergency Planning Committee
LHMP	Local Hazard Mitigation Plan
MHFD	Mile High Flood District
MMI	Modified Mercalli Scale
MPH	Miles per Hour
NASA	National Aeronautics and Space Administration
NCEI	National Centers for Environmental Information
NDMC	National Drought Mitigation Center
NFDRS	National Fire Danger Rating System
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NEPA	National Environmental Policy Act
NID	National Inventory of Dams
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRC	U.S. Coast Guard’s National Response Center
NRP	Natural Resource Protection
NWS	National Weather Service
OEM	Office of Emergency Management
OIT	Office of Information Technology (State of Colorado)
ORM	Colorado Office of Risk Management
OSHA	Occupational Safety and Health Administration
PGA	Peak Ground Acceleration

PIF	Pandemic Intervals Framework
PPE	Personal Protective Equipment
RMIIA	Rocky Mountain Insurance Information Association
SBA	Small Business Administration
SCADA	Supervisory Control and Data Acquisition
SCENIC	Southwest Climate and Environmental Information Collaborative
SFHA	Special Flood Hazard Area
SRL	Severe Repetitive Loss Properties
THIRA	Threat and Hazard Identification and Risk Assessment
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFW	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WHO	World Health Organization
WRCC	Western Regional Climate Center
WUI	Wildland Urban Interface

DEFINITIONS

100-Year Flood: The term “100-year flood” can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1% chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the 1% annual chance flood, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program (NFIP).

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Active Threat: A dynamic, quickly evolving situation involving an individual (or individuals) using deadly physical force, such as firearms, bladed weapons, or a vehicle.

> **Active Shooter**: One or more individuals actively engaged in killing or attempting to kill people in a populated area. The terms active threat and active shooter are often used interchangeably.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Avalanche: Any mass of loosened snow or ice and/or earth that suddenly and rapidly breaks loose from a snowfield and slides down a mountain slope, often growing and accumulating additional material as it descends.

Slab avalanches: The most dangerous type of avalanche, occurring when a layer of coherent snow ruptures over a large area of a mountainside as a single mass. Like other avalanches, slab avalanches can be triggered by the wind, by vibration, or even by a loud noise, and will pull in surrounding rock, debris, and even trees.

Climax avalanches: An avalanche involving multiple layers of snow, usually with the ground as a bed surface.

Loose snow avalanches: An avalanche that occurs when loose, dry snow on a slope becomes unstable and slides. Loose snow avalanches start from a point and gather more snow as they descend, fanning out to fill the topography.

Powder snow avalanches: An avalanche that occurs when sliding snow has been pulverized into powder, either by rapid motion of low-density snow or by vigorous movement over rugged terrain.

Surface avalanches: An avalanche that occurs only in the uppermost snow layers.

Wet snow avalanche: An avalanche in wet snow, also referred to as a wet loose avalanche or a wet slab avalanche. Often the basal shear zone is a water-saturated layer that overlies an ice zone.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1% chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the NFIP are protected to the same degree against flooding.

Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as "watersheds" and "drainage basins."

Benefit: A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit/cost analysis of proposed mitigation measures, benefits are limited to specific, measurable risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

Benefit/Cost Analysis: A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building: A building is defined as a structure that is walled and roofed, principally aboveground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment: A capability assessment provides a description and analysis of a community's current capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community's actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified. The following capabilities were reviewed under this assessment:

- Legal and regulatory capability
- Administrative and technical capability
- Fiscal capability

Community Rating System (CRS): The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Conflagration: A fire that grows beyond its original source area to engulf adjoining regions. Wind, extremely dry or hazardous weather conditions, excessive fuel buildup, and explosions are usually the elements behind a wildfire conflagration.

Critical Area: An area defined by state or local regulations as deserving special protection because of unique natural features or its value as habitat for a wide range of species of flora and fauna. A sensitive/critical area is usually subject to more restrictive development regulations.

Critical Facility: Facilities and infrastructure that are critical to the health and welfare of the population. These become especially important after any hazard event occurs. For the purposes of this plan, critical facilities include:

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic or water reactive materials.
- Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for disaster response before, during, and after hazard events.
- Public and private utilities, facilities and infrastructure that are vital to maintaining or restoring normal services to areas damaged by hazard events.
- Government facilities.

Cyber Attack: A deliberate exploitation of computer systems, technology-dependent enterprises, and networks. The term encompasses a variety of malicious activities, as defined in the text.

Dam: A man-made barrier, together with appurtenant structures, constructed above the natural surface of the ground for the purpose of impounding water.

Dam Failure: Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, freezing and thawing cycles, earthquakes, and intentional destruction.

Dam Incident: Situations at dams that require an immediate response by dam safety engineers. These are episodes that without intervention will likely result in a dam failure.

High Hazard Dam: Dams where failure or operational error will probably cause loss of human life.

Significant Hazard Dam: Dams where failure or operational error will result in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities, or can impact other concerns. Significant hazard dams are often located in rural or agricultural areas but could be located in areas with population and significant infrastructure.

Low-Hazard Dam: No probable loss of human life and low economic or environmental losses; losses are principally limited to the owner’s property.

Low Head Dam: Engineered structures built into and across stream and river channels for a variety of purposes. Water flows over the dams continuously, as they span from one riverbank to the other. Low head dams generally range in height from 1-15 feet.

Debris Flow: Dense mixtures of water-saturated debris that move down-valley; looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

Debris Slide: Debris slides consist of unconsolidated rock or soil that has moved rapidly down slope. They occur on slopes greater than 65%.

Disaster Mitigation Act of 2000 (DMA): The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before they occur. Under the DMA, a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP) were established.

Drainage Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Drainage basins are also referred to as **watersheds** or **basins**.

Drought: Drought is a period of time without substantial rainfall or snowfall from one year to the next. Drought can also be defined as the cumulative impacts of several dry years or a deficiency of precipitation over an extended period of time, which in turn results in water shortages for some activity, group, or environmental function. A hydrological drought is caused by deficiencies in surface and subsurface water supplies. A socioeconomic drought impacts the health, well-being, and quality of life or starts to have an adverse impact on a region. Drought is a normal, recurrent feature of climate and occurs almost everywhere.

Earthquake: A sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy.

> **Epicenter**: The point on the earth's surface directly above the hypocenter of an earthquake. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth.
>
> **Fault**: A fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other.
>
> **Focal Depth**: The depth from the earth's surface to the hypocenter.
>
> **Hypocenter**: The region underground where an earthquake's energy originates.
>
> **Liquefaction**: Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

Emergency Action Plan: A document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency.

Epidemic: An infectious disease outbreak affecting a large number of people in a given population in a short period of time.

Erosion: The removal and simultaneous transportation of soil or other earth materials from one location to another by water, wind, waves, or moving ice. Deposition is the placing of eroded material in a new location.

Expansive Soil: Expansive or swelling soils are made up of layers of clay and can expand up to 20% by volume when exposed to water causing more property damage than any other natural hazard.

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Extreme Heat: Summertime weather that is substantially hotter or more humid than average for a location at that time of year.

Fire Behavior: Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

Fire Frequency: Fire frequency is the broad measure of the rate of fire occurrence in a particular area. An estimate of the areas most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

Flood: The inundation of normally dry land resulting from the rising and overflowing of a body of water.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area (SFHA).

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's FIRM. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A FIRM identifies most, but not necessarily all, of a community's floodplain as the SFHA.

1% Annual Chance Floodplain or 100-Year Floodplain: The area flooded by a flood that has a 1% chance of being equaled or exceeded each year. This is a statistical average only; a 100-year flood can occur more than once in a short period of time. The 1% annual chance flood is the standard used by most federal and state agencies.

0.1% Annual Chance Floodplain or 500-Year Floodplain: The area flooded by a flood that has a 0.1% chance of being equaled or exceeded each year. This is a statistical average only; a 500-year flood can occur more than once in a short period of time.

Floodway: Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Floodway Fringe: Floodway fringe areas are located in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Freezing Rain: The result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glaze ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to 6 tons of ice, creating a threat to power and telephone lines and transportation routes.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1% chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita Scale of Tornado Intensity: Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour [mph]) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

Goal: A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people or cause property damage.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazards U.S. Multi-Hazard (Hazus-MH) Loss Estimation Program: Hazus-MH is a GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus-MH software program assesses risk in a quantitative manner to estimate damages and losses associated with natural hazards. Hazus-MH is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards. Hazus-MH has also been used to assess vulnerability (exposure) for other hazards.

Hydrology: Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

Intensity: For the purposes of this plan, intensity refers to the measure of the effects of a hazard.

Inventory: The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Landslide: Landslides can be described as the sliding movement of masses of loosened rock and soil down a hillside or slope. Fundamentally, slope failures occur when the strength of the soils forming the slope exceeds the pressure, such as weight or saturation, acting upon them.

Lightning: Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a “bolt,” usually within or between clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000ºF. The rapid heating and cooling of air near lightning causes thunder. Lightning is a major threat during thunderstorms. In the United States, 75 to 100 Americans are struck and killed by lightning each year (see http://www.fema.gov/hazard/thunderstorms/thunder.shtm).

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Magnitude: Magnitude is the measure of the strength of an earthquake, and is typically measured by the Richter scale. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Malware: Malicious code infecting a computer system.

Mass Movement: A collective term for landslides, debris flows, falls and sinkholes.

Mitigation: A preventive action that can be taken in advance of an event that will reduce or eliminate the risk to life or property.

Mitigation Initiatives (or Mitigation Actions): Mitigation initiatives are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Mudslide, Mudflow, or Debris Flow: A river of rock, earth, organic matter, and other materials saturated with water.

Objective: For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal.

Pandemic: An epidemic that has spread across multiple continents or worldwide, affecting a substantial number of individuals.

Peak Ground Acceleration: Peak Ground Acceleration (PGA) is a measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

Preparedness: Preparedness refers to actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Presidential Disaster Declaration: These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

Probability of Occurrence: The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

Ransomware: A type of malware that encrypts a system's data, which the perpetrators then demand a ransom to restore the data.

Repetitive Loss Property: Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced:

- Four or more paid flood losses in excess of $1000.00; or
- Two paid flood losses in excess of $1000.00 within any 10-year period since 1978 or
- Three or more paid losses that equal or exceed the current value of the insured property.

Return Period (or Mean Return Period): This term refers to the average period of time in years between occurrences of a particular hazard (equal to the inverse of the annual frequency of occurrence).

Riparian Zone: The area along the banks of a natural watercourse.

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Risk: Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment: Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social, and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Robert T. Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

SCADA systems: Supervisory Control and Data Acquisition Systems are control system architecture for operating machinery, utilities, or other systems.

Severe Local Storm: Small-scale atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms, and snowstorms. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area. Typical impacts are on transportation infrastructure and utilities.

Sinkhole: A collapse depression in the ground with no visible outlet. Its drainage is subterranean. It is commonly vertical-sided or funnel-shaped.

Special Flood Hazard Area: The base floodplain delineated on a FIRM. The SFHA is mapped as a Zone A in riverine situations. The SFHA may or may not encompass all of a community's flood problems

Stakeholder: Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

Steep Slope: Different communities and agencies define it differently, depending on what it is being applied to, but generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 33%.

Subsidence: The sinking of the ground over human-caused or natural underground voids, or the settlement of native low-density soils.

Terrorism: The unlawful use of intentional violence to achieve political aims. The term active threat is used here to include terrorism, but the term active shooter is most often used to refer to non-politically motivated acts.

Thunderstorm: A thunderstorm is a storm with lightning and thunder produced by cumulonimbus clouds. Thunderstorms usually produce gusty winds, heavy rains, and sometimes hail. Thunderstorms are usually short in duration (seldom more than 2 hours). Heavy rains associated with thunderstorms can lead to flash flooding during the wet or dry seasons.

Tornado: A tornado is a violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds. On a local scale, tornadoes are the most intense of all atmospheric circulations, and winds can reach destructive speeds of more than 300 mph. A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long.

Vulnerability: Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed: A watershed is an area that drains downgradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Wildfire: Wildfire refers to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Wildland Urban Interface (WUI) Area: An area susceptible to wildfires and where wildland vegetation and urban or suburban development occur together. An example would be smaller urban areas and dispersed rural housing in forested areas.

Windstorm: Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage. Windstorms are especially dangerous in areas with significant tree stands, exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and aboveground utility lines. A windstorm can topple trees and power lines; cause damage to residential, commercial, critical facilities; and leave tons of debris in its wake.

Winter Storm: A storm having significant snowfall, ice, or freezing rain; the quantity of precipitation varies by elevation.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

APPENDIX G: EXAMPLE OF ANNUAL PROGRESS MEETING AGENDA AND REPORT

Gilpin County Hazard Mitigation Plan
Annual Progress Meeting Agenda

1. **Discussion on hazard events and impacts that occurred during the performance period**
2. **Review of progress on mitigation action implementation**
3. **Discussion on success stories**
4. **Recommendations for new actions/projects**
5. **Review of funding options and grant opportunities**
6. **Review of changes in plan maintenance or implementation**
7. **Review of continuing public involvement**

Gilpin County Hazard Mitigation Plan
Annual Progress Report Template

Reporting Period:

Background: Gilpin County along with the cities of Black Hawk and Central City and the Timberline Fire District developed a hazard mitigation plan to reduce risk from all hazards by identifying resources, information, and strategies for risk reduction. The federal Disaster Mitigation Act of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. To prepare the plan, the participating partners organized resources, assessed risks from natural hazards within the County, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from natural hazards. By completing this process, these jurisdictions-maintained compliance with the Disaster Mitigation Act, achieving eligibility for mitigation grant funding opportunities afforded under the Robert T. Stafford Act. The plan can be viewed online at:

Summary Overview of the Plan's Progress: The performance period for the Hazard Mitigation Plan became effective on ____, 2022, with the final approval of the plan by FEMA. The initial performance period for this plan will be 5 years, with an anticipated update to the plan to occur before ______, 2027. The *Gilpin County Hazard Mitigation Plan* has targeted 54 hazard mitigation activities to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

__ out of __ initiatives (__%) reported ongoing action toward completion.

__ out of __ initiatives (__%) were reported as being complete.

__ out of __ initiatives (___%) reported no action taken.

Purpose: The purpose of this report is to provide an annual update on the implementation of the action plan identified in the *Gilpin County Hazard Mitigation Plan*. The objective is to ensure that there is a continuing and responsive planning process that will keep the hazard mitigation plan dynamic and responsive to the needs and capabilities of the partner jurisdictions. This report discusses the following:

- Natural hazard events that have occurred within the last year
- Changes in risk exposure within the planning area (all of Gilpin County)
- Mitigation success stories
- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement

The Hazard Mitigation Planning Committee: The Hazard Mitigation Planning Committee, made up of planning partners and stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on _____, 202_. It was determined through the plan's development process that the HMPC would remain in service to oversee maintenance of the plan. At a minimum, the HMPC will provide technical review and oversight on the development of the annual progress report. It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the HMPC membership present at the meeting is as indicated in Table 1.

Table 1		
Name	**Title**	**Jurisdiction/Agency**

Hazard Events within the Planning Area: During the reporting period, there were ______ hazard events in the planning area that had a measurable impact on people or property. A summary of these events is as follows:

- ________________________
- ________________________
- ________________________

Changes in Risk Exposure in the Planning Area: *(Insert brief overview of any natural hazard event in the planning area that changed the probability of occurrence or ranking of risk for the hazards addressed in the hazard mitigation plan)*

Mitigation Success Stories: *(Insert brief overview of mitigation accomplishments during the reporting period)*

Review of the Action Plan: Table 2 reviews the action plan, reporting the status of each initiative. Reviewers of this report should refer to the *Gilpin County Hazard Mitigation Plan* for more detailed descriptions of each initiative and the prioritization process.

Address the following in the "status" column of the following table:

- *Was any element of the initiative carried out during the reporting period?*
- *If no action was completed, why?*
- *Is the timeline for implementation for the initiative still appropriate?*
- *If the initiative was completed, does it need to be changed or removed from the action plan?*

ID	Title and Description	Hazards Mitigated	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
Gilpin County Mitigation Actions								

Changes That May Impact Implementation of the Plan: *(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan's development)*

Recommendations for Changes or Enhancements: Based on the review of this report by the Hazard Mitigation Planning Committee, the following recommendations will be noted for future updates or revisions to the plan:

____

____

____

____

____

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the governing boards of all planning partners and to local media outlets and the report is posted on the Gilpin County Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

Insert Contact Info Here

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