San Luis Valley Hazard Mitigation Plan 2023-2028

March 2023

Assistance provided by:

WSP

Table of Contents

Appendices

Annexes

Executive Summary

This plan is the product of a 2022 planning process undertaken by the six counties in the San Luis Valley of Southern Colorado – Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache. The purpose is to meet the requirements of the Disaster Mitigation Act of 2000 (PL 106-390), and thereby maintain continued eligibility for certain Hazard Mitigation – or disaster loss reduction – programs from the Federal Emergency Management Agency (FEMA). This plan combines the six county Hazard Mitigation Plans drafted independently in 2017/2018 into one unified regional plan, including an annex for each county, and sets priorities for mitigation in the Region for the time period of 2023-2028.

The process followed a methodology that adheres to FEMA guidance. It consisted of two levels of planning teams; a coordinating Planning Team comprised of the County Emergency Manager Coordinators, and six County Planning Teams (CPT) consisting of local government representatives – one in each county. Every municipality within each county was invited to participate.

The planning process examined the recorded history of losses resulting from natural hazards, and analyzed the future risks posed to each county by these hazards. A hazard identification and risk assessment was updated for the following hazards:

- Avalanche
- Dam Incident
- Drought
- Earthquake
- Flood
- Hailstorm
- Severe Winter Weather
- Wildfire
- High Winds and Tornadoes
- Cyber Attack
- Hazardous Materials Incidents
- Pandemic

Cyber-attack, pandemic, and hazardous materials incident are all new hazards profiled for the plan, which were not included in any county plans previously. Where applicable, these profiles were built on existing information found in the 2018 plans previously completed for each individual county. The hazards were assessed for geographic extent, potential magnitude, probability, vulnerability and given a rating for overall significance. Drought, wildfire, floods, and winter storms tend to cause the most damage or economic loss in the Region.

The plan's mitigation strategy includes goals for each county in the entire planning area. The plan also puts forth county-specific recommendations for mitigation based on the risk assessment that are designed to reduce future losses in each county, and ultimately, within the Region.

1 Introduction

1.1 Purpose

The purpose of this plan is to provide the counties of the San Luis Valley Region, which includes Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache Counties, and their associated jurisdictions, with a comprehensive hazard mitigation strategy for reducing long-term risks to people, property, and natural resources from the effects of hazard events. This plan demonstrates the Region's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan also maintains the planning area's eligibility for certain federal disaster assistance under the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grant programs.

1.2 Participating Jurisdictions

Alamosa County

- City of Alamosa
- Alamosa County Fire Protection District
- Rio Grande Water Conservation District

Conejos County

- Town of Antonito
- Town of La Jara
- Town of Manassa
- Town of Romeo
- Town of Sanford

Costilla County

- Town of San Luis
- Town of Blanca

Mineral County

- City of Creede

Rio Grande County

- City of Monte Vista
- Town of Del Norte
- Town of South Fork

Saguache County

- Town of Center
- Town of Crestone
- Town of Moffat
- Town of Saguache

1.3 Background and Scope

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. This dollar amount only partially reflects the true cost of disasters because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Disasters can weaken local economies and dramatically reduce local tax bases. The rising cost of natural disasters has sharpened interest in identifying effective ways to reduce vulnerability to hazards. Many disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated by implementing cost-effective hazard mitigation measures.

Hazard mitigation is defined by FEMA as any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. 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. 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 (National Institute of Building Science Natural Hazard Mitigation Saves 2019 Report). This plan documents the planning region's hazard mitigation planning process, identifies relevant hazards and risks, and identifies the strategies that each participating County and jurisdiction will use to decrease vulnerability and increase resiliency and sustainability.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. 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 planning area has been affected by hazards in the past and is thus committed to reducing future disaster impacts and maintaining eligibility for federal funding.

1.4 Mitigation Planning Requirements

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the Disaster Mitigation Act (DMA) 2000 implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR §201.6) and finalized on October 31, 2007. These regulations established the requirements that local hazard mitigation plans must meet 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), also known as the Stafford Act.

Significant steps in the process of preparing this updated plan included (a) forming a local planning committee, (b) preparing a strategy for public involvement, (c) identifying and assessing natural hazards, (d) determining the vulnerability of community assets to identified natural hazards, and (e) then determining a corresponding set of measures and actions to minimize or manage those risks.

In order to maintain eligibility for certain FEMA hazard mitigation funds these plans must be updated every five years. This plan underwent a comprehensive update in 2022-2023.

1.5 Grant Programs Requiring Hazard Mitigation Plans

FEMA-approved hazard mitigation plans qualify communities for the following federal mitigation grant programs:

- Hazard Mitigation Grant Program (HMGP)
- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA)
- High Hazard Potential Dam Grant Program (HHPD)

The HMGP and BRIC grant programs are authorized under the Stafford Act and DMA 2000. The HMGP is a state competitive grant program for communities in areas covered by a recent disaster declaration. The BRIC grant program is also competitive but is available on an annual basis and does not require a disaster declaration; they rely on specific pre-disaster grant funding sources.

1.1.1 Disaster-Funded Mitigation Assistance

Hazard Mitigation Grant Program (HMGP)

Provides grants to states, Tribes, and local entities to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to purchasing supplies to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect property or to purchase property that has been subjected to, or is in danger of, repetitive damage.

The amount of funding available for the HMGP under a disaster declaration is limited. The program may provide a state or tribe with up to 15 percent of the total disaster grants awarded by FEMA. The cost-share eligibility requirement for this grant is 75 percent federal/25 percent non-federal. Funding from other federal sources cannot be used for the 25 percent share with one exception. Funding provided to states under the Community Development Block Grant program from the Department of Housing and Urban Development can be used to meet the non-federal share requirement.

1.1.2 Hazard Mitigation Assistance Programs

Building Resilient Infrastructure and Communities (BRIC)

FEMA's BRIC grant program gives states, local communities, tribes, and territories funding to address future risks from natural disasters, including those involving wildfires, drought, hurricanes, earthquakes, extreme heat, and flooding. Addressing these risks helps make communities more resilient. BRIC is a grant with a 75 percent federal and 25 percent state/local match, and for small and impoverished communities a 90 percent federal and 10 percent state/local match. For Fiscal Year 2022, FEMA will distribute up to $2.295 billion through the BRIC program in the following manner: $112 million for State/Territory allocation, $50 million for Tribal Set-Aside, and $2.133 billion for National Competition for Mitigation Projects.

Flood Mitigation Assistance (FMA) Grant Program

The goal of the FMA grant program is to reduce or eliminate flood insurance claims under the National Flood Insurance Program (NFIP). Emphasis for this program is placed on mitigating repetitive loss properties. Repetitive loss properties are properties for which two or more NFIP losses of at least $1,000 each have been paid within any 10-year period since 1978. Grant funding is available for three types of grants, including planning, project, and technical assistance. Project grants, which use most of the program's total funding, are awarded to states, tribes, and local entities for planning and technical assistance and/or to apply mitigation measures to reduce flood losses to properties insured under the NFIP. The cost-share eligibility requirement for this grant is 75 percent federal/25 percent non-federal. For FY 2021, $160 million was allocated for FMA program grants nationwide.

1.6 Plan Organization

The San Luis Valley Regional Hazard Mitigation Plan is organized as follows with a Base Plan that covers the entire six county All Hazards Region. Additional specifics are detailed in county-level annexes for each county: Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache.

- Executive Summary
  - Provides an overview of the process, plan, and findings
- Chapter 1 – Introduction
  - Describes the plan's purpose, participating jurisdictions, hazard mitigation planning requirements, and federal hazard mitigation programs
- Chapter 2 – Community Profile
  - Provides a general description of the Region and the six counties, including its location, geography, climate, history, population, economy, and government
- Chapter 3 – Planning Process
  - Describes the process used to develop the updated plan, including how it was prepared, who was involved in the process, and how the public was involved
- Chapter 4 – Risk Assessment

  - Identifies and profiles the hazards that could affect the Region, assesses vulnerability to those hazards, provides an inventory of critical facilities and other community assets, describes land-use trends, and assesses capability related to mitigation
- Chapter 5 – Mitigation Strategy
  - Identifies and assesses goals and actions to mitigate hazards in each participating jurisdiction, based on the risk assessment, and includes a strategy for prioritization and implementation. Provides an overview of progress on implementation and summary of specific actions detailed in county annexes
- Chapter 6 – Plan Adoption, Maintenance and Evaluation
  - Provides a formal process for monitoring, evaluating, and updating the plan, identifies methods for continued public involvement, and describes how the updated plan will be incorporated into existing planning mechanisms

Appendices

- A. Acronyms
- B. References and Resources
- C. Documentation of the Planning Process
- D. Plan Approval and Adoption

Annexes

Annex G. Alamosa County

Annex H. Conejos County

Annex I. Costilla County

Annex J. Mineral County

Annex K. Rio Grande County

Annex L. Saguache County

2 Community Profile

This section provides a brief overview of the community profile of the planning area. Additional community profiles of the participating counties are provided in the county annexes.

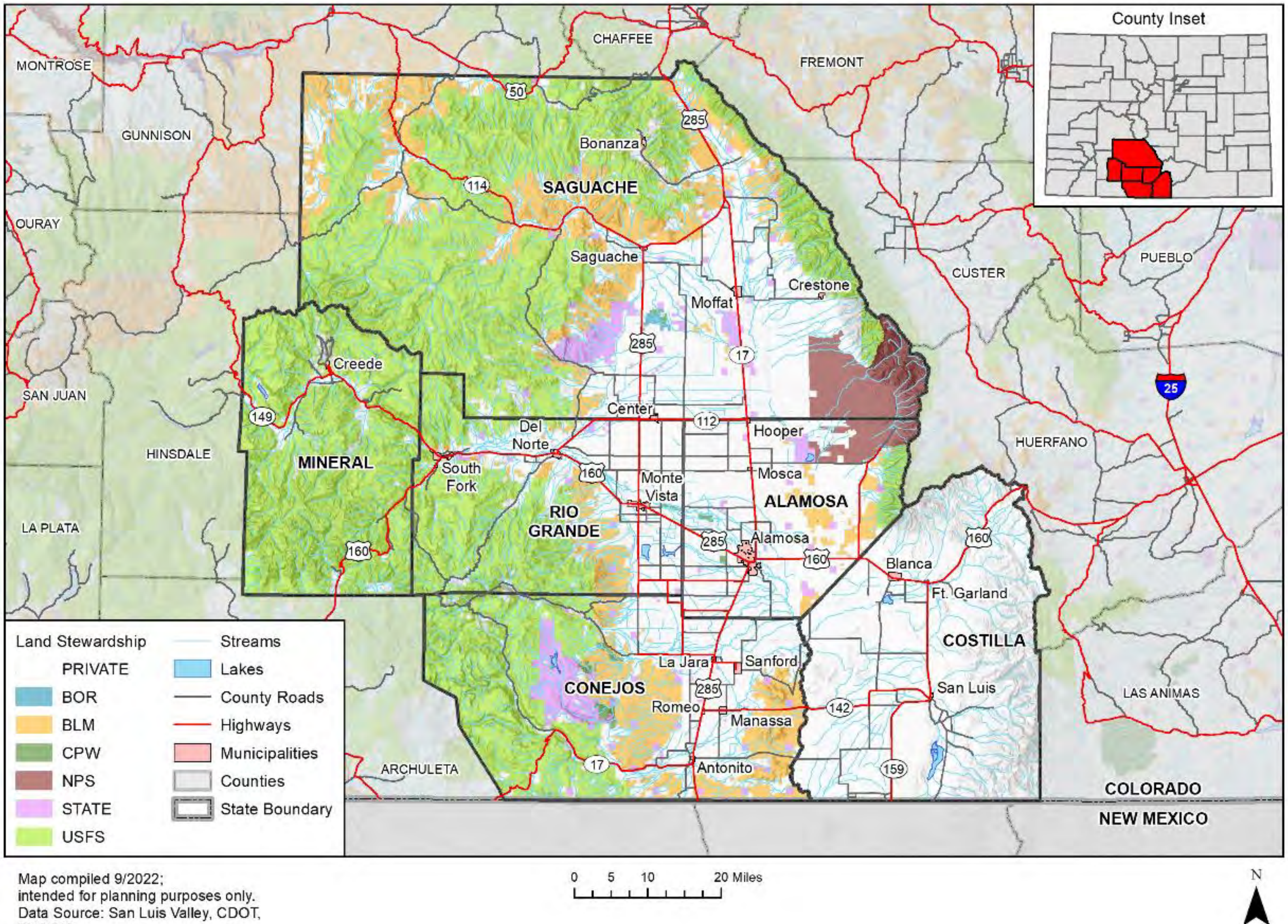
2.1 Geography and Climate

The San Luis Valley is an approximately 8,000 square mile region spanning south-central Colorado. It is bordered by the Sangre de Cristo Mountains on the East, the San Juan Mountains on the West, the Continental Divide on the Northwest, and New Mexico on the South. It contains six counties: Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache.

Contained within the San Luis Valley is the Great Sand Dunes National Park and Preserve, located in Alamosa and Saguache Counties, an approximately 230 square mile area which contains the tallest sand dunes in North America. It also contains ten 14,000 ft mountain peaks, as well as Colorado's first designated National Monument, the Wheeler Geologic Area in Mineral County.

The San Luis Valley is also home to the headwaters of the Rio Grande River. The Rio Grande, along with several smaller surface streams, connect with a vast, shallow, unconfined aquifer which lies beneath much of the Valley and recharges surface water. Beneath the impermeable clay layer which forms the basis of the unconfined aquifer, lays a confined aquifer, accessible by wells and utilized for agriculture and day to day livelihood.

Figure 2-1 Map of the San Luis Valley



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT, SLV GIS

With an average altitude of 7,665 ft above sea level, the San Luis Valley is one of the largest high alpine desert valleys in the world. It is characterized by temperate summers with highs averaging around 80°F, and frigid winters with lows below 0 °F. Average rainfall in the valley ranges from 7 to 10 inches per year, while average snowfall is around 40 to 60 inches annually. It is important to note that mountain areas in the region receive much more snow than the Valley floor exceeding 400 - 500 inches near Wolf Creek Pass in Mineral County. While winters are cold, the San Luis Valley averages about 285 sunny days per year.

2.2 Population

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 Colorado State Demography Office estimated the San Luis Valley population at 46,081 in 2020. Table 2-1 shows planning area population data from 1990 through 2020. The total San Luis Valley population increased 17.7% from 1990 to 2005 and decreased by 2.7% from 2005 to 2020.

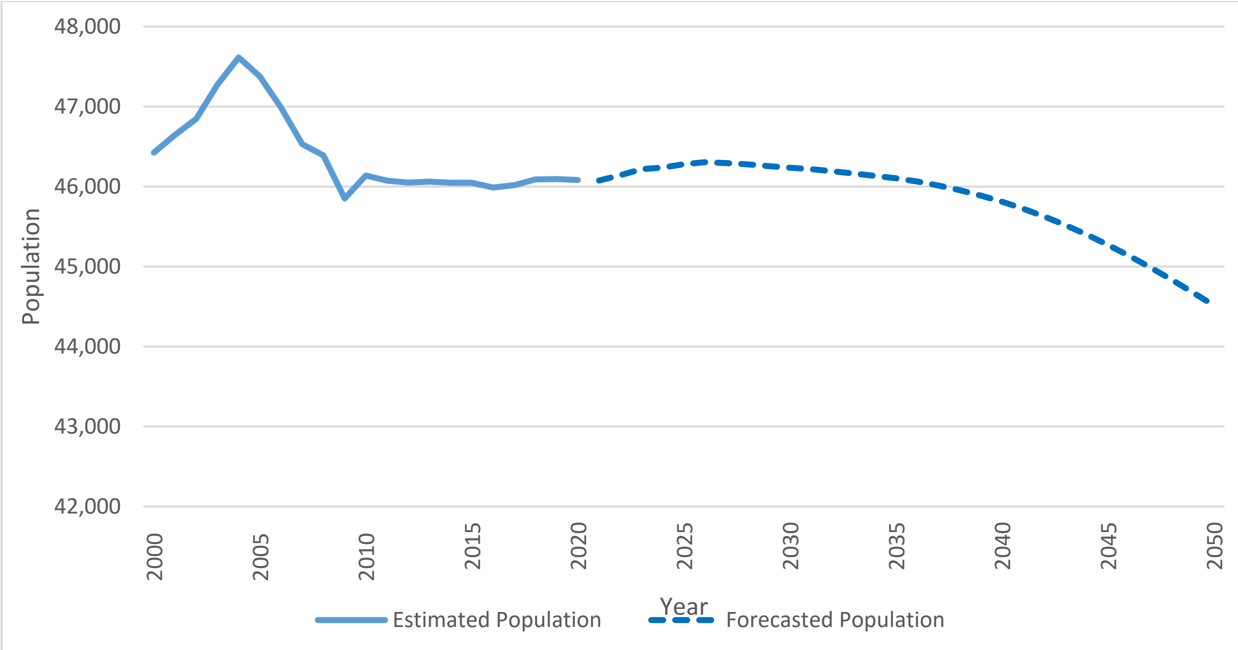
Table 2-1 San Luis Valley Population

	2010	2012	2014	2016	2018	2020
Alamosa County	15,293	15,750	16,111	16,353	16,444	16,153
Conejos County	8,220	8,241	8,276	8,213	8,142	8,130
Costilla County	3,536	3,556	3,578	3,590	3,687	3,810
Mineral County	1,020	702	704	793	823	853
Rio Grande County	11,926	11,925	11,840	11,351	11,351	11,300
Saguache County	6,161	6,189	6,211	6,255	6,468	6,730
Area total	**46,156**	**46,363**	**46,720**	**46,555**	**46,915**	**46,976**

Source: U.S. Census Bureau American Community Survey 5-Year Estimates

Figure 2-2 shows 5-year population changes in the San Luis Valley from 2000 to 2020, as well as forecasted growth through the year 2050, according to the Colorado State Demography Office. The population of the San Luis Valley is expected to decrease to around 45,500 by 2050.

Figure 2-2 San Luis Valley Population and Forecasted Growth 2000 to 2050



Source: Colorado State Demography Office

2.3 Economy

The San Luis Valley is known for the productivity of its agricultural lands. While much of the land is used for grazing, crops including barley, potatoes, and wheat are also cultivated. The barley grown in the area is a major supplier of malt for the Coors Beer Company. Given the semi-arid conditions, San Luis Valley farms have historically been dependent on snowmelt from the surrounding mountains as their primary water source. However, they are becoming more dependent on water from the aquifer systems.

With the abundance of sunny days, low precipitation, and sparse tree cover, the San Luis Valley has become a hotspot for solar energy development. Photovoltaic (PV) technology, known more commonly as solar panels, are small scale electrical power systems. At least five PV solar plants are currently operating in the San Luis Valley, including the Alamosa Solar Generating Project, which is the third largest operating concentrated PV plant. Large scale solar technology, known as concentrated solar power (CSP), have been proposed for the region, but have been met with pushback from residents who are concerned about the impact a CSP plant would have on the water supply and lack of transmission venues to push energy to the larger power grid.

The 2018 American Community Survey 5-Year data profiles provides estimates for total employment by industry sector. These employment trends are shown in the Table 2-2 below.

Table 2-2 San Luis Valley Employment by County and Industry Sector

	Alamosa County	Conejos County	Costilla County	Mineral County	Rio Grande County	Saguache County
	Total	Total	Total	Total	Total	Total
Agriculture, forestry, fishing and hunting, and mining	5%	9%	20%	1%	13%	29%
Construction	9%	12%	8%	19%	10%	9%

	Alamosa County	Conejos County	Costilla County	Mineral County	Rio Grande County	Saguache County
Manufacturing	3%	4%	12%	1%	9%	10%
Wholesale trade	7%	3%	3%	0%	3%	3%
Retail trade	9%	10%	7%	5%	11%	10%
Transportation and warehousing, and utilities	8%	10%	6%	6%	6%	7%
Information	1%	1%	1%	3%	3%	1%
Finance and insurance, and real estate and rental and leasing	8%	5%	3%	5%	7%	2%
Professional, scientific, and management, and administrative and waste management services	3%	5%	9%	3%	3%	2%
Educational services, and health care and social assistance	29%	25%	15%	9%	21%	15%
Arts, entertainment, and recreation, and accommodation and food services	6%	4%	3%	35%	4%	7%
Other services, except public administration	6%	2%	3%	3%	2%	1%
Public administration	6%	9%	9%	8%	9%	5%

2.4 History

The San Luis Valley was long part of the lands of the Ute Indian Tribes. The Spanish, and later the Mexicans, slowly conquered the area from these tribes during the 17th and 18th centuries. The Valley was the first region of Colorado to be settled by Europeans. The area was administered as part of the Spanish, later Mexican, province of Nuevo Mexico (New Mexico) until the area was purchased by the United States as part of the Treaty of Guadalupe Hidalgo in 1848. Extensive settlement began in the Valley by Hispanic farmers and ranchers in the 1850s. Today, the Valley has the largest native Hispanic population in Colorado and many families are directly descended from the original Nuevo Mexican settlers. The Valley became part of the Territory of Colorado in 1861. For the remainder of the 19th century, the Valley saw the removal of the Native Americans to reservations elsewhere and the slow migration of farmers and ranchers into the area.

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: *1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;* *2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process; and* *3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.* *[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

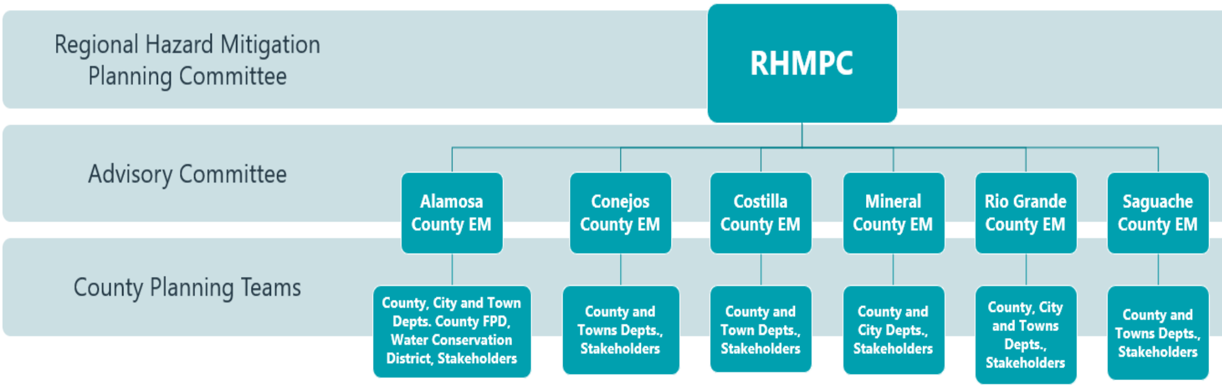
3.1 Background on Mitigation Planning in the San Luis Valley Region

This plan represents the first Regional Hazard Mitigation Plan (HMP) for the six counties in the San Luis Valley. Prior to this plan, all six counties had adopted county-specific hazard mitigation plans over the years, which served as the basis for the 2022 planning process. While this is the first regional HMP, regional coordination has been long standing in the San Luis Valley.

The overall effort to obtain a planning grant and complete the latest updates was guided by the Regional Hazard Mitigation Planning Committee (RHMPC), composed of emergency managers from each of the six counties and select state and regional partners. The RHMPC was established to address hazards, identify goals, and explore opportunities for collaborative mitigation actions on a regional level. Every incorporated community within the six counties chose to participate in the update of the Regional Plan. A graphic illustrating the RHMPC, and the regional planning framework is shown below.

The planning process was initiated in early 2022 under the coordination of the RHMPC and Alamosa County Emergency Manager as the lead, with each county emergency manager leading coordination within their respective county. Funding was secured through a FEMA Post Fire Mitigation (HMGP 5534) planning grant to enable a consultant to be hired to facilitate the process and develop the plan. WSP USA Environment & Infrastructure Inc. (WSP) of Denver, Colorado (Formally Wood Environment and Infrastructure Solutions, Inc.) contracted with Alamosa County to provide professional planning services during the development of the plan. The development of the plan followed a structured planning process that involved various local government departments and other public and private stakeholders. The planning process is described further in this section and documented in Appendix C.

Table 3-1 Regional Hazard Mitigation Planning Committee Framework



3.2 Multi-Jurisdictional Participation

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

- Participate in the process as part of the Regional Hazard Mitigation Planning Committee (RHMPC),
- 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 San Luis Valley Regional Hazard Mitigation Plan's RHMPC, "participation" meant:

- Attending and participating in RHMPC meetings;
- Establishing/reconvening a County Planning Team (CPT);
- Providing available data requested by the Steering Committee/ WSP;
- Providing/updating the hazard profile and vulnerability details specific to jurisdictions;
- Developing/updating the local mitigation strategy (action items and progress);
- Advertising and assisting with the public input process;
- Reviewing and commenting on plan drafts; and
- Coordinating the formal adoption of the plan by the governing boards.

This Regional Plan includes the participation of all counties and the municipalities in the San Luis Valley, as well as the Alamosa Fire Protection District and the Rio Grande Water Conservation District, as noted in Chapter 1 and detailed further in Section 3.4. Documentation of participation is included in Appendix C in the form of meeting sign in sheets, meeting summaries, and more.

3.3 10-Step Planning Process

WSP established the planning process for the San Luis Valley Regional Plan using the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

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

Into this four-phase process, WSP integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance (FMA) programs. Thus, the modified 10-

step process used for this plan meets the requirements of six major programs: FEMA's Hazard Mitigation Grant Program, Pre-Disaster Mitigation program, Community Rating System (CRS), FMA Program, Severe Repetitive Loss program, and new flood control projects authorized by the U.S. Army Corps of Engineers. FEMA's March 2013 Local Mitigation Planning Handbook recommends a nine-step process within the four-phase process. Table 3-2 summarizes the four-phase DMA process, the detailed CRS planning steps and workplan used to develop the plan, the nine handbook planning tasks from FEMA's 2013 Local Mitigation Planning Handbook, and where the results are captured in the Plan. The sections that follow describe each planning step in more detail.

Table 3-2 Mitigation Planning Process Used to Develop the Regional Hazard Mitigation Plan

FEMA 4 Phase Guidance	Community Rating System (CRS) Planning Steps (Activity 510) and WSP Workplan Tasks	FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)	Location in Plan
Phase I: Organize Resources	Task 1. Organize Resources	1: Determine the Planning Area and Resources	Chapters 1, 2 and 3
		2: Build the Planning Team 44 CFR 201.6(c)(1)	Chapter 3, Section 3.3.1
	Task 2. Involve the public	3: Create an Outreach Strategy y 44 CFR 201.6(b)(1)	Chapter 3, Section 3.3.1
	Task 3. Coordinate with Other Agencies	4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)	Chapter 3, Section 3.3.1 and county annexes
Phase II: Assess Risks	Task 4. Assess the hazard	5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)	Chapter 4 and county annexes
	Task 5. Assess the problem		Chapter 4 and county annexes
Phase III: Develop the Mitigation Strategy	Task 6. Set goals	6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(ii); and 44 CFR 201.6(c)(3)(iii)	Chapter 5, Section 5.2
	Task 7. Review possible activities		Chapter 5, Section 5.3
	Task 8. Draft an action plan		Chapter 5, Section 5.4 and county annexes
Phase IV: Adopt and Implement the Plan	Task 9. Adopt the plan	8: Review and Adopt the Plan	Chapter 6
	Task 10. Implement, evaluate, revise	7: Keep the Plan Current	Chapter 6
		9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)	Chapter 6

3.4 Phase One: Organize Resources

Step 1: Get Organized – Building the Planning Team

WSP worked with the Regional Steering Committee to establish the framework and organization for the process. Organizational efforts were initiated with each county to inform and educate the plan participants of the purpose and need for the regional hazard mitigation plan. During the update of this Regional Plan, the planning process was directed through a Regional Steering Committee comprised of emergency managers from Alamosa County, Conejos County, Costilla County, Mineral County, Rio Grande County and Saguache County. The San Luis Valley counties have a standing weekly regional coordination meeting through a virtual platform (Google Meet) and invited the planning consultant to attend as an initial discussion on the organizational aspects of the planning process with the county emergency managers. Using FEMA planning guidance representatives for each county's CPT base membership was established, with additional invitations extended as appropriate to other federal, state, and local stakeholders and the public throughout the planning process. This included agencies that have the authority to regulate development (county and local government), as well as businesses, academia (school districts), and other private and non-profit interests to be involved in the planning process. Neighboring jurisdictions included the participating counties themselves, as well as Archuleta, Chaffee, Fremont, Hinsdale, Huerfano, Las Animas, Gunnison counties in Colorado and Taos County, New Mexico. The list of agencies and departments invited to participate in each county is listed in the Section 1 of each County Annex; stakeholders are discussed further in this section in Step 3. Documentation of participation included in Appendix C.

An email invitation was sent from each county emergency manager requesting identified jurisdictions and stakeholders to participate as members of each county planning team and to attend a series of planning workshops. During the plan development process, communication amongst the CPTs occurred through a combination of face-to-face meetings, virtual meetings, hybrid (options to participate in-person or virtually) Zoom meetings and email correspondence. Three primary planning meetings were held during the development of the plan in 2022 which are summarized in Table 3-3 below. An initial hybrid kickoff meeting utilized Zoom and the Alamosa County Emergency Operations Center on April 28, 2022. Two other hybrid virtual and in-person planning workshops were held in August and September 2022. The meeting schedule and topics are listed below. In addition, periodic virtual meetings were held with the county emergency managers and WSP to discuss the process, including upcoming milestones and information needs. Primary Planning Meeting summaries and agendas are included in Appendix C, Documentation of the Planning Process.

Table 3-3 Planning Meetings and Topics

Meeting	Date and Location	Meeting Purpose
Kickoff Meeting	April 28, 2022 Zoom and Alamosa County Emergency Operations Center	Reconvene each County Planning Team and bring together the RHMPC outline DMA 2000 process and requirements, identify timelines, discuss significant events last five years.
Risk Assessment and Goals Review	August 15, 2022 Zoom and Alamosa County Commissioner's Meeting Room	Review results of draft risk assessment. Begin discussion on mitigation plan goals.
Mitigation Strategy and Goals Finalization	September 19, 2022 Zoom and Alamosa Emergency Operations Center	Review and status updates of existing mitigation actions from each CPT and develop new actions.

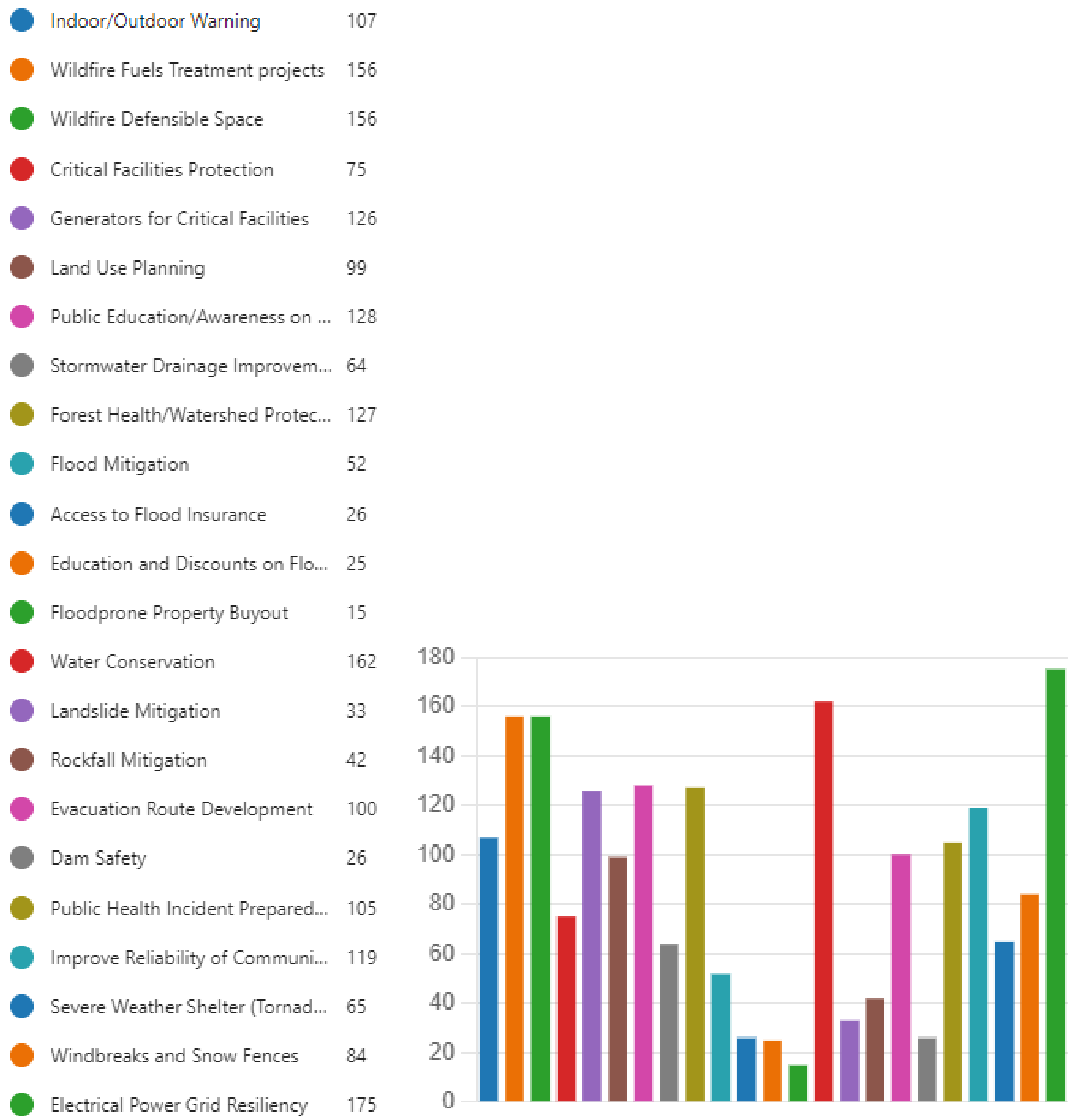
Step 2: Plan for Public Involvement – Engaging the Public

At the kickoff meeting, the RHMPC 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 RHMPC provided links to a public survey via Microsoft Forms. The survey was advertised by each county and participating jurisdictions through social media, in local newsletters and posted to each county's website.

The survey was for the public to provide feedback to the County Planning Teams on topics related to hazard concerns and reducing hazard impacts. The survey provided an opportunity for public input during the planning process, prior to finalization of the plan update. The survey gathered public feedback on concerns about drought, wildfires, high winds, and tornadoes and solicited input on strategies to reduce their impacts. The survey was opened in June 2022 and closed on August 8, 2022. A total of 255 responses were received and shared with the RHMPC to inform the process.

The public survey included a question on ranking hazard significance. The results generally track with the significance levels noted in Chapter 4 of this plan, with drought, wildfire, high winds, and tornadoes as being the most significant. The following graph is a display of the results from Question 5. The question reads: "The following types of mitigation actions may be considered in the Plan. Please indicate all the types of mitigation actions that you think should have the highest priority in the San Luis Valley Regional Hazard Mitigation Plan. These results will be considered during the planning process." The results indicate that electrical power grid resiliency, water conservation, wildfire fuels treatments projects and defensible space, public education and awareness and forest health/watershed protection were popular with the public, seen in Figure 3-1. Additional results of the survey are included in Appendix C Documentation of the Planning Process.

Figure 3-1 San Luis Valley Regional HMP Public Survey Results, Question 5



The public was given an opportunity to review and comment on the draft plan before it was finalized in February 2023. A public virtual meeting took place on January 4, 2023, to introduce the draft plan to the public prior to releasing it for review. There were 63 attendees representing a mix of the public, participating jurisdictions, and stakeholders. Each county made the plan available on their County website and advertised the plan through emails to specific groups and various social media. The plan was available for comment from January 30th to February 14th, 2023. A public input comment form was available with the online plan. Two sets of comments were provided on the input form by stakeholders including representatives from the Colorado State Forest Service and the Rio Grande National Forest. The comments resulted in minor changes to the Chapter 4 and the county annexes mostly in regards to wildfire and enhancing linkages with Community Wildfire Protection Plans. Other comments were received by email directly to the Saguache County and Costilla County emergency managers. The Saguache public comments resulted in acknowledgement of areas of population that are focused in subdivisions in the unincorporated area, including the Baca Grande Property

Owners Association and KV Homeowners Association; these areas were also labeled on some of the maps in the Saguache County Annex. Two new mitigation actions for these areas in Saguache County also resulted from the comments, including a stormwater drainage study and drought and wildfire resiliency project. Another comment received in Costilla County from the State Office of Dam Safety resulted in coordination with the Sanchez Ditch and Reservoir Company who owns the Sanchez Dam. This resulted in a new mitigation action being added to the Costilla Annex related to seepage repairs and safety enhancements specific to this high hazard rated dam. Records of public advertisements and public input can be found in Appendix C.

Step 3: Coordinate with Other Departments and Agencies

The Steering Committee invited a range of local, state, and regional agencies and other interested parties to participate on each of the County Planning Teams and the RHMPC and review and comment on draft updates to the plan. Many of the agencies participated throughout the planning process in meetings described in Step 1: Organize the Planning Effort. In addition, the HMPC developed a list of neighboring communities and local and regional agencies involved in hazard mitigation activities, as well as other interested parties to keep informed on the plan update process.

Stakeholders included local and regional agencies involved in hazard mitigation activities or those beyond the County and local government that have the authority to regulate development. Stakeholders could participate in various ways, either by contributing input at RHMPC meetings, being aware of planning activities through an email group, providing information to support the effort, or reviewing and commenting on the draft plan. Representatives from the following agencies and organizations were invited to participate as stakeholders in the process; an asterisk (*) indicates they attended RHMPC meetings.

State and Federal Agencies

- Colorado Climate Center
- Colorado Department of Transportation*
- Colorado Division of Homeland Security and Emergency Management (DHSEM)*
- Colorado Department of Local Affairs
- Colorado Department of Public Safety, Division of Fire Prevention and Control*
- Colorado Department of Natural Resources, Division of Water Resources
- Colorado Office of Dam Safety
- Colorado Geological Survey
- Colorado Parks and Wildlife*
- Colorado Resiliency Office
- Colorado State Forest Service*
- Colorado State Patrol*
- Colorado State Patrol, HazMat*
- Colorado Water Conservation Board
- National Park Service – Great Sand Dune National Park & Preserve
- Bureau of Land Management
- National Weather Service, Pueblo*
- U.S. Fish and Wildlife Service: Baca National Wildlife Refuge, Alamosa National Wildlife Refuge, Monte Vista Wildlife Refuge
- U.S. Forest Service, Rio Grande National Forest*
- Senator Bennet's Office*
- Rio Grande Water Conservation District

Nonprofits/Private Sector

- American Red Cross*
- Amateur Radio Emergency Services

- SLV Behavioral Health Group
- Alamosa Regional Communications Center*
- Community Animal Response Team*
- SLV Emergency Preparedness and Response (EPR)
- Monte Vista COOP*
- KV HOA, Inc
- SLV Agricultural Coalition
- SLV Promotora's Network

School Districts
- Upper Rio Grande School District
- Center School District
- Sierra Grande School District
- Alamosa School District*
- Moffat School District
- Crestone Charter School
- Centennial School District*
- Mountain Valley School District

Fire/Ambulance/Health Districts
- Crestone VFD*
- Northern Saguache Ambulance District
- Baca Grande Ambulance
- Moffat VFD
- Saguache VFD
- Kundalini Fire Management*
- Pueblo Interagency Dispatch Center
- San Luis Valley Health*
- SLV Regional Emergency Medical and Trauma Advisory Council (RETAC)

Utilities
- San Luis Valley Rural Electric Cooperative (REC)
- Xcel Energy*
- San Isabel Electric

Special Districts
- Baca Grande POA
- San Luis Valley Regional Solid Waste Authority
- Baca Grande Water and Sanitation District
- San Luis Valley Geographic Information Systems (GIS)/GPS Authority*
- San Luis Valley Water Conservancy District
- Rio Grande Water Conservation District

Universities
- Adams State University*
- Religious Institutions
- Seventh Day Adventists
- Trinidad State Junior College

Private Industry
- GM Stone's Farm Supply*
- WSB Computer Services

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

Table 3-4 Summary of State and Other Agency Coordination

Agency	Coordination Notes
Colorado Climate Center	Confirmed 2014 Climate Change in Colorado report was still the latest resource specific to Colorado
Colorado Geological Survey	Coordinated with on information on geologic hazards and utilized GIS data to inform landslide, earthquake and avalanche hazards.
Colorado Water Conservation Board	Reviewed information on pasts droughts and their impacts on the planning area. Incorporated information from Drought Mitigation Plan into the risk assessment. Requested and reviewed information on flood insurance policies and claims including repetitive loss data; Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1)
Colorado Department of Transportation	Invited to and participated in RHMPC meetings.
Colorado State Forest Service	Invited to and participated in RHMPC meetings. CSFS provided a review of wildfire-related mitigation actions from the prior county plans and provided update and status.
Colorado Department of Natural Resources, Division of Water Resources - Office of Dam Safety	Provided database of dams with non-failure flood risk used to inform HIRA.
Colorado Resiliency Office	Outreach on related initiatives; CRO provided information on COVID-19 Regional Resiliency and Recovery roadmaps, with a focus on economic resiliency.
Other: High and Significant hazard dams Dam Owners	Agencies that own High and Significant Hazard Dams invited to participate on the RHMPC: Colorado Parks and Wildlife U.S. Forest Service Provided an opportunity to comment on public review draft: San Luis Valley Water Conservancy District U.S. Bureau of Reclamation Irrigation districts: Private dam owners:
Other: San Luis Valley GIS/GPS Authority	Provided GIS data to support planning and HIRA

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. The counties in the San Luis Valley use 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 3-5 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 3-5 Summary of Key Plans, Studies, and Reports

Plan, Study, Report Name	How Plan, Study or Report Informed the Plan
Colorado State Hazard Mitigation Plan (2018 Update)	Reviewed information on past hazard events and hazard risk information to inform the risk assessment Reviewed State goals and objectives
Colorado Drought Mitigation and Response Plan (2018 Update)	Reviewed information on past 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
Colorado State Demographer Community Demographic Profiles (ACS 5-Year Estimates 2016-2020)	Provide demographic data and trends for the counties and incorporated jurisdictions in the San Luis Valley
Various Community Wildfire Protection Plans: Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache	Reviewed information on past wildfires, mitigation actions, and wildfire risk to inform the risk assessment and mitigation strategy
Colorado Water Conservation Board (CWCB) Future Avoided Cost Explorer	Utilized tool to identify economic risks from future wildfire and drought
Colorado Division of Water Resources High Hazard Dam Release - Downstream Floodplain Impacts Study	Informed Dam Incident hazard profile of dams that may pose a flooding risk during high flow releases
Various draft flood hazard mapping studies in progress by the CWCB and WSP USA	Informed the GIS-based flood hazard risk assessments for Costilla and Mineral Counties; cities of Alamosa and Saguache
Rio Grande Basin Implementation Plan (2022)	Review of water resources information and drought and watershed resiliency projects
United States Department of Agriculture (USDA) Risk Management Agency Crop Indemnity Reports (2007-2021)	Provided data related to crop losses due to drought and hail

Integration of 2016 Hazard Mitigation Plans into Other Planning Mechanisms

A DMA 2000 requirement is that the plan outline a process by which local governments will integrate the mitigation plan with other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate; this process is detailed in Chapter 6. This process was being followed by some of the counties with cross reference to their 2016 Hazard Mitigation Plans, with some examples noted below; other opportunities to do this in the future are noted in each county Annex in Section 9.

- Cross referenced the 2016 HMP in other County Emergency Operations Plans including:
  - Alamosa County EOP
- Referenced in grant applications including Pre-Disaster Mitigation Grants for the Town of Crestone
- Cross referenced in other County Comprehensive Plans including:
  - Costilla County – incorporated Comprehensive Plan into 2016 HMP

3.5 Phase Two: Assess Risks

Steps 4 and 5 – Identify Hazards and Assess Risks

Chapter 4 Hazard Identification and 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 each of the counties and incorporated jurisdictions. Where data permitted, Geographic Information Systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. The RHMPC 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 each of the County Annexes.

3.6 Phase Three: Develop the Mitigation Plan

Steps 6 and 7 – Set Goals and Review Possible Activities

WSP facilitated a brainstorming and discussion session with the RHMPC during their second workshop to review the goals and objectives from each of the 2016 plans. In 2016 Alamosa, Conejos, Rio Grande, Mineral, and Saguache Counties had the same goals and Costilla County had their own separate goals. During the third workshop the RHMPC decided to make minor revisions that are captured in Chapter 5.

During the third RHMPC webinar/workshop WSP facilitated a discussion session with the RHMPC 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 each of the counties' 2016 plans. Some new mitigation actions resulted from this process that were added to the plan in 2022. This process and its results are described in greater detail in Chapter 5 and each of the counties action plans are detailed in each county annex.

Step 8 – Draft the Plan

Based on input from the RHMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, WSP produced a complete first draft of the plan. This complete draft was shared electronically for RHMPC review and comment. Other agencies were invited to comment on this draft as well. RHMPC and agency comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. WSP integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the Colorado Division of Homeland Security and Emergency Management (DHSEM) and FEMA Region VIII to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

3.7 Phase Four: Implement the Plan and Monitor Progress

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 D.

Step 10 – Implement, Evaluate and Revise the Plan

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

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

4 Risk Assessment

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

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

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

This risk assessment builds upon the methodology described in the 2013 FEMA Local Mitigation Planning Handbook, which recommends a four-step process for conducting a risk assessment:

Describe Hazards

1) Identify Community Assets
2) Analyze Risks
3) Summarize Vulnerability

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

Section 4.1 Hazard Identification identifies the hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.

Section 4.2 Hazard Profiles discusses the threat to the planning area and describes previous occurrences of hazard events, the likelihood of future occurrences, and the Region's vulnerability to particular hazard events.

Additional County Annexes include a summary of community assets including population, building stock, critical facilities, and historic, cultural, and natural resources. Additional details on vulnerability to specific hazards where they vary from those of the Region are noted in the annexes, with more detailed maps.

4.1 Hazard Identification

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

4.1.1 Results and Methodology

Using existing hazards data, plans from participating jurisdictions, and input gained through planning and public meetings, the County Planning Teams agreed upon a list of hazards that could affect the Region.

Hazards data from FEMA, Colorado Department of Homeland Security and Emergency Management (DHSEM), the 2018 State of Colorado Multi-Hazard Mitigation Plan, approved county plans from the participating San Luis Valley Region jurisdictions, and many other sources were examined to assess the significance of these hazards to the planning area. The hazards evaluated in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

The final list of hazards identified and investigated for the 2022/2023 San Luis Valley Region Multi-Hazard Mitigation Plan includes:

- Avalanche
- Dam Incidents
- Drought
- Earthquake
- Flooding (Flash Flood & Levee Failure)
- Hailstorm
- High Winds and Tornadoes
- Landslide/Rockfall/Debris Flow
- Lightning
- Severe Winter Storm
- Wildland Fires
- Cyber Attack
- Pandemic
- Hazardous Materials Incident
- Power/Utility Failure (Energy)

Cyber-attack, pandemic, and hazardous materials incidents are all new hazards profiled for the plan, which were not included in any county plans previously. These hazards were identified due to recent significant events (COVID 19 Pandemic) and/or growing concerns.

Long term power outages associated with power/utility failure is a high hazard vulnerability for the entire six county region. The San Luis Valley is not on a traditional loop system where power imported from one area could change to another. Electrical power is provided to the region by differing providers all using the same venue. This is a primary life safety issue sensitive to residents of the SLV. There are a number of hazards that can impact the power grid including earthquake, flooding, hailstorm, high winds and tornadoes, landslide/rockfall/debris flow, lightning, severe winter storm, wildland fires, and cyber attack, and the issue is addressed as a consequence of the hazard in this plan, versus a stand-alone issue.

Members of each county's Planning Team used a hazards worksheet to rate the significance of hazards that could potentially affect the region. Significance was measured in general terms, focusing on key criteria such as the likelihood for future occurrences of the event, frequency of past occurrences, geographical area affected, and damage and casualty potential. Table 4-1 represents the worksheet used to identify and rate the hazards and is a composite that includes input from all the participating jurisdictions. Note that the significance of the hazard may vary from jurisdiction to jurisdiction. Each hazard profile includes further details on hazard significance based by county based on the ratings for geographic area, magnitude/severity, and probability of future occurrences.

Table 4-1 San Luis Valley Overall Hazard Significance Summary Table

Hazard	Alamosa	Conejos	Costilla	Mineral	Rio Grande	Saguache
Avalanche	Low	Low	Medium	Medium	Medium	Medium
Dam Incidents	Medium	Medium	Medium	Low	Medium	Low
Drought	High	High	High	High	High	High
Earthquake	Low	Low	Low	Low	Low	Low
Flooding (Flash Flood & Levee Failure)	High	Medium	High	Low	High	High
Hailstorm	Medium	Medium	Medium	Medium	Medium	Medium
High Winds and Tornadoes	Medium	Medium	Medium	Medium	Medium	Medium
Landslide/Rockfall/ Debris Flow	Low	Low	Low	Medium	Medium	Medium
Lightning	Low	Low	Low	Medium	Low	Low
Severe Winter Storm	High	High	High	High	High	High
Wildland Fires	Medium	Medium	High	High	High	High
Cyber Attack	Medium	Medium	Medium	Medium	Medium	Medium
Pandemic	Medium	Medium	Medium	Medium	Medium	Medium
Hazardous Materials Incident	Medium	Medium	Medium	Medium	Medium	Medium

Geographic Area	Probability of Future Occurrences
Negligible: Less than 10 percent of planning area or isolated single-point occurrences	Unlikely: Less than 1 percent probability of occurrence in the next year or has a recurrence interval of greater than every 100 years.
Limited: 10 to 25 percent of the planning area or limited single-point occurrences	Occasional: Between a 1 and 10 percent probability of occurrence in the next year or has a recurrence interval of 11 to 100 years.
Significant: 25 to 75 percent of planning area or frequent single-point occurrences	Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences	Highly Likely: Between 90 and 100 percent probability of occurrence in the next year or has a recurrence interval of less than 1 year.
Potential Magnitude/Severity	**Overall Significance**
Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.	Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.	Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.

Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time or result in many permanent disabilities and a few deaths. overwhelmed for an extended period of time or many deaths occur.	High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.
Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time, or many deaths occur.	

4.1.2 Other Hazards Considered but not Profiled

As part of the hazard identification process, the County Planning Teams also noted other hazards that could impact the region but are not further profiled as impacts tend to be more isolated or do not result in local, state, or federal disaster declarations. These include some natural and human caused hazards in the 2018 State of Colorado Multi-Hazard Mitigation Plan such as wildlife hazards associated with human/wildlife interaction, dense fog, erosion and deposition, expansive soils, extreme heat, and subsidence. The plan is still largely focused on natural hazards, and local emergency operations plans address less-predictable human-caused hazards such as civil unrest. Other concerns identified during the plan update process are addressed as consequences of other hazards that are fully profiled, including:

- Water contamination, railroad derailment (hazardous materials)
- Loss of communications and widespread electrical outage (High Winds, Lightning, Severe Winter Storm)
- Dust storm (Drought, High Wind)

4.1.3 Disaster Declaration History

As part of the hazard identification process, the County Planning Teams researched past events that triggered federal and/or state emergency or disaster declarations in the planning area. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

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

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans.

Table 4-2 provides information on federal emergencies and disasters declared in the Central Region counties between 1953 and 2022.

Table 4-2 Federal Disaster Declarations in the San Luis Valley, 1953-2022

Year	Declaration #	Hazard	County Impacted
1970	DR-293	Heavy Rains, Flooding	All
1973	DR-396	Flooding, Landslides	Alamosa, Conejos, Costilla, Mineral, Rio Grande
1977	EM-3025	Drought	Conejos, Costilla, Mineral, Rio Grande, Saguache
1984	DR-719	Severe Storms, Mudslides, Landslides, Flooding	Saguache
2002	FSA-2428	Million Fire	Rio Grande
2002	DR-1421	Wildfires	All
2003	EM-3185	Snowstorm	Alamosa, Costilla, Saguache
2005	EM-3224	Hurricane Katrina Evacuation	All
2006	FM-2646	Malo Vega Fire	Costilla
2013	FM-5031	West Fork Fire Complex	Mineral, Rio Grande
2015	DR-4229	Severe Storms, Tornadoes, Flooding, Landslides, Mudslides	Saguache
2018	FM-5246	Spring Creek Fire	Costilla
2020	EM-3436 DR-4498	COVID-19 Pandemic	All

Regional Hazard Events Since 2010

Several other significant natural hazard events have occurred since the last update of this plan, some of which did not result in a federal disaster declaration. One of the most notable is the West Fork Fire Complex in June 2013, a federally declared fire emergency that cost more than $31 million to contain. The West Fork Fire Complex burned 109,615 acres, making it the second largest wildfire in modern Colorado history. The fire demonstrated extreme behavior as a result of dead fuels, primarily pine- and spruce-beetle killed trees, high winds, and drought conditions. Although the fire threatened a number of neighborhoods and caused the evacuation of the Town of South Fork for several days, there were no fatalities as a result of the event and no structures were lost. Information about that event, as well as other smaller-scale events, is provided in the Table 4-3 below.

Table 4-3 Significant Regional Events, 2010-2022

Incident	Date(s)	Location	Impacts
Streams Lake Fire	May 31-June 2, 2013	Mineral County	Approximately 100 acres of forest burned
West Fork Fire Complex	June 5-July 31, 1013	Mineral County	109,615 acres burned; FEMA PA Grant: $7.9 million
Flood-Crestone	June 4-June 16, 2015	Saguache County, Town of Crestone	Federally declared for Public Assistance (DR-4229); >$100,000 damage to roads and bridges
High Water Event	June 8, 2015	Conejos County	County bridge on CR 13 damaged and closed for several days

Incident	Date(s)	Location	Impacts
Ice Jam Flood	December 28, 2015	Conejos County	Ice dam at CR H and CR 13 caused water to approach homes; 3-day effort by Road/Bridge to clear ice
Beaver Park Dam Incident	February 24-March 20, 2016	Rio Grande County	Depressions on dam embankment triggered drawdown of reservoir until stabilization work completed
Spring Creek Fire	2018	Costilla County	
COVID-19 Pandemic	2020-2022	All counties	Major economic impacts due to complete shutdown of normal business operations and extended periods of social distancing required. Increased costs of response for healthcare network and procurement of supplies. All counties were impacted.

Source: After-Action Reports 2010-2016, Colorado Division of Homeland Security and Emergency Management; FEMA

4.1.4 Building Inventory and Assets

People, buildings, critical facilities and infrastructure, and other important assets in the San Luis Valley are potentially exposed to hazards identified in this plan. Typically parcel and assessor's data can be used to quantify the number and values of improved parcels as an estimate of structures exposed. This data was not available on a consistent basis across the region. In lieu of assessor's data, a GIS database of structure footprints developed by Microsoft was used as the basis for structures. The value of structures was based on Building Inventory extracted from Hazus 5.1. Table 4-4 summarizes the property inventory for each county and the participating jurisdictions; the additional tables break out the building types and values grouped by occupancy type and jurisdiction. Average building values were calculated based on the Building Inventory extracted from Hazus 5.1. This was used as the basis to estimate losses from specific hazards where applicable, where the number of structures at risk was multiplied by the average value and was assumed to be residential for most instances.

Table 4-4 San Luis Valley Total Structure Exposure by County and Jurisdiction

County	Jurisdiction	Structure Count	Percentage of Exposure
Alamosa	Alamosa	3,692	
	Hooper	102	
	Mosca	90	
	Alamosa County	5,773	
	Total	**9,657**	**23%**
Conejos	Antonito	512	
	La Jara	454	
	Manassa	654	
	Romeo	202	
	Sanford	533	
	Conejos County	5,384	
	Total	**7,739**	**18%**
Costilla	Blanca	252	
	Ft. Garland	259	

County	Jurisdiction	Structure Count	Percentage of Exposure
	San Luis	439	
	Costilla County	3,580	
	Total	**4,530**	**11%**
Mineral	Creede	402	
	Mineral County	1,701	
	Total	**2,103**	**5%**
Rio Grande	Center	47	
	Del Norte	1,031	
	Monte Vista	2,261	
	South Fork	853	
	Rio Grande County	6,967	
	Total	**11,159**	**26%**
Saguache	Bonanza	47	
	Center	974	
	Crestone	150	
	Moffat	126	
	Saguache	477	
	Saguache County	5,236	
	Total	**7,010**	**17%**
	Grand Total	**42,198**	**100%**

Source: Microsoft Footprints 2021, WSP GIS Analysis

Table 4-5 Hazus Total Exposure by County and Property Types

Property Type	Alamosa	Conejos	Costilla	Mineral	Rio Grande	Saguache
Residential	$1,011,702,000	$562,053,000	$305,884,000	$243,658,000	$1,039,843,000	$1,039,843,000
Commercial	$537,930,000	$54,636,000	$26,764,000	$15,610,000	$194,634,000	$56,368,000
Industrial	$57,869,000	$13,666,000	$3,306,000	$3,277,000	$36,152,000	$10,193,000
Agriculture	$14,421,000	$9,938,000	$19,101,000	$92,000	$60,083,000	$13,087,000
Religion	$20,741,000	$5,544,000	$3,734,000	$735,000	$45,447,000	$13,003,000
Government	$16,645,000	$9,854,000	$3,239,000	$1,039,000	$10,585,000	$6,011,000
Education	$31,029,000	$15,969,000	$5,509,000	$3,361,000	$16,655,000	$11,240,000
Total	**$1,690,337,000**	**$671,660,000**	**$367,537,000**	**$267,772,000**	**$1,403,399,000**	**$1,149,745,000**

Source: Hazus 5.1

Table 4-6 Total Building Inventory by County and Property Types

County	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total	Percent
Alamosa	5,585	471	108	70	36	27	19	6,316	25%
Conejos	4,152	134	47	43	8	15	14	4,413	17%
Costilla	2,483	72	13	17	8	13	12	2,618	10%
Mineral	1,205	32	11	1	2	5	2	1,258	5%
Rio Grande	6,274	383	82	88	48	15	13	6,903	27%
Saguache	3,625	133	42	43	17	8	7	3,875	15%
Total	**23,324**	**1,225**	**303**	**262**	**119**	**83**	**67**	**25,383**	**100%**

Source: Hazus 5.1

Table 4-7 Average Value of Building Inventory by County and Property Types

County	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	All Bldgs. Average
Alamosa	$181,146	$1,142,102	$535,824	$206,014	$576,139	$616,481	$1,633,105	$698,687
Conejos	$135,369	$407,731	$290,766	$231,116	$693,000	$656,933	$1,140,643	$507,937
Costilla	$123,191	$371,722	$254,308	$1,123,588	$466,750	$249,154	$459,083	$435,400
Mineral	$202,206	$487,813	$297,909	$92,000	$367,500	$207,800	$1,680,500	$476,532

County	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	All Bldgs. Average
Rio Grande	$165,738	$508,183	$440,878	$682,761	$946,813	$705,667	$1,281,154	$675,885
Saguache	$133,008	$423,820	$242,690	$304,349	$764,882	$751,375	$1,605,714	$603,691
Average for Region	$156,289	$723,218	$410,769	$445,504	$749,613	$570,759	$1,250,194	$615,192

Source: Hazus 5.1

4.1.5 People

The most important asset is the people of the San Luis Valley. Population and demographic information are summarized in Chapter 2. For the purposes of refining risk to specific hazards such as flood the Microsoft Footprints database that intersected a hazard was multiplied by the Census Bureau's Average Household Size values for that county or jurisdiction, based on an assumption that the majority of these structures are residential.

4.1.6 Critical Facilities, Infrastructure, and Other Important Community Assets

A critical facility can be defined as one that if damaged would have devastating impacts on disaster response and recovery operations. FEMA Lifeline categories shown in Figure 4-1 are the U.S. 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.

Figure 4-1 FEMA Lifeline Categories

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

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

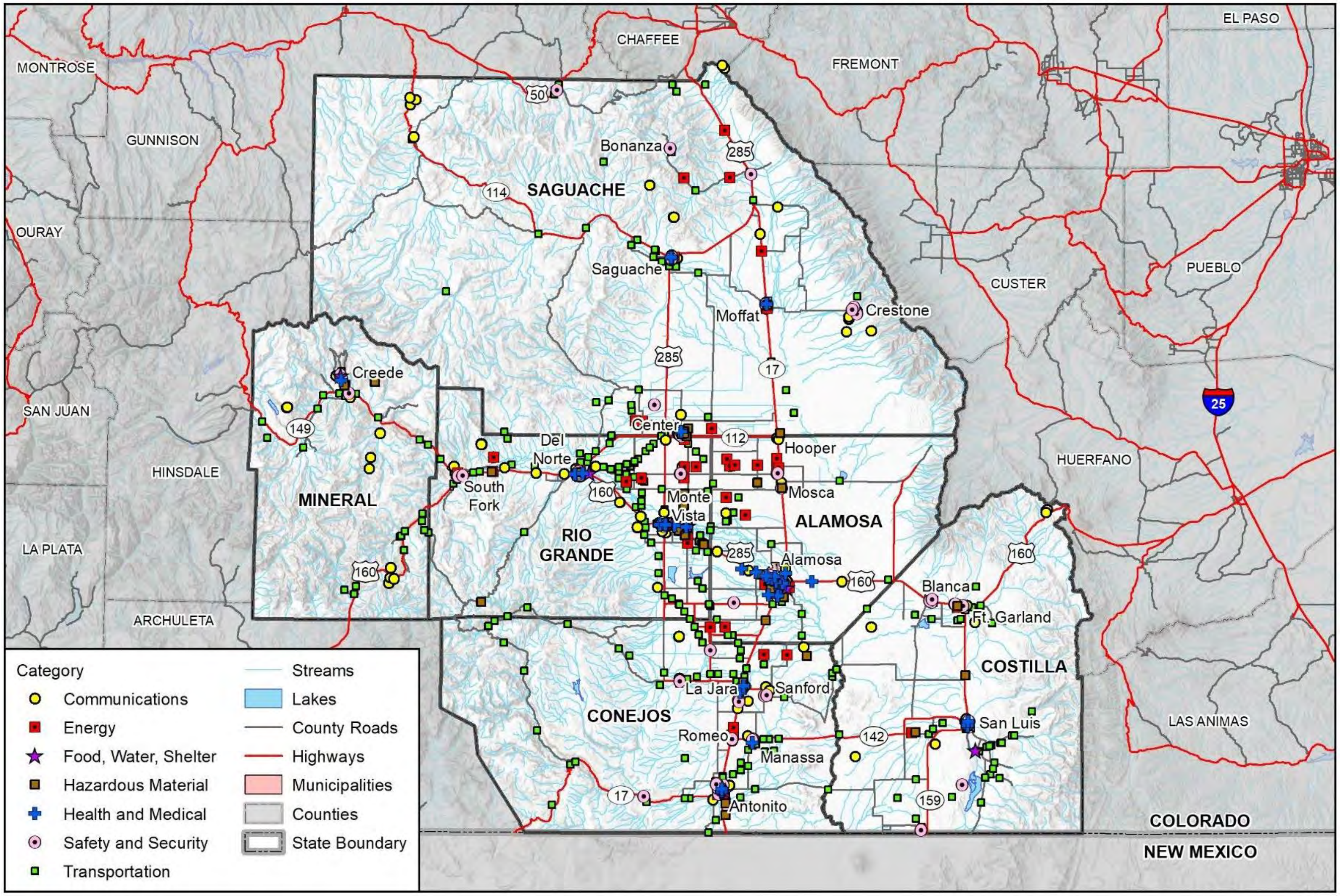
A summary of the critical facilities exposure analysis can be found in Table 4-8 and Figure 4-2 illustrates the location of critical facilities throughout the San Luis Valley.

Table 4-8 Summary of Critical Facility Exposure Summarized by Lifelines

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Alamosa	47	21	1	11	27	28	19	**154**
Conejos	25	8	1	5	8	29	62	**138**
Costilla	20	2	1	4	3	16	43	**89**
Mineral	19	1	1	2	1	7	27	**58**
Rio Grande	56	16	3	15	10	31	76	**207**
Saguache	43	12	-	9	4	26	47	**141**
Total	**210**	**60**	**7**	**46**	**53**	**137**	**274**	**787**

Source: CDPHE, CEPC, HIFLD, NBI, WSP GIS Analysis

Figure 4-2 San Luis Valley Critical Facilities



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, CDPHE, CEPC, HIFLD, National Bridge Inventory

4.1.7 Natural, Historic and Cultural Assets

Assessing the vulnerability of the San Luis Valley to natural hazards 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 this ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural resources are important to include in benefit-cost analyses for future projects. They may be used to leverage additional funding for projects that contribute to other community goals as well. An abundance of natural resources exists throughout the San Luis Valley, including wetlands and endangered species.

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. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

Wetlands are valuable because of their ability to improve water quality, limit erosion, protect wildlife and reduce flood peaks while slowly releasing floodwaters to downstream areas. Wetlands also provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital.

The San Luis Valley is home to three of eight National Wildlife Refuges in the State of Colorado: the Alamosa National Wildlife Refuge, the Baca National Wildlife Refuge, and the Monte Vista National Wildlife Refuge. These riparian habitats support songbirds, water birds, raptors, mule deer, beaver, and coyotes.

4.2 Hazard Profiles

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

The hazards identified in Section 4.1 are profiled individually in this section. Each of the hazards identified as posing a threat in the San Luis Valley are profiled in subsequent sections. Each profile includes a summary of the overall risk and vulnerability for each identified hazard for each participating jurisdiction. The sources used to collect information for the hazard profiles include, but are not limited to the following:

- State of Colorado Natural Hazards Mitigation Plan (2018)
  - Hazus
  - National Oceanic and Atmospheric Administration's National Centers for Environmental Information database (formerly the National Climatic Data Center or NCDC)
  - Disaster declaration history from FEMA and the U.S. Department of Agriculture (USDA) Farm Service Agency

- State of Colorado datasets compiled by state and federal agencies;
- Existing plans and reports; and
- Information collected from the County Planning Team and additional stakeholders.

4.2.1 Hazard Profile Methodology

Each hazard is profiled in a similar format that describes hazard characteristics, hazard location, past occurrences, likelihood of future events, magnitude/severity, and vulnerable community assets:

Hazard/Problem Description

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

Past Occurrences

This subsection contains information on historic incidents, including impacts where known. Information provided by the Regional Steering Committee is included here along with information from other data sources, including NOAA's National Centers for Environmental Information (NCEI) Storm Events Database and other data sources. When available, tables showing county-specific data from the NCEI database may be found in each hazard profile.

Geographical Area Affected

This subsection discusses which areas of the Region are most likely to be affected by a hazard event.

- **Negligible:** Less than 10 percent of planning area or isolated single-point occurrences
- **Limited:** 10 to 25 percent of the planning area or limited single-point occurrences
- **Significant:** 25 to 75 percent of planning area or frequent single-point occurrences
- **Extensive:** 75 to 100 percent of planning area or consistent single-point occurrences

Magnitude/Severity

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

- **Negligible:** Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
- **Limited:** 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
- **Critical:** 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time or result in many permanent disabilities and a few deaths. overwhelmed for an extended period of time or many deaths occur.
- **Catastrophic:** More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time, or many deaths occur.

Frequency/Likelihood of Occurrence

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

- **Highly Likely**—90 to 100 percent chance of occurrence in next year or happens every year.

- **Likely**—Between 10 and 90 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
- **Occasional**—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
- **Unlikely**—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

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

$$\frac{\text{\# of known events}}{\text{years of historic record}} \times 100$$

This gives the percent chance of the event happening in any given year. An example would be three droughts occurring over a 30-year period which equates to 10 percent chance of that hazard occurring any given year.

Climate Change Considerations

This describes the potential for climate change to affect the frequency and intensity of the hazard in the future.

Vulnerability Assessment

Vulnerability is the measurement of exposed structures, critical facilities, or populations relative to the risk of the hazard. For most hazards, vulnerability is a best estimate. Some hazards, such as flood, affect specific areas so that exposure can be quantified, and vulnerability assessments result in a more specific approximation. Other hazards, such as tornadoes, are random and unpredictable in location and duration that only approximate methods can be applied. The assessment was conducted through the study of potential impacts to the following specific sectors:

- People
- Property
- Critical Facilities and Infrastructure
- Economy
- Historic, Environmental, and Cultural Resources
- Development Trends

Risk Summary

This section summarizes risk by county according to the area affected, likelihood, and magnitude of impacts. Overall, Hazard Significance is summarized for the region and by county and tribe. If the hazard has impacts on specific towns or cities in the region that differ from the county or region, they are noted here, where applicable.

4.2.2 Avalanche

Hazard/Problem Description

According to the 2013 Colorado Natural Hazards Mitigation Plan, an avalanche is a mass of snow, ice, and debris flowing and sliding rapidly down a steep slope. Avalanches are also referred to as snow slides. Snow avalanches are defined in Colorado state statutes as a geologic hazard.

Deep snow deposits often become susceptible to avalanche based on the slope stability and the structure of the snow deposits through multiple storms. An avalanche occurs when the deposit reaches its breaking point, whether triggered naturally or by human intervention. Avalanches can be naturally triggered (by wind, snow, rain, etc.) or human triggered (skiers, snowboarders, snowmobilers, climbers, etc.). There are more avalanche-related deaths in Colorado than any other state.

Slab avalanches are the most dangerous type of avalanche. They form when stronger snow overlies weaker snow. Often, human triggered slab avalanches are one to two feet deep, have an area about half the size of a football field, and can reach speeds over 20 mph within seconds.[1]

Past Occurrences

According to the National Centers for Environmental Information (NCEI), 20 significant avalanche events have been recorded in the six counties in San Luis Valley since 1950. These events have resulted in seven injuries and 23 fatalities.

Table 4-9 San Luis Valley Avalanche Events 1950-2022

County	# of Events	Injury	Fatalities
Alamosa	1	0	1
Conejos	4	1	5
Costilla	1	0	1
Mineral	4	1	5
Rio Grande	4	1	5
Saguache	6	4	6
Total	**20**	**7**	**23**

Source: NCEI

Details on several notable avalanche events were reported by the NCEI:

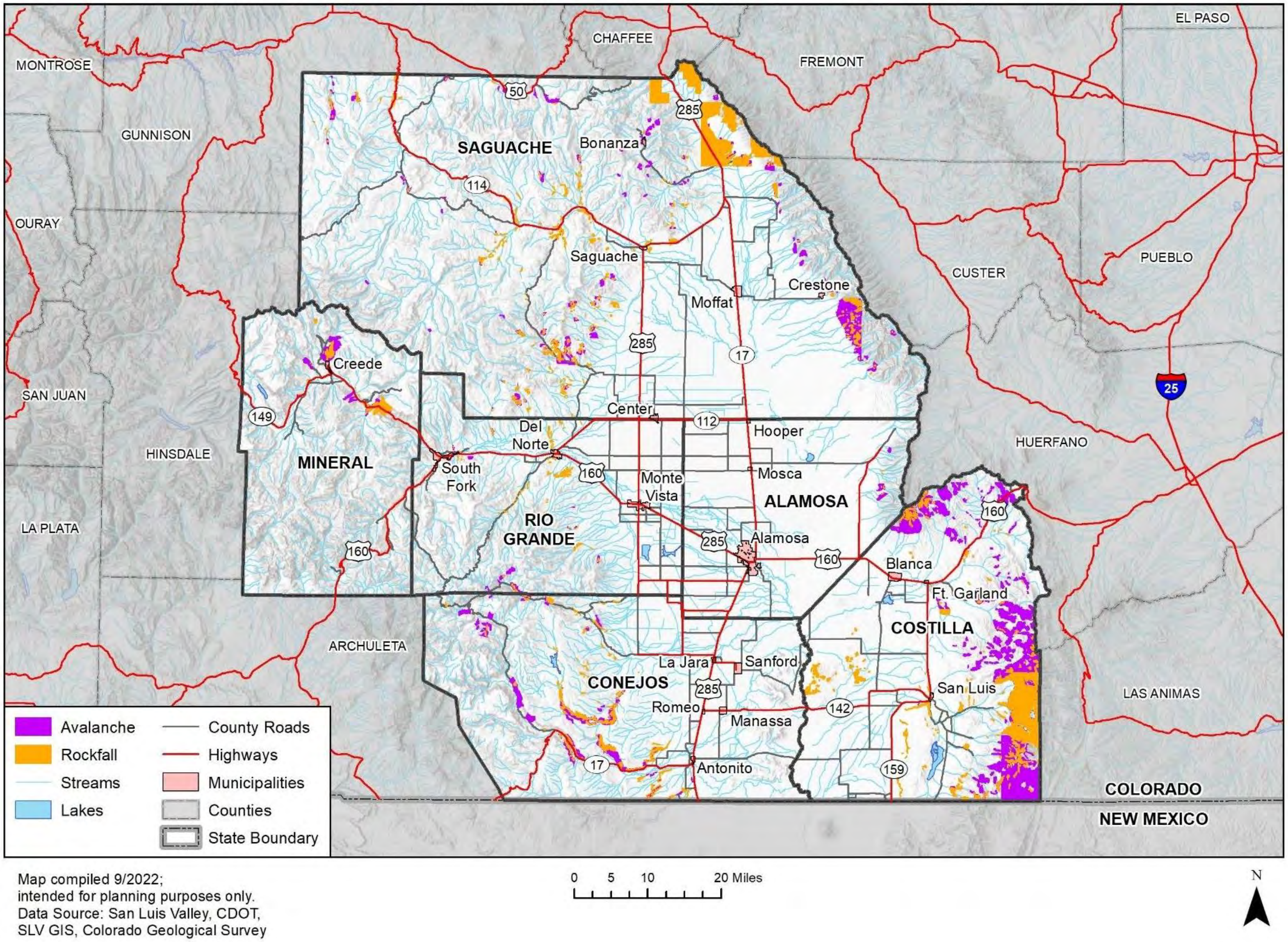
- **January 10, 2008**: An avalanche buried a hiker in the Hourglass, between Blanca Peak and Little Bear Peak in the northern Sangre de Cristo Mountains.
- **March 19, 2010**: Two men were buried and perished when up to 2 1/2 feet of snow slid off a cabin roof 17 miles west of Creede. This was the first instance of a fatal roof avalanche since 1996 in Vail. (Conejos Co.)
- **November 22, 2010**: An avalanche at Wolf Creek Ski Area killed the Wolf Creek Ski Area Director.
- **February 16, 2012**: A backcountry skier was killed in an avalanche near Wolf Creek Pass in the Gibbs Creek drainage basin. The skier was found under 5-feet of snow in a 600 foot by 600-foot slide. Another skier was injured.
- **February 2, 2016**: A snowmobile rider died in an avalanche in the Lost Mine Creek drainage between Campo Mollino and Park Creek.

Geographical Area Affected

The Colorado Geological Survey (CGS) and the Colorado Avalanche Information Center (CAIC) have mapped the State's areas susceptible to avalanche activity. The CAIC forecasts backcountry avalanche and mountain weather conditions for 10 Zones in the mountains of Colorado. Slopes in the Sangre de Cristo Mountains on the eastern edge of Alamosa County are susceptible to avalanche. Figure 4-3 below displays avalanche and rockfall risk in San Luis Valley.

[1] Colorado Department of Transportation, www.codot.gov

Figure 4-3 San Luis Valley Avalanche and Rockfall Hazards



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, Colorado Geological Survey

The Colorado Department of Transportation (CDOT) has mapped avalanche corridors on the state highway system, and the approximate number of slide paths that CDOT and CAIC crews monitor and/or control on each. In the San Luis Valley Region, CDOT conducts avalanche-mitigation operations at the following locations:

1) SH 17, Cumbres and La Manga Passes (15 slide paths) in Conejos County
2) U.S. 160, Wolf Creek Pass (61 slide paths) in Rio Grande County
3) U.S. 285 Poncha Pass (2) in Saguache County

Magnitude/Severity

In an avalanche, the impact forces of the rapidly moving snow and debris and the burial of areas in the run-out zone can result in the destruction of structures and anything else in its path. Areas prone to avalanche hazards in and around the San Luis Valley are generally not heavily populated. Avalanches causing death or injury are usually human triggered in the backcountry and therefore can result in isolated injuries or fatalities. On rare occasions, roads, highways, and railroads may be damaged and blocked by snow and debris, resulting in travel delays and costly efforts to clear and repair transportation routes. Otherwise, impacts to critical facilities and interruption of essential services are not expected.

The San Luis Valley's avalanche area is not heavily populated. Recorded avalanche events are often human-triggered, and frequently result in injuries or fatalities (loss of structures or other facilities is not expected). The Planning Team has rated the severity of the avalanche hazard in the San Luis Valley as limited, meaning that minor injuries and minor property damages are possible, with minimal disruptions to infrastructure and critical services.

Frequency/Likelihood of Occurrence

The likelihood of an avalanche increases with heavy accumulation of snow and wind. The probability of future occurrence will depend on weather patterns and levels of recreational activity within known avalanche zones. The probability of avalanches in the high mountain areas of the San Luis Valley in the future is highly likely, with an annual recurrence interval (100% chance each year); many of these will be in remote areas with minor impacts.

Climate Change Considerations

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

Vulnerability Assessment

According to the CAIC, avalanches have killed more people in Colorado than any other natural hazard since 1950, and Colorado accounts for one-third of all avalanche deaths in the United States. Every year, snow avalanches kill and injure winter recreationists in Colorado's high country, including cross-country skiers, downhill skiers, snowshoers, and snowmobilers. Private property losses are rare, due to local regulation of known avalanche zones, although lack of knowledge of avalanche run-out potential (the farthest reach of snow and debris) has occasionally resulted in damages to residences and private vehicles in Colorado.

Avalanche prone areas within the Region are primarily accessible only by means of public trail systems. Snowmobilers, skiers, snowboarders, hikers, climbers, and snowshoers are all at risk when participating in activities near known avalanche zones. In particularly heavy snow years, the avalanche risk is greater. With prime conditions of wind or snow load, avalanches can be triggered easily.

According to the 2018 Colorado Natural Hazards Mitigation Plan, the avalanche hazard is localized in mountain regions: "Avalanche-prone areas are well known; avalanche chutes identify where they will likely occur again…the complex interaction of weather and terrain factors contributes to the location, size, and timing of avalanches. In the absence of detailed scientific observation, any accumulation of snow on a slope steeper than 20 degrees should be considered a potential avalanche hazard."

People

According to the 2018 Colorado Natural Hazards Mitigation Plan, it is difficult to determine the number of persons at risk from avalanche, but a half dozen can be expected every year in Colorado. "There is no way to determine the number of people caught or buried in avalanches each year, because non-fatal avalanche incidents are increasingly under-reported. The American Institute for Avalanche Research and Education reports that 90 percent of avalanche victims die in slides triggered by themselves or a member of their group. Obtaining a better understanding of outdoor recreation in avalanche-prone areas may lead toward a better understanding of future probability for this hazard."[2]

Backcountry recreationalists, road crews, and motorists along SH 17, Cumbres and La Manga Passes in Conejos County, U.S. 160, Wolf Creek Pass also in the Rio Grande County and US 285 Poncha Pass in Saguache County are all very active during most winters. Rising numbers of outdoor enthusiasts may lead to an increase in fatal avalanche occurrences, as avalanche events can be triggered by people's recreational activities. Beyond backcountry skiing, there has been an increased interest in other forms of recreation such as snowmobiling and motorized and non-motorized snow biking.

Backcountry avalanche incidents involve search and rescue teams and resources, which can put these personnel at risk. The key actions to limiting impacts to individuals recreating in hazardous areas include spreading knowledge and awareness of the hazard and being properly equipped for self-rescue, if necessary, with tools such as locator beacons, shovels, GPS units and other communication tools and probes. Excessive avalanche cycles may result in risk to people in structures, though GIS analysis did not indicate specific structures at risk; this could be in part due to a data limitation, as noted in the Previous Occurrences section.

Property

Private property losses are rare in the Region, however, all property located near areas of risk to avalanche and rockfall are vulnerable to damages in a hazard event.

Critical Facilities & Infrastructure

Avalanches can lead to the temporary blockage of roads, notably Hwy 160 over Wolf Creek Pass in Mineral County. Significant damage to an essential government facility could force the temporary closure of that facility, disrupting the ability of local governments to provide the usual level of service to residents. The following facilities were identified as potentially exposed to avalanche hazards during a GIS analysis performed during the 2022 update, displayed in Table 4-10 below.

Table 4-10 Critical Facilities Potentially Exposed to Avalanche Hazards

County	Jurisdiction	Lifeline	Facility Type
Mineral	Creede	Communications	Microwave Service Tower
Mineral	Creede	Food, Water, Shelter	Wastewater Treatment Plant
Rio Grande	Rio Grande County	Transportation	Non-Scour Fair Condition Bridge
Saguache	Bonanza	Safety and Security	Fire Station

[2] Colorado Natural Hazards Mitigation Plan, 2018-2023, Colorado Division of Homeland Security and Emergency Management

County	Jurisdiction	Lifeline	Facility Type
Saguache	Bonanza	Transportation	Non-Scour Fair Condition Bridge
Saguache	Saguache County	Transportation	Non-Scour Fair Condition Bridge
Saguache	Saguache County	Transportation	Non-Scour Poor Condition Bridge

Source: WSP analysis

Economy

Avalanche activity inside or outside the San Luis Valley and along connecting roadways can disrupt transportation in and out of the local communities, which could result in temporary economic impacts.

Historical, Environmental, and Cultural Resources

Moderate damage can occur to forests below avalanche run-out zones. This can also disturb stream habitat with debris piles. There are also historic mining sites likely to be at risk throughout the Region.

Development Trends

Avalanche vulnerability could increase to a degree with future development and population growth as there will be a higher number of people driving on roadways and taking part in backcountry recreation, as well as potentially requiring search and rescue and emergency response and services. Risk to structures can potentially increase without careful siting and planning. Population growth projections in the Region, however, do not correlate to a substantial increase in avalanche risk.

Risk Summary

Overall, an avalanche is a medium to low significance hazard. Most of the hazard is in the high elevation and remote areas on the borders of the Valley.

Table 4-11 Avalanche Risk Summary Table

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Limited	Highly Likely	Limited	Low
Conejos County	Limited	Highly Likely	Limited	Low
Costilla County	Significant	Highly Likely	Limited	Medium
Mineral County	Limited	Highly Likely	Limited	Medium
Rio Grande County	Significant	Highly Likely	Limited	Medium
Saguache County	Limited	Highly Likely	Limited	Medium

- Avalanche incidents present a risk for death and injury for people recreating in areas of steep slopes in the winter.
- There are seven critical facilities located in avalanche areas throughout the planning area. Most of these facilities are in the Transportation FEMA Lifeline Category, but a fire station and wastewater treatment plant are also identified.
- Unique Jurisdictional Vulnerability: Mineral, Costilla, Rio Grande, and Saguache County have the most mapped hazard areas. The Town of Bonanza in Saguache County could potentially be affected by avalanches.
- Related Hazards: Severe Winter Storm, Earthquake.

4.2.3 Dam Incidents

Hazard/Problem Description

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

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

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

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

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

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

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

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

Non-Failure Inundation

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

Causes of Dam Failure

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

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

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

Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

Regulatory Oversight

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

<u>Colorado Rules and Regulations for Dam Safety and Dam Construction</u>

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

U.S. Army Corps of Engineers Dam Safety Program

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

Federal Energy Regulatory Commission Dam Safety Program

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

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

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

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

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

Past Occurrences

Colorado has a history of dam failure, with at least 130 known dam failures since 1890 (Flood Hazard Mitigation Plan for Colorado). There have been three dam incidents in the San Luis Valley, each of which were non-failure incidents. According to the 2016 Costilla County Hazard Mitigation Plan, in 1992 the Sanchez Dam, a high hazard dam in Costilla County, experienced a leak and failure of the dam was threatened. There was repair work conducted to keep the dam serviceable and prevent any complete failure or downstream flooding.

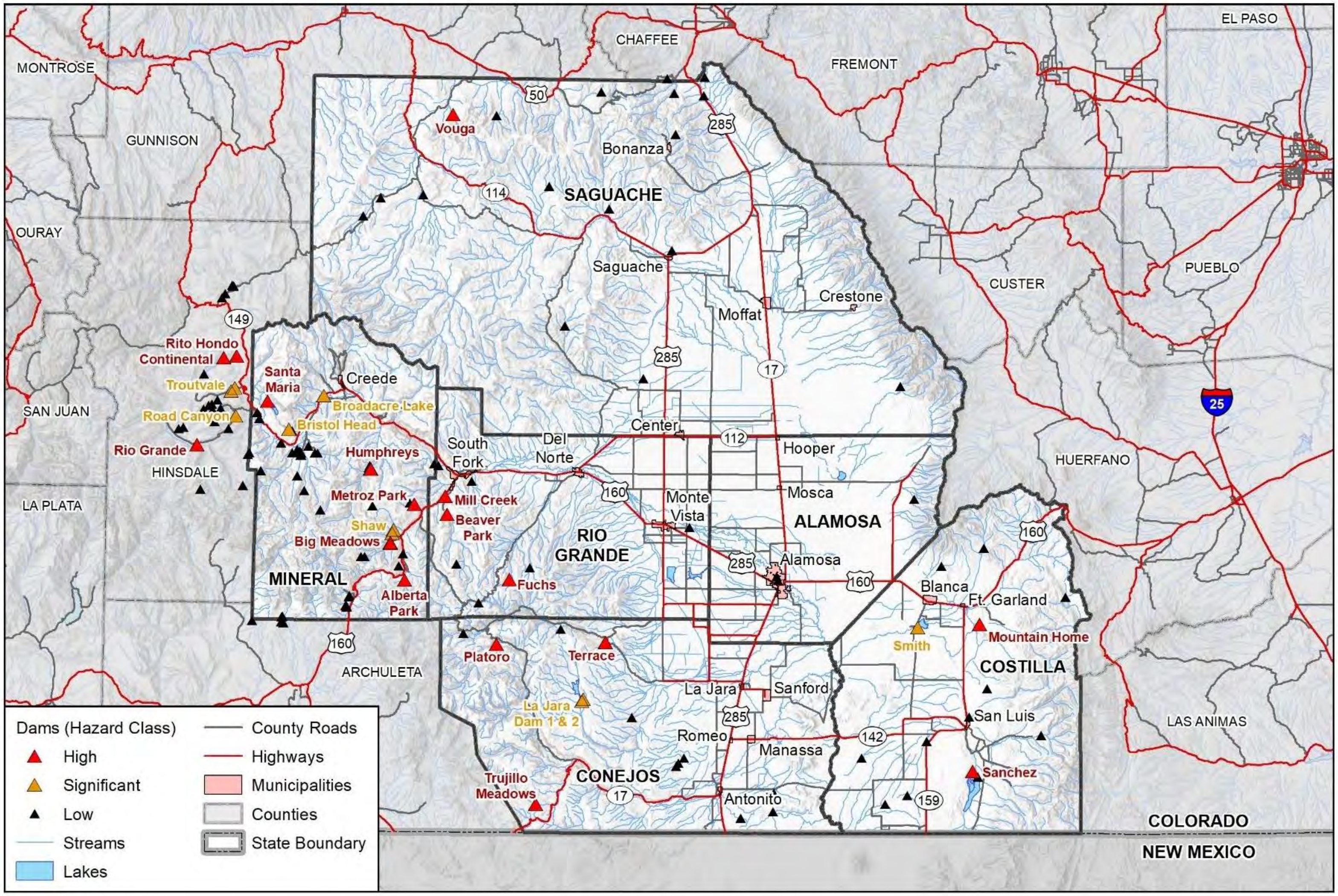
On March 18, 2016, the Beaver Park dam had an issue with sinkholes developing in the reservoir area behind the dam resulting in internal erosion. In July of 2017 another dam incident occurred at the Alberta Park dam due to manmade errors. According to the Dam Safety Incident Database, while drilling in the embankment with hollow stem augers an apparent connection was made with a pervious seam and elevated pressures associated with the drilling process caused a surge of muddy seepage and an increase in volume of seepage.

Drilling was stopped, the hole was grouted, and the situation returned to "normal". The reservoir was lowered, and an emergency seepage collection system and stability buttress were constructed. Neither of these incidents resulted in large-scale downstream flooding, property or infrastructure damage, or any casualties.

Geographical Area Affected

The geographic extent of dam failure in the San Luis Valley Region is significant. According to the Colorado DWR's Dam Safety Program, there are 131 registered dams within the San Luis Valley counties or upstream in Hinsdale County. Of these dams, 19 are high hazard and 10 are significant hazard dams. Three of these high hazard dams are upstream of the planning area in Hinsdale County, as are three of the significant hazard dams. Figure 4-4 below shows the locations as well as the condition assessment status of each dam. Table 4-12 below provides further information on each of these high and significant hazard dams. Each of these dams has the potential to cause downstream inundation and potential property damage and loss of life. Based on inundation mapping conducted using data from the Colorado Division of Water Resources Dam Safety Program, the majority of the dam inundation risk in the San Luis Valley is within Rio Grande, Alamosa, Conejos, and Costilla Counties.

Figure 4-4 San Luis Valley Dam Locations



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, DWR Dam Safety

Table 4-12 High and Significant Hazard Dams in Planning Area

Name	Owner	River	Hazard Class	Nearest Downstream City	Distance to Nearest Downstream City (miles)	Emergency Action Plans (EAP)
Alberta Park	Colorado Parks and Wildlife	Pass Creek	High	South Fork	17	Y
Beaver Park	Colorado Parks and Wildlife	Beaver Creek	High	South Fork	6	Y
Big Meadows – Main Dam	Colorado Parks and Wildlife	S Fork Rio Grande	High	South Fork	12	Y
Big Meadows – North Dike	Colorado Parks and Wildlife	S Fork Rio Grande	High	South Fork	12	Y
Continental	Santa Maria Reservoir Co.	North Clear Creek	High	South Fork	50	Y
Fuchs	Fuchs Ranches, Inc.	E Fork Pinos Creek	High	Del Norte	16	Y
Humphreys – Main Dam	Ruth Brown	Goose Creek	High	South Fork	18	Y
Humphreys – Spillway Dam	Ruth Brown	Goose Creek	High	South Fork	18	Y
Metroz Park Lower	Metroz Park and Lake Co.	Decker Creek	High	South Fork	8	Y
Mill Creek	U.S. Forest Service Rio Grande Natl. Forest	Mill Creek	High	South Fork	4	Y
Mountain Home	Tracy Kester	Trinchera Creek	High	Arroya Hondo, NM	93	Y
Platoro	U.S. Bureau of Reclamation	Conejos River	High	Platoro	1	Y
Rio Grande	San Luis Valley Irrigation District	Rio Grande River	High	South Fork	47	Y
Rito Hondo	Colorado Parks and Wildlife	Rito Hondo	High	South Fork	48	Y
Sanchez	Sanchez Ditch and Reservoir Co.	Ventero Creek	High	San Luis	7	Y
Santa Maria	Santa Maria Reservoir Co.	Boulder Creek	High	South Fork	41	Y
Terrace	Terrace Irrigation Company	Alamosa River	High	Capulin	12	Y
Trujillo Meadows	Colorado Parks and Wildlife	Los Pinos River	High	Antonito	36	Y

Name	Owner	River	Hazard Class	Nearest Downstream City	Distance to Nearest Downstream City (miles)	Emergency Action Plans (EAP)
Vouga	Vouga Reservoir Association	Razor Creek	High	Gunnison	24	Y
Bristol Head #2	Justin Rhoads	Seepage Creek	Significant	South Fork	30	Y
Broadacre Lake	La Soleil, L.L.C.	Shallow Creek	Significant	South Fork	20	Y
La Jara – Dam No. 1	Colorado Parks and Wildlife	La Jara Creek	Significant	Capulin	24	Y
La Jara – Dam No. 2	Colorado Parks and Wildlife	La Jara Creek	Significant	Capulin	24	Y
Road Canyon #1	Colorado Parks and Wildlife	Road Canyon Creek	Significant	South Fork	42	Y
Shaw – North Dam	San Luis Valley Water Conservancy District	Kitty Creek	Significant	South Fork	13	Y
Shaw – South Dam	San Luis Valley Water Conservancy District	Kitty Creek	Significant	South Fork	15	Y
Smith	Trinchera Irrigation Co.	Trinchera Creek	Significant	Arroya Hondo, NM	88	Y
Troutvale #1 (Upper)	Colorado Parks and Wildlife	South Clear Creek	Significant	South Fork	36	Y
Troutvale #2 (Lower)	Colorado Parks and Wildlife	South Clear Creek	Significant	South Fork	37	Y

Source: DWR Dam Safety

Non-Failure Dam Incidents:

The dams at the highest risk of non-failure inundation are shown in Table 4-13 below. The high, moderate, or low designations were assigned by DNR by dividing the total number of ranked dams across the state into thirds. Should there be a need to relieve pressure on the dam (e.g., if there was excess inflow from high rains or snowmelt) releases from the dams ranked as high or moderate may result in downstream flooding.

Table 4-13 High and Significant Hazard Dams with Outlet Release Flood Potential in Planning Area

County	Dam ID	Dam Name	Outlet Description	Max Outlet Release Capacity (cfs)	Composite Ranking	Outlet Release Ranking
CONEJOS	220102	PLATORO	2-40" BTRFX. V*	1,010	37	High
RIO GRANDE	200102	BEAVER PARK	48" STEEL CHAMBER RE-LINED IN 2009	480	45	High
COSTILLA	240106	SANCHEZ	10.5' H X 8' W ARCHED CROWN CONCRETE CONDUIT	950	58	High
MINERAL	200204	SANTA MARIA	7.5'H x 6'W CONCRETE-LINED TUNNEL & CUT AND COVER CONDUIT, W/ 2-48" AND 1-36" CONDUITS AT MID-LENGTH VALVE CHAMBER	500	81	High
COSTILLA	350102	MOUNTAIN HOME	3-30" STEEL, CONC. ENCASED, TO 5.5' H x 5' W CONCRETE TUNNEL	645	85	High
CONEJOS	210102	TERRACE	ROCK TUNNEL THROUGH LEFT ABUTMENT W/ TWO 48" GATE VALVES; EAST GATE VALVE FEEDS INTO 48" CONDUIT IN D/S TUNNEL	1,080	85	High
HINSDALE	200137	RIO GRANDE	Tunnel thru right abutment, with three gate openings in central gate chamber	2,547	104	High
SAGUACHE	280109	VOUGA	24" CSP	370	124	High
MINERAL	200103	BIG MEADOWS - MAIN DAM	36" RCP	190	176	Moderate
HINSDALE	200110	CONTINENTAL	48"W X 66"H CONCRETE CONDUIT	794	179	Moderate
MINERAL	200121	HUMPHREYS - MAIN DAM	2-36" STEEL	115	290	Moderate
MINERAL	200233	HUMPHREYS - SPILLWAY DAM	36" steel power penstock siphon over left abutment installed in	60	320	Low

County	Dam ID	Dam Name	Outlet Description	Max Outlet Release Capacity (cfs)	Composite Ranking	Outlet Release Ranking
			2011, feeds 350kw small hydro powerplant			
RIO GRANDE	200114	FUCHS	18" CMP	38	328	Low
MINERAL	200101	ALBERTA PARK	18" CMP, lined w/ InSituForm in 1995, 16" diam.	16	354	Low
MINERAL	200230	BIG MEADOWS - NORTH DIKE	NO OUTLET ON THIS DAM - SEE MAIN DAM	0.0001	367	Low
MINERAL	200133	METROZ PARK, LOWER	30" PVC	109	367	Low
CONEJOS	220103	TRUJILLO MEADOWS	36" CMP, EXTENDED D/S IN 1998	145	367	Low

Source: DWR High Hazard Dam Release – Downstream Floodplain Impacts Study

Magnitude/Severity

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

Information from the event of record is used to calculate a magnitude and severity rating for comparison with other hazards, and to assist in assessing the overall impact of the hazard on the planning area. In some cases, the event of record represents an anticipated worst-case scenario, and in others, it is a reflection of common occurrence. There is no event of record for the San Luis Valley with a sufficiently detailed profile that allows for a specific discussion on the severity and magnitude of such an event. However, the rating systems utilized in dam classification is a useful measurement for assessing the potential magnitude and severity of a dam failure. In addition, all high-hazard dams in Colorado are required to have Emergency Action Plans (EAPs) that include predicted inundation maps for dam failure scenarios. These tools allow planners to measure the estimated worst-case or event-of-record occurrences for a dam failure.

Overall, dam failure impacts would likely be **limited** throughout the San Luis Valley, with 10-25 percent of the planning area affected. Roads closed due to dam failure floods could result in serious transportation disruptions throughout the wider Region.

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

Frequency/Likelihood of Occurrence

The likelihood of occurrence for this hazard in the future across the region is generally occasional. The structural integrity of dams depends on regular inspections and maintenance, which do not always happen. Additionally, snowmelt flooding can exceed the capacity and strength of dams, causing them to fail. The dams throughout the San Luis Valley will continue to be tested by snowmelt, heavy rains, and other types of floods every year. Thus, dam failures could possibly threaten each of the counties in the region in the future. There are no official recurrence intervals calculated for dam failures, so estimating the frequency of occurrence of dam failure is extremely difficult.

Climate Change Considerations

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

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

Vulnerability Assessment

While dam failures are unlikely, a major failure could have severe consequences. Structures, above-ground infrastructure, critical facilities, and natural environments are all vulnerable to dam failure. Roads closed due to dam failure floods could result in serious transportation disruptions due to the limited number of roads in the county. Information for the exposure analysis provided in the sections below is based off dam inundation data provided by the state.

The most significant issue associated with dam failure involves the properties and populations in the inundation areas. Flooding as a result of a dam failure would significantly impact these areas. There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Dam inundation for various dams throughout and upstream of the San Luis Valley was provided by the CO DWR and provided the basis for GIS overlay analysis. Due to the sensitivity of this information it is not presented in this public document but was made available to the emergency managers during the planning process.

People

Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable time frame. 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 difficulty to detect the dams when approaching from upstream and risk of becoming trapped in the low head dam's recirculating currents. According to the Colorado Department of Natural Resources, Dam Safety Division, in recent years Colorado has experienced one fatality annually and there has been a total of 13 fatal incidents recorded since 1986 (Zimmer 2019). The Dam Safety Division, Low Head Dam Inventory Final Report (October 2019), notes an increase of low head dam incidents in the state directly correlated to increased recreational water usage by out-of-state tourists, new residents, and long-term residents (Zimmer 2019). The San Luis Valley is a very popular region for outdoor recreation and tourism, and as the population and number of visitors increases in Colorado and the San Luis Valley there is the potential for increased fatalities from low head dams.

Property

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

Communities located below a high or significant hazard dam and along a waterway are potentially exposed to the impacts of a dam failure. High hazard dams threaten lives and property, while significant hazard dams threaten property only. Inundation maps that identify anticipated flooded areas (which may not coincide with known floodplains) are produced for many high hazard dams. Several of the high or significant hazard dams contained dam inundation extents in spatial form that were analyzed to quantify risk across the planning area. Table 4-14 below summarizes the number of structures throughout the region which are located within mapped inundation areas, grouped by individual dam. Note that numerous inundation zones throughout the region overlap one another and as such Table 4-14 breaks down structures at risk within each inundation zone in order to avoid inflating the risk posed by this hazard. In all, Alamosa County has the highest number of exposed structures, with 4,992 located in inundation areas, followed by Rio Grande County with 2,895 structures.

Table 4-14 San Luis Valley Structures within Inundation Areas, by Dam and County

Dam Name (Hazard Class)	County	Jurisdiction	Structure Count
Alberta Park (High)	Mineral	Mineral County	22
	Rio Grande	South Fork	8
		Rio Grande County	5
		Total	**35**
Beaver Park (High)	Alamosa	Alamosa	309
		Alamosa County	215
	Rio Grande	Del Norte	242
		Monte Vista	4
		South Fork	218
		Rio Grande County	722
		Total	**1,710**
Big Meadows – Main Dam (High)	Mineral	Mineral County	30
	Rio Grande	South Fork	31
		Rio Grande County	18
		Total	**79**
Big Meadows – North Dike (High)	Mineral	Mineral County	46
	Rio Grande	South Fork	98
		Rio Grande County	168
		Total	**312**
Continental (High)	Alamosa	Alamosa	42
		Alamosa County	600
	Costilla	Costilla County	1
	Mineral	Mineral County	445
	Rio Grande	Del Norte	486
		Monte Vista	53
		South Fork	233
		Rio Grande County	1,058
		Total	**2,918**
Fuchs (High)	Rio Grande	Del Norte	21
		Rio Grande County	119
		Total	**140**
Humphreys – Main Dam (High)	Mineral	Mineral County	57
	Rio Grande	South Fork	22
		Rio Grande County	16
		Total	**95**
Humphreys – Spillway Dam (High)	Mineral	Mineral County	8
		Total	**8**
La Jara – Dam No. 1 (Significant)	Conejos	Conejos County	188
		Total	**188**
Metroz Park Lower (High)	Mineral	Mineral County	2
	Rio Grande	South Fork	9
		Rio Grande County	9
		Total	**20**

Dam Name (Hazard Class)	County	Jurisdiction	Structure Count
Mill Creek (High)	Rio Grande	South Fork	5
		Rio Grande County	31
		Total	**36**
Mountain Home (High)	Conejos	Conejos County	1
	Costilla	Costilla County	124
		Total	**125**
Rio Grande (Significant)	Alamosa	Alamosa	3,682
		Alamosa County	1,228
	Conejos	Conejos County	2
	Costilla	Costilla County	2
	Mineral	Mineral County	502
	Rio Grande	Del Norte	769
		Monte Vista	281
		South Fork	272
		Rio Grande County	1,274
		Total	**8,012**
Road Canyon #1 (High)	Mineral	Mineral County	1
		Total	**1**
Sanchez – Main Dam (High)	Conejos	Conejos County	3
	Costilla	San Luis	121
		Costilla County	210
		Total	**334**
Santa Maria (High)	Alamosa	Alamosa	3,651
		Alamosa County	1,072
	Conejos	Conejos County	1
	Costilla	Costilla County	1
	Mineral	Mineral County	472
	Rio Grande	Del Norte	549
		Monte Vista	53
		South Fork	251
		Rio Grande County	1,118
		Total	**7,168**
Terrace (High)	Alamosa	Alamosa County	49
	Conejos	La Jara	454
		Conejos County	1,200
	Costilla	Costilla County	2
		Total	**1,705**
Trujillo Meadows (High)	Conejos	Conejos County	13
		Total	**13**
Vouga (High)	Saguache	Saguache County	2
		Total	**2**

Source: Microsoft Footprints 2021, DWR Dam Safety, WSP GIS Analysis

Critical Facilities & 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 466 critical facilities throughout the region which lie within dam inundation areas. 151 of these facilities are within inundation areas from the Rio Grande Dam, which is the highest of all dams with vulnerable facilities downstream. These at-risk facilities are listed in Table 4-15 below by critical facility classification as based on the FEMA Lifeline categories (FEMA Community Lifelines, 2019).

Table 4-15 San Luis Valley Critical Facilities at Risk to Dam Inundation by Dam and FEMA Lifeline

Dam Name (Hazard Class)	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Alberta Park (High)	-	-	-	-	-	-	4	**4**
Beaver Park (High)	8	3	2	1	-	3	18	**35**
Big Meadows - Main Dam (High)	-	-	-	-	-	-	7	**7**
Big Meadows - North Dike (High)	-	-	-	-	-	-	8	**8**
Contenental (High)	11	4	2	2	1	2	30	**52**
Fuchs (High)	-	-	1	-	-	-	2	**3**
Humphreys - Main Dam (High)	1	-	-	-	-	-	3	**4**
Humphreys - Spillway Dam (High)	-	-	-	-	-	-	1	**1**
La Jara - Dam No. 1 (Significant)	1	-	-	-	-	1	2	**4**
Metroz Park Lower (High)	-	-	-	-	-	-	3	**3**
Mill Creek (High)	-	-	-	-	-	-	1	**1**
Mountain Home (High)	-	-	-	-	-	-	6	**6**
Rio Grande (Significant)	38	8	3	10	24	32	36	**151**
Sanchez - Main Dam (High)	-	-	1	1	2	4	8	**16**
Santa Maria (High)	33	8	3	9	22	28	32	**135**
Terrace (High)	4	1	-	2	3	5	20	**35**
Trujillo Meadows (High)	-	-	-	-	-	-	1	**1**
Total	**96**	**24**	**12**	**25**	**52**	**75**	**182**	**466**

Source: DWR Dam Safety, CDPHE, CEPC, HIFLD, NBI, WSP GIS Analysis

Economy

Extensive and long-lasting economic impacts could result from a major dam failure or inundation event, including the long-term loss of water in a reservoir, which may be critical for potable water needs. A major dam failure and loss of water from a key structure could bring about direct business and industry damages and potential indirect disruption of the local economy. A dam failure can have long lasting economic impacts and could deter visitors for a period of time.

Historical, Environmental, & Cultural Resources

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

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

Development Trends

The vulnerability to dam failure could increase if development occurs in inundation areas downstream of dams. Often these inundation areas are not shown on plat or planning maps or NFIP maps and thus are not regulated. This type of development can change the designation of a dam from low to high hazard. Projected growth trends in the Region are not anticipated to change exposure to this hazard.

Risk Summary

Overall dam failure is a medium to low significance hazard. The majority of the high and significant hazard dams in the San Luis Valley are located either in or upstream of Alamosa, Costilla, Conejos, Mineral, and Rio Grande Counties, and thus these counties each have higher risk of dam failure, larger mapped inundation zones, and larger populations, property, and critical facility inventories at risk. The inundation areas in Saguache County are much smaller and flow north out of the county, possibly presenting greater risk to other counties outside the San Luis Valley, but not presenting any risk to incorporated communities in the county.

Table 4-16 Dam Incident Risk Summary Table

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Significant	Unlikely	Critical	Medium
Conejos County	Significant	Unlikely	Critical	Medium
Costilla County	Significant	Unlikely	Critical	Medium
Mineral County	Limited	Unlikely	Limited	Low
Rio Grande County	Significant	Unlikely	Critical	Medium
Saguache County	Limited	Unlikely	Negligible	Low

Table 4-17 Unique Jurisdictional Risk*

County/ Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County: City of Alamosa	Extensive	Occasional	Catastrophic	High*
Rio Grande County: South Fork, Del Norte, and Monte Vista	Extensive	Occasional	Catastrophic	Medium

County/ Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Conejos County: La Jara	Extensive	Occasional	Catastrophic	High*
Costilla County: San Luis	Extensive	Occasional	Catastrophic	Medium

* Where it differs from overall county rating, where applicable

- Dam Incidents present a very low likelihood for future catastrophic events, but potentially devastating consequences if one were to occur.
- Dam incidents present a risk for death and injury for people residing downstream.
- Similar to people, property located in the downstream inundation areas is also at risk of being damaged or destroyed in a dam incident. According to GIS analysis, an estimated 10,613 buildings are exposed in dam inundation areas.
- Dam incidents could result in extensive and long-term economic impacts to downstream communities, through direct damages as well as lost revenues from forced closures.
- There are 466 critical facilities located in inundation areas throughout the planning area, all of which would be potentially at risk in a dam incident. The majority of these facilities are in the Transportation FEMA Lifeline Category, followed by the Communications Lifeline Category.
- Unique Jurisdictional Vulnerability: Every municipality in Rio Grande County is at least partially located within an inundation area. The Town of La Jara in Conejos County could potentially be entirely inundated if the Terrace Dam had a failure, as could the entire City of Alamosa if upstream dams in Rio Grande, Mineral, and Hinsdale Counties were to fail.
- Related Hazards: Flooding, earthquake.

4.2.4 Drought

Hazard/Problem Description

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

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

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

- **Meteorological** drought is usually defined by a period of below average precipitation.
- **Agricultural** drought occurs when there is an inadequate water supply to meet the needs of agricultural operations, based on soil moisture deficiencies relative to water demands of crops and rangeland.
- **Hydrologic** drought refers to deficiencies in surface and subsurface water supplies and is measured as streamflow, snowpack, reservoir, and groundwater levels.

- **Socioeconomic** drought occurs when a drought impacts health, well-being, and quality of life, or when drought effects start to have an adverse economic impact on a region.

There are also distinctions between drought mitigation planning and water conservation planning:

- Drought mitigation planning identifies temporary responses to potential water supply shortages, such as mandatory restrictions on certain water uses, water allocation or the temporary use of an alternative water supply. These measures are intended to be temporary responses to water supply shortages
- Water conservation planning involves long-term improvements in water use efficiency, such as managing landscape irrigation, implementing conservation water rate structures, and replacing or retrofitting water fixtures.

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or wildfires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.

Droughts, when combined with wind events, often result in dust storms in the Valley. The Great Sand Dunes are a result of prevailing winds depositing soil on the eastern side of the Valley.

Past Occurrences

Colorado has experienced drought in 2018-2019, 2011-2013, 2000-2006, 1996, 1994, 1990, 1989, 1979-1975, 1965-1963, 1957-1951, 1941-1931, and 1905-1893 (Colorado Drought Mitigation and Response Plan, 2018). The most significant are listed in Table 4-18. Although drought conditions can vary across the state, it is likely that the San Luis Valley suffered during these dry periods. The period of 2014-2018 was close to average.

Table 4-18 Historic Dry and Wet Periods in Colorado*

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

Source: McKee, et al. *modified for the Colorado State Drought Plan in 2018 based on input from the Colorado Climate Center. **modified for the San Luis Valley Regional HMP 2022
*2014-2018 were close to average.

The most intense single year of drought in state history occurred in 2002, an extremely dry year embedded in an extended dry period between 2000 and 2006. Drought conditions in 2002 resembled those of 1934, the worst of the Dust Bowl years between 1931 and 1941. The magnitude of drought conditions in 2002 was rated as "exceptional" by the U.S. Drought Monitor, making 2002 the most severe drought in the state since the 1930s.

Since 2012, the San Luis Valley Region has received 33 USDA Secretarial declarations for drought, 11 of which were unique to one county in the Region.

Table 4-19 USDA Secretarial Declarations for Drought in San Luis Valley, 2012-2021

Year	Declaration #	Counites Impacted
2012	S3260	Alamosa, Conejos, Costilla, Mineral, Rio Grande, Saguache
	S3282	Conejos, Costilla,
2013	S3456	Alamosa, Costilla, Saguache
	S3518	Alamosa, Conejos, Costilla,
	S3558	Alamosa
	S3461	Conejos, Costilla
	S3545	Conejos, Mineral, Rio Grande, Saguache
	S3548	Conejos, Costilla, Mineral, Rio Grande, Saguache
	S3539	Mineral, Saguache
2014	S3645	Conejos, Costilla,
	S3615	Conejos
	S3627	Costilla
	S3630	Costilla
	S3715	Mineral, Rio Grande,
2015	S3802	Conejos
	S3785	Costilla
2018	S4293	Alamosa, Costilla, Saguache
	S4320	Alamosa, Conejos, Costilla, Mineral, Rio Grande, Saguache
	S4329	Alamosa, Conejos,
	S4300	Conejos, Costilla,
	S4285	Costilla
	S4289	Costilla
	S4326	Saguache
2019	S4468	Alamosa, Costilla, Saguache
	S4481	Alamosa, Conejos, Costilla, Mineral, Saguache,
	S4469	Conejos, Costilla
2020	S4648	Alamosa, Conejos, Costilla, Mineral, Rio Grande, Saguache
	S4651	Conejos, Costilla
	S4680	Mineral, Rio Grande, Saguache
	S4722	Saguache
2021	S4917	Alamosa, Conejos, Costilla, Mineral, Rio Grande, Saguache
	S4920	Conejos, Costilla
	S5119	Saguache

Source: USDA

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

The Drought Impact Reporter contains information on 114 drought impacts from droughts that affected the San Luis Valley between 2000 and 2021. The list is not comprehensive. County specific impacts can be found in the county annexes. Most of the impacts, 59, were classified as "agriculture." Other impacts include "relief, response, and restrictions" (41), "plants and wildlife" (39), "water supply and quality" (30), "tourism and recreation" (19), "society and public health" (13), "business and industry" (4), and "energy" (1). These categories are described as follows:

- **Agriculture (59)** – 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 (1)** – This category concerns drought's effects on power production, rates, and revenue. Examples include production changes for both hydropower and non-hydropower providers, changes in electricity rates, revenue shortfalls and/or windfall profits, and purchase of electricity when hydropower generation is down.
- **Water Supply and Quality (30)** – Drought effects associated with water supply and water quality include dry wells, voluntary and mandatory water restrictions, changes in water rates, increasing of water restrictions, increases in requests for new well permits, changes in water use due to water restrictions, greater water demand, decreases in water allocation or allotments, installation or alteration of water pumps or water intakes, changes to allowable water contaminants, water line damage or repairs due to drought stress, drinking water turbidity, change in water color or odor, declaration of drought watches or warnings, and mitigation activities.
- **Plants and Wildlife (39)** – Drought effects associated with unmanaged plants and wildlife, both aquatic and terrestrial, include: loss of biodiversity of plants or wildlife; loss of trees from rural or urban landscapes, shelterbelts, or wooded conservation areas; reduction and degradation of fish and wildlife habitat; lack of feed and drinking water; greater mortality due to increased contact with agricultural producers (as predators seek food from farms and producers are less tolerant of the intrusion); disease; increased vulnerability to predation (from species concentrated near water); migration and concentration (loss of wildlife in some areas and too much wildlife in others); increased stress on endangered species; salinity levels affecting wildlife; wildlife encroaching into urban areas; and loss of wetlands.
- **Fire (33)** – Drought often contributes to forest, range, rural, or urban fires, fire danger, and burning restrictions. Specific impacts include enacting or increasing burning restrictions, fireworks bans, increased fire risk, occurrence of fire (number of acres burned, number of wildfires compared to average, people displaced, etc.), state of emergency during periods of high fire danger, closure of roads or land due to fire occurrence or risk, and expenses to state and county governments of paying firefighters overtime and paying equipment (helicopter) costs.
- **Society and Public Health (13)** – 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 (4)** – This category tracks drought's effects on non-agriculture and non-tourism businesses, such as lawn care, recreational vehicles, or gear dealers, and plant nurseries. Typical impacts include reduction or loss of demand for goods or services, reduction in employment, variation in number of calls for service, late opening or early closure for the season, bankruptcy, permanent store closure, and other economic impacts.
- **Tourism and Recreation (19)** – 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 (41)** – This category refers to drought effects associated with disaster declarations, aid programs, requests for disaster declaration or aid, water restrictions, or fire restrictions. Examples include disaster declarations, aid programs, U.S. Department of Agriculture (USDA) Secretarial Disaster Declarations, Small Business Association Disaster Declarations, government relief and response programs, state-level water shortage or water emergency declarations, county-level declarations, a declared "state of emergency," requests for declarations or aid, non-profit organization-based relief, water restrictions, fire restrictions, National Weather Service (NWS) Red Flag Warnings, and declaration of drought watches or warnings.

Beyond the impacts addressed by the Drought Monitor, San Luis Valley also experienced significant impacts for recreation and tourism. Specifically, the Costilla County Planning Team noted economic stress related to impacts to fishing tourism.

Geographical Area Affected

Drought is a regional phenomenon that affects all areas within the Region equally. The spatial extent for drought in the San Luis Valley is extensive. Drought impacts are most severe for agricultural and commercial interests that rely on an uninterrupted supply of water. The impacts will vary throughout the Region, but a severe drought will affect the entire regional economy, particularly the agricultural industries. Drought is one of the few hazards that has the potential to directly or indirectly impact each and every person within the San Luis Valley, as well as adversely affect the local economy. The impacts would be water restrictions associated with domestic supplies, agricultural losses and economic impacts associated with those losses, economic impacts to tourism and recreation industries, increased wildland firefighting costs, and increased costs for water.

Magnitude/Severity

Periods of drought are common occurrences in Colorado and can cause significant economic and environmental impacts. The severity of a drought depends on the degree of moisture deficiency, duration, and size of the affected area. Drought is a common natural phenomenon in Colorado, requiring continuous monitoring and foresight to lessen the drought-related impacts to agricultural and municipal users. The objective of drought mitigation planning is to identify actions for responding to a supply shortage before an actual water supply emergency occurs. The State Water Availability Task Force (WATF) monitors conditions that affect Colorado's water supply (i.e., snowpack, precipitation, reservoir storage, streamflow, and weather forecasts) and determines when there is a need to activate the Colorado Drought Mitigation and Response Plan to address physical, social, and economic impacts due to drought. The WATF is comprised of Colorado's water supply specialists, emergency management professionals, federal land managers, scientists and experts in climatology and weather forecasting.

Drought can also cause structural damage to dams and ditches (high sedimentation loads from pulling water from the bottom of reservoirs can damage dam works).

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

Frequency/Likelihood of Occurrence

Drought is a frequent occurrence in the San Luis Valley, and a prolonged drought develops approximately every 15-20 years. Generally, drought has between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less. Historical drought data for the planning area indicates there have been 6 significant droughts in the last 60 years (1950-2010). This equates to a drought every 10 years on average or a 10 percent chance of a drought in any given year, which corresponds to a likely occurrence rating.

Climate Change Considerations

Climate change can have impacts both in terms of inter-annual droughts and intra-annual runoff patterns (State of Colorado Drought Mitigation and Response Plan Update, 2018). Temperatures increased and resulting changes in evaporation and soil moistures will also add to the trend of decreasing runoff in a majority of Colorado Basins. The following Table 4-20 shows the challenges water managers may face with the projected changes in climate.

Table 4-20 Future Drought Vulnerability Due to Climate Change and Challenges Faced by Colorado Water Managers

Challenge	Observed and/or Projected Change
Water demands for agriculture and outdoor watering	Increasing temperatures raise evapotranspiration by plants, lower soil moisture, alter growing seasons, and thus increase water demand.
Water supply infrastructure	Changes in snowpack, streamflow timing, and hydrograph evolution may affect reservoir operations including flood control and storage. Changes in the timing and magnitude of runoff may affect functioning of diversion, storage, and conveyance structures.
Legal water systems	Earlier runoff may complicate prior appropriation systems and interstate water compacts, affecting which rights holders receive water and operations plans for reservoirs.
Water quality	Although other factors have a large impact, "water quality is sensitive both to increased water temperatures and changes in patterns of precipitation" (CCSP SAP 4.3, p. 149). For example, changes in the timing and hydrograph may affect sediment load and pollution, impacting human health.

Challenge	Observed and/or Projected Change
Energy demand and operating costs	Warmer air temperatures may place higher demands on hydropower reservoirs for peaking power. Warmer lake and stream temperatures may affect water use by cooling power plants and other industries.
Mountain habitats	Increasing temperature and soil moisture changes may shift mountain habitats toward higher elevation.
Interplay among forests, hydrology, wildfires, and pests	Changes in air, water, and soil temperatures may affect the relationships between forests, surface and groundwater, wildfire, and insect pests. Water-stressed trees, for example, may be more vulnerable to pests.
Riparian habitats and fisheries	Stream temperatures are expected to increase as the climate warms, which could have direct and indirect effects on aquatic ecosystems (CCSP SAP 43.), including the spread of instream non-native species and diseases to higher elevation and the potential for non-native plant species to invade riparian areas. Changes in streamflow intensity and timing may also affect riparian ecosystems.
Water – and snow – based recreation	Changes in reservoir storage affect lake and river recreation activities; changes in streamflow intensity and timing will continue to affect rafting directly and trout fishing indirectly. Changes in the character and timing of snowpack and the ratio of snowfall to rainfall will continue to influence winter recreational activities and tourism.
Groundwater resources	Changes in long-term precipitation and soil moisture can affect groundwater recharge rates; coupled with demand issues, this may mean greater pressure on groundwater resources.

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

Vulnerability Assessment

The most significant impacts from drought are related to water-intensive activities, such as agriculture (both crops and livestock), wildfire protection, municipal usage, commerce, recreation, and wildlife preservation, as well as a reduction of electric power generation and water quality deterioration. Secondary impacts of drought are wildfires, wind erosion, and soil compaction that can make an area more susceptible to flooding. Drought impacts increase with the length of a drought.

People

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

Property

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

Critical Facilities & Infrastructure

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

Economy

The Region's economy is largely dependent on agriculture and, to a lesser extent tourism, and recreation. The agricultural industries in the San Luis Valley are highly vulnerable to drought. The USDA Risk Management Agency crop indemnity reports show crops losses only for Alamosa, Conejos, and Saguache between 2007 and 2021. In that time period a total of 85.5 acres were lost and $63,322 indemnity payments made to farmers in those three counties.

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

The Colorado Water Conservation Board (CWCB), Future Avoided Cost Explorer (FACE) tool which estimates annual damages from drought, the San Luis Valley could potentially experience an average annual loss of $5.3 million of total damages due to drought conditions under current population and climate scenarios.

Historical, Environmental, and Cultural Resources

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

Development Trends

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

The Colorado Water Conservation Board (CWCB), Future Avoided Cost Explorer (FACE) provides an in-depth look at the potential economic impacts and expected annual damages from future flood, drought, and wildfire events. The tool looks at three different climate scenarios (current climate conditions, 2050 future – moderately warmer climate and 2050 – severely warmer climate) as well as compares current population to low, medium, and high growth population scenarios. The following Table 4-21 compares the estimated annual damages for the San Luis Valley Region due to drought events for each of the climate and population scenarios. Refer to the County annexes for impacts specific to each county.

Table 4-21 Potential Fiscal Impacts due to Drought by Climate and Population Scenarios

Climate Scenarios	Population Scenarios		
	Low Growth	Medium Growth	High Growth
Current	Total damages: $11M	Total damages: $13M	Total damages: $32M
	Total damages per person: $260	Total damages per person: $240	Total damages per person: Less than $470
Moderate Climate	Total damages: $16M	Total damages: $16M	Total damages: $34M
	Total damages per person: $370	Total damages per person: Less than $280	Total damages per person: Less than $510
More Severe Climate	Total damages: $17M	Total damages: $18M	Total damages: $38M
	Total damages per person: $410	Total damages per person: $330	Total damages per person: Less than $570

Source: CWCB FACE Tool

Risk Summary

Table 4-22 Drought Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Extensive	Likely	Critical	High
Conejos County	Extensive	Likely	Critical	High
Costilla County	Extensive	Likely	Critical	High
Mineral County	Extensive	Likely	Critical	High
Rio Grande County	Extensive	Likely	Critical	High
Saguache County	Extensive	Likely	Critical	High

Overall drought is considered a high significance hazard due to the extensive geographic extent, potential magnitude of impacts, and the likelihood of future drought events.

- Drought has had significant impacts on the local agricultural economy in the San Luis Valley; there have been 33 USDA Disaster Declaration specific to Drought in the San Luis Valley since 2012.
- The San Luis Valley experiences an average annual loss of $11 Million of total damages due to drought under current population and climate scenarios.
- Potential for recreation and tourism sector job loss. An increased risk of public health issues such as impaired drinking water, increased incidence of mosquito-borne illness, and respiratory complications as a result of declined air quality.
- Reduced tourism due to wildfires or camping/hunting/fishing restrictions.
- Impacts on water-supply and distribution, as well as critical facilities dependent on steady water supply.
- Related Hazards: Wildfire, flooding, high winds, and tornadoes.

4.2.5 Earthquake

Hazard/Problem Description

How Earthquakes Happen

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

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

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

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

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

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

Ground Motion

Earthquake hazard assessment is also based on expected ground motion. This involves determining the annual probability that certain ground motion accelerations will be exceeded, then summing the annual probabilities over the time period of interest. The most mapped ground motion parameters are the horizontal and vertical peak ground accelerations (PGA) for a given soil or rock type. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage "short period structures" (e.g., single-family dwellings). Longer period response components create the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 4-23 lists damage potential and perceived shaking by PGA factors, compared to the modified Mercalli scale.

Table 4-23 Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGAa
		Resistant Buildings	Vulnerable Buildings	(%g)
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/ Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X - XII	Extreme	Very Heavy	Very Heavy	>124%
PGA Peak Ground Acceleration PGA measured in percent of g (%g), where g is the acceleration of gravity				

Sources: USGS 2008; USGS 2010

Effect of Soil Types

The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, distance from the source of the earthquake, and liquefaction, a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil. Liquefaction generally occurs in soft, unconsolidated sedimentary soils. A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. Table 4-24 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, depending 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 4-24 NEHRP Soil Classification System

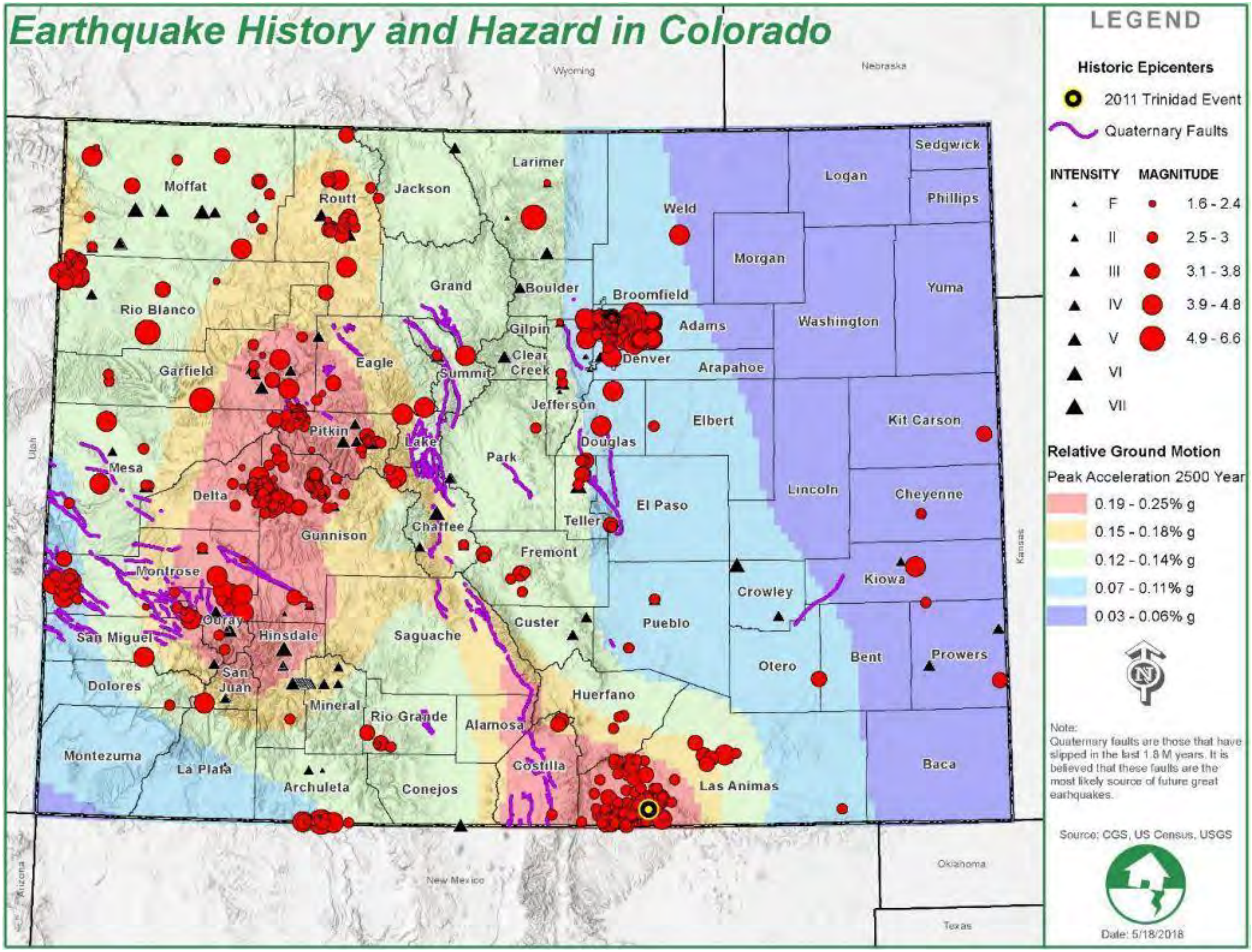
NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	
Notes:		

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
m Meters		
m/s Meters per second		

Past Occurrences

Although not as frequent or as large as California, Colorado has experienced earthquakes in its relatively brief period of historic record. Colorado has a relatively short period of historical records for earthquakes. According to the 2018 Colorado State Hazard Mitigation Plan, more than 700 earthquakes of magnitude 2.5 or higher have been recorded in Colorado since 1867. Higher magnitude earthquakes have only occurred a few times in the last 150 years. Figure 4-5 below was taken from the 2018 Colorado State HMP and shows the locations and magnitudes of past recorded earthquakes in the state, as well as known fault lines and peak ground acceleration statewide. Specific to the San Luis Valley, there are several known fault systems which run through Alamosa, Costilla, Rio Grande, and Saguache Counties. The region is also in close proximity to a cluster of seismic activity in Las Animas County, including the 2011 Trinidad Earthquake. Continued seismic activity in this area could impact the counties of the San Luis Valley.

Figure 4-5 Earthquake History and Hazard in Colorado



The following Table 4-25 includes some notable earthquakes which have occurred throughout Colorado, as recorded by the CGS, and listed in the 2018 State Hazard Mitigation Plan. Since the 2011 Trinidad earthquake, there have been no large or damaging earthquakes which have been felt in the San Luis Valley.

Table 4-25 Colorado's Largest Earthquakes

Date	Location	Magnitude	Maximum Intensity
1870 (Dec 4)	Pueblo/Ft. Reynolds	N/A	VI
1871 (Oct)	Lily Park, Moffat County	N/A	VI
1880 (Sep 17)	Aspen	N/A	VI
1882 (Nov 7)	North Central Colorado	6.6	VII
1891 (Dec 1)	Axial Basin (Maybell)	N/A	VI
1901 (Nov 15)	Buena Vista	N/A	VI
1913 (Nov11)	Ridgway Area	N/A	VI
1944 (Sep 9)	Montrose/Basalt	N/A	VI
1955 (Aug 3)	Lake City	N/A	VI
1960 (Oct 11)	Montrose/Ridgway	5.5	V
1966 (Jan 5)	NE of Denver	5.0	V
1966 (Jan 23)	CO-NM border near Dulce, NM	5.5	VII
1967 (Aug 9)	NE of Denver	5.3	VII
1967 (Nov 27)	NE of Denver	5.2	VI
2011 (Aug 22)	Trinidad (Cokedale)	5.3	VII

Source: CGS

Geographical Area Affected

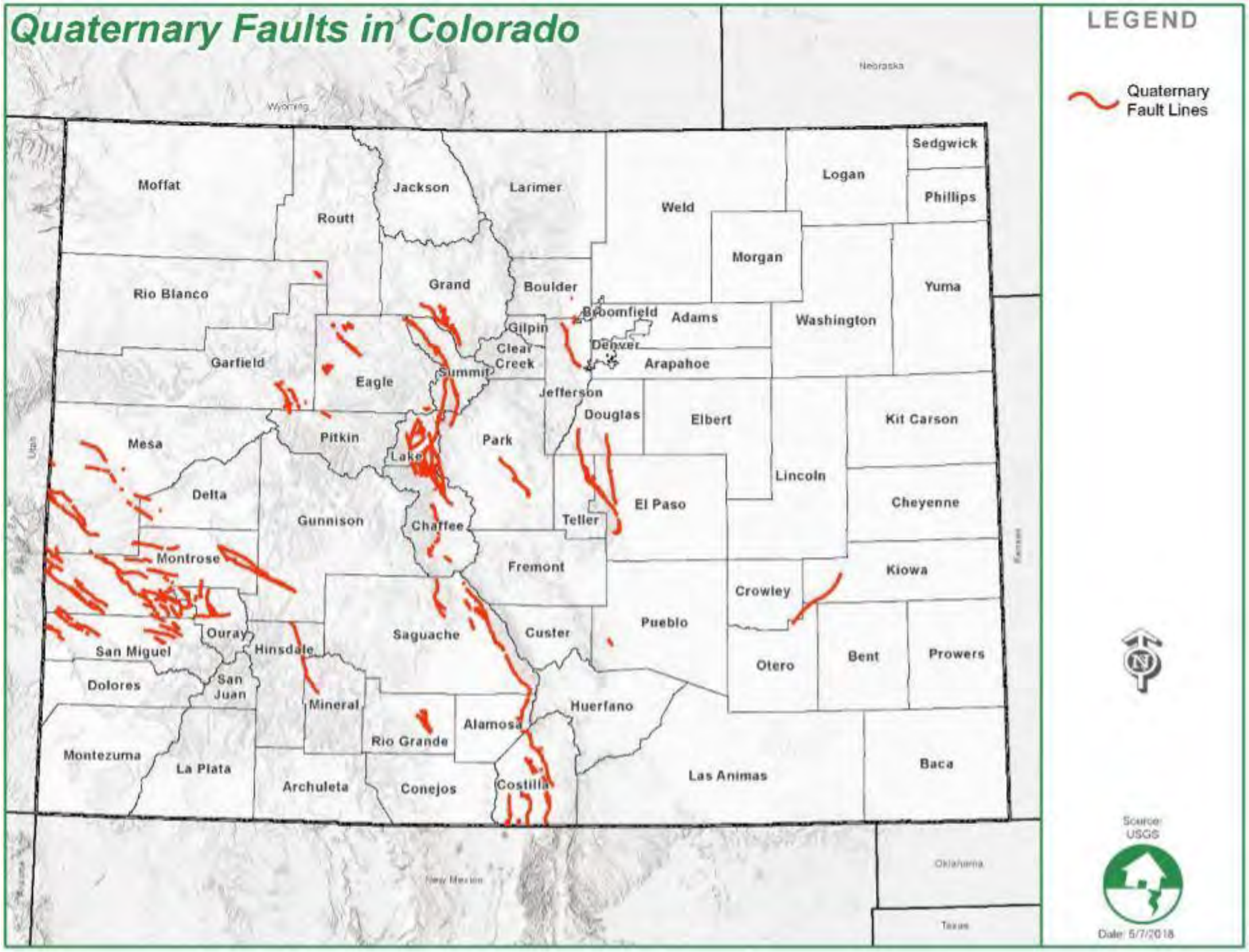
The geographic extent of earthquakes in the planning area is extensive. All of the San Luis Valley could potentially be impacted by earthquakes, including those with epicenters in adjacent areas. Alamosa and Costilla Counties are likely to have the potential for higher ground shaking relative to other parts of the region, based on a limited number of historic events.

Colorado is considered a region of relatively minor earthquake activity. Geologic studies indicate there are more than 90 potentially active faults in Colorado with documented movement within the last 1.6 million years. Potentially active faults present the greatest earthquake hazard (those that have ruptured to the ground surface during the Holocene period, or about the last 15,000 years). Faults are classified based on the time frame of their latest suspected movement (in order of activity occurrence, most recent is listed first):

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

The Sangre de Cristo fault runs along the eastern edge of the valley in the Sangre de Cristo Mountains. One of the three USGS operated permanent seismic stations in Colorado is located in northeastern Alamosa County. These faults, and other known faults in the region, are shown in Figure 4-6 below.

Figure 4-6 Colorado Quaternary Fault Map



Source: State of Colorado Hazard Mitigation Plan, 2018

Magnitude/Severity

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

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

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

The severity of the seismic hazard in the San Luis Valley is rated potentially catastrophic by the Planning Team, meaning that a major earthquake could result in multiple deaths, property destruction, population displacement, infrastructure damages, and service disruptions of 72 hours are more.

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

Magnitude

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

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

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

A comparison of magnitude and intensity is shown in Table 4-26 below.

Table 4-26 Magnitude and Modified Mercalli Scales for Measuring Earthquakes

Magnitude	Modified Mercalli Intensity
1.0 – 3.0	I
3.0 – 3.9	II, III
4.0 – 4.9	IV – V
5.0 – 5.9	VI – VII
6.0 – 6.0	VII – IX
7.0 and higher	VIII or higher

Source: USGS Earthquake Hazards Program

Intensity

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

Table 4-27 Modified Mercalli Intensity (MMI) Scale

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

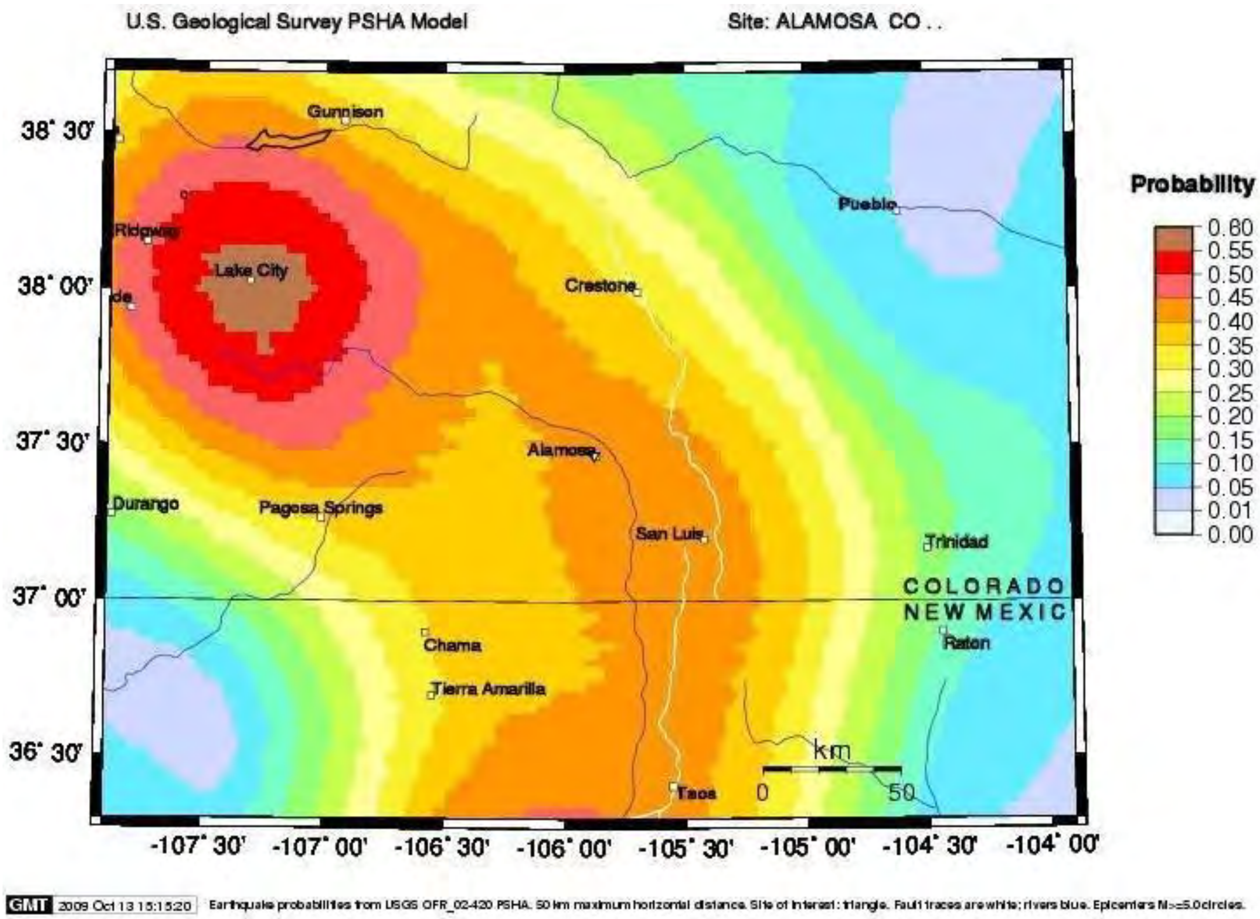
Frequency/Likelihood of Occurrence

The frequency rating for earthquakes in the San Luis Valley is Occasional—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.

The occurrence of earthquakes is relatively infrequent in Colorado, and the historical earthquake record is short (only about 130 years). Given the short history of recorded events, it is impossible to accurately estimate the timing or location of future strong earthquakes in Colorado. Relative to other western states, Colorado's earthquake hazard is higher than Kansas or Nebraska, but lower than Utah and certainly much lower than Nevada and California. Even though the seismic hazard in Colorado is low to moderate, it is likely that future damaging earthquakes will occur. Research based on Colorado's earthquake history suggests that an earthquake of 6.3 or larger has a one percent (1 percent) probability of occurring each year somewhere in Colorado (Charlie, Doehring, Oaks Colorado Earthquake Hazard Reduction Program Open File Report 93-01, 1993).

Figure 4-7 below illustrates the probability of a 5.0 or greater magnitude earthquake occurring within the San Luis Valley area in the next 150 years. This map shows a 35-45% probability of an earthquake of that magnitude in and around Alamosa County in the next 150 years.

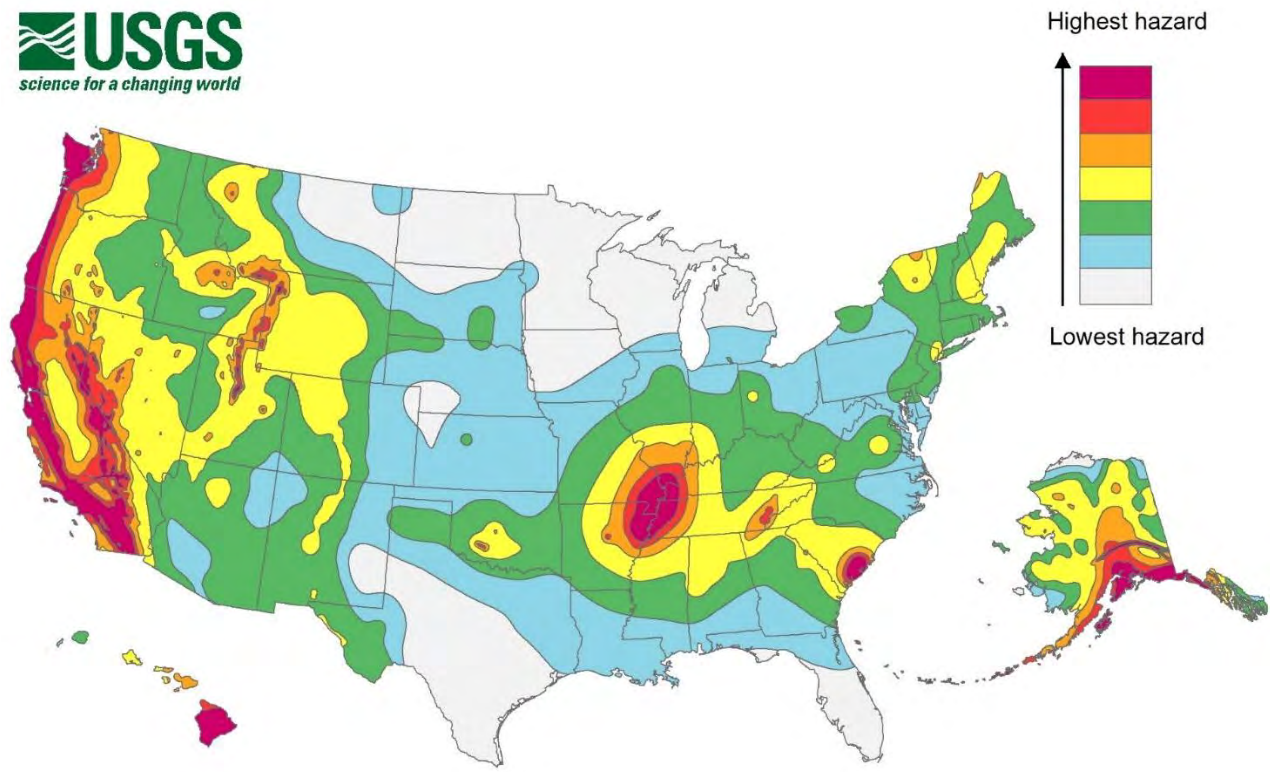
Figure 4-7 Probability of a 5.0 or Greater Magnitude Earthquake in next 150 years



Source: U.S. Geological Survey

Figure 4-8 below is from the most recent USGS models for the conterminous U.S., showing PGA having a 2 percent probability of being exceeded in 50 years, for a firm rock site. The models are based on seismicity and fault-slip rates and take into account the frequency of earthquakes of various magnitudes. Locally, the hazard may be greater than shown, because site geology may amplify ground motions, however this map shows the relatively low risk for future occurrence in the San Luis Valley compared to other parts of Colorado.

Figure 4-8 USGS Long-Term National Seismic Hazard Map



Climate Change Considerations

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

Vulnerability Assessment

The overall vulnerability to earthquake hazards is low for all participating jurisdictions due to the low probability and magnitude and the low density of population and structures. However, all structures in the San Luis Valley are potentially vulnerable to seismic ground shaking. The most vulnerable are historic buildings constructed of unreinforced masonry. Other critical facilities or infrastructure at risk are unknown; their construction determines their ability to withstand seismic shaking.

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

People

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

Impacts on persons and households in the planning area were estimated for each county for the 2,500-Year Probabilistic Earthquake. Table 4-28 summarizes the results. 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 a total of 207 injuries across the region, 44 of which would require hospitalization. There would also be an estimated 10 fatalities. Additionally, there could be increased risk of damage or injury from rock fall to travelers, hikers, and others recreating outdoors at the time of the earthquake. More detailed descriptions of the numbers of estimated casualties in each county under the various time of occurrence scenarios are available in the county annexes.

Table 4-28 Estimated Earthquake Impact on Persons and Households – 2,500 Year Probabilistic Earthquake

County	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
Alamosa	243	189
Conejos	8	7
Costilla	8	7
Mineral	0	0
Rio Grande	41	30
Saguache	11	9

Source: Hazus 5.1 Global Summary Report, WSP Analysis

Property

The Hazus analysis estimates that there are 22,000 buildings in the planning area, with a total replacement value of $4.99 billion. Because all structures in the planning area are susceptible to earthquake impacts to varying degrees, this total represents the regionwide property exposure to seismic events. Most of the buildings and most of the associated building value are residential. According to the model about 5,379 buildings will be at least moderately damaged, with 273 buildings completely destroyed. Each county annex provides more detailed summaries of the building damage by extent and building type per county.

The Hazus model provides estimates of building related losses in the earthquake scenario, broken out into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

For the 2,500-year probabilistic earthquake scenario the total building related losses for the entire planning area is an estimated $490.2 million. Of this total, direct building losses are estimated at $358.3 million and $131.9 million in income related losses. The Hazus analysis also estimated the amount of earthquake-caused debris in the planning area for the 2,500-Year probabilistic earthquake scenario event, which is estimated to be 201,000 tons.

Critical Facilities & 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 essential facilities to earthquake damage in two categories: at least moderate damage or complete damage. According to the model, 6 essential facilities would sustain at least moderate damage, all of them schools and all of them located in Alamosa County. No essential facilities are projected to sustain complete damage. The model also anticipates pipeline breaks and leaks in the county's potable water, wastewater, and natural gas lines. Across these linear networks, the earthquake is expected to cause 1,743 pipeline leaks and 436 complete fractures. The model also estimates lifeline damages to linear networks such as transportation and utilities. Damage to the transportation system is estimated at $9.81 million and utility lifelines at $448.2 million. The steep terrain in Mineral and Rio Grande Counties adjacent to the highway and road corridors would likely create multiple rockslides that could damage roadways and disrupt traffic.

Table 4-29 Hazus-MH Estimated Damage to Transportation and Utility Systems by County

County	Transportation Losses ($)	Utility Losses ($)
Alamosa	$2,280,000	$149,130,000
Conejos	$570,000	$90,200,000
Costilla	$1,310,000	$60,470,000
Mineral	$580,000	$12,090,000
Rio Grande	$2,980,000	$81,140,000
Saguache	$2,090,000	$55,210,000

Source: Hazus 5.1 Global Summary Report, WSP Analysis

Economy

Economic impacts of an earthquake could be staggering in the impacted areas. Not only the costs of direct damages to property, infrastructure, and inventory, but the losses incurred from businesses forced to close temporarily or permanently. Hazus-MH models total economic losses that includes building and lifeline related losses previously described.

Table 4-30 Hazus-MH Earthquake Loss Estimation

County	Total Buildings Damaged	Building and Income Related Losses	Total Economic Losses (includes, building, income, and lifeline)
Alamosa	Slight: 1,489 Moderate: 1,310 Extensive: 759 Complete: 209	$323.96 million 35% of damage related to residential structures 29% of loss due to business interruption	$475.4 million Building: $231.5 Million Income: $92.5 Million Transportation/Utility: $151.4 Million
Conejos	Slight: 840 Moderate: 529 Extensive: 142 Complete: 12	$29.5 million 71% of damage related to residential structures 22% of loss due to business interruption	$120.3 million Building: $23 Million Income: $6.5 Million Transportation/Utility: $90.8 Million
Costilla	Slight: 541 Moderate: 371 Extensive: 105 Complete: 9	$19.3 million 70% of damage related to residential structures 22% of loss due to business interruption	$81.1 million Building: $15 Million Income: $4.3 Million Transportation/Utility: $61.8 Million
Mineral	Slight: 178 Moderate: 75 Extensive: 14	$6.5 million 81% of damage related to residential structures	$19.2 million Building: $5.2 Million Income: $1.3 Million

County	Total Buildings Damaged	Building and Income Related Losses	Total Economic Losses (includes, building, income, and lifeline)
	Complete: 1	21% of loss due to business interruption	Transportation/Utility: $12.7 Million
Rio Grande	Slight: 1,343 Moderate: 893 Extensive: 275 Complete: 31	$82.4 million 53% of damage related to residential structures 26% of loss due to business interruption	$166.6 million Building: $61.3 Million Income: $21.2 Million Transportation/Utility: $84.1 Million
Saguache	Slight: 759 Moderate: 500 Extensive: 133 Complete: 11	$28.5 million 67% of damage related to residential structures 21% of loss due to business interruption	$85.8 million Building: $22.4 Million Income: $6.1 Million Transportation/Utility: $57.3 Million

Source: Hazus 5.1 Global Summary Report, WSP Analysis

Historical, Environmental, and Cultural Resources

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

Development Trends

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

Risk Summary

Table 4-31 Earthquake Risk Summary Table

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Extensive	Occasional	Catastrophic	Low
Conejos County	Extensive	Occasional	Catastrophic	Low
Costilla County	Extensive	Occasional	Catastrophic	Low
Mineral County	Extensive	Occasional	Catastrophic	Low
Rio Grande County	Extensive	Occasional	Catastrophic	Low
Saguache County	Extensive	Occasional	Catastrophic	Low

Overall earthquake is considered a low significance hazard due to the relatively unlikely probability of a severe earthquake, and the lack of history of damaging events in the planning area; the potential for a large damaging earthquake does exist due to the presence of faults that formed the San Luis Valley that are considered.

- Research indicates that an earthquake of a magnitude 6.3 or larger has a one percent probability of occurring each year somewhere in Colorado.

- Effects on people: People can be injured or killed in earthquakes due to falling items or structures, as well as from cascading events triggered by the earthquake. Regionwide, 207 injuries and 10 fatalities are estimated.
- Effects on property: Impacts on property include direct damage to structures from the shaking. $358.3 million in building damage is projected to occur.
- Effects on the economy: economic impacts can be from direct damages to structures as well as lost wages and income. The total economic loss is projected to be $948.3 million.
- Effects on critical facilities and infrastructure: Linear facilities, such as pipelines, railroads, and roadways, are largely at much greater risk than other facility types. $458 million in damages to linear facility networks are projected.
- Related hazards: Wildland fires, landslide, dam incidents.

4.2.6 Flooding (Flash Flood & Levee Failure)

Hazard/Problem Description

Flooding in and around the San Luis Valley can occur as a result of rain, melting snow or rain on melting snow (or due to the failure of a dam or levee). According to the 2013 Colorado Flood Hazard Mitigation Plan, "A flood is a general and temporary condition of partial or complete inundation of normally dry land areas from: (1) the overflow of stream banks, (2) the unusual and rapid accumulation of runoff of surface waters from any source, or (3) 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." [3]

The 100-year flood is the national standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). Participation in the NFIP requires adoption of a local floodplain management ordinance and its enforcement within a mapped Special Flood Hazard Area. Regulation of floodplain development by the community entitles citizens to purchase federal flood insurance.

The San Luis Valley is at risk to both riverine and stormwater flooding. Riverine flooding occurs when a stream exceeds its "bank- full" capacity and generally occurs as a result of prolonged rainfall, or rainfall that is combined with soils already saturated from previous rain events. The area adjacent to a river channel is its floodplain (i.e., the area that is inundated by the 100-year flood).

Stormwater refers to water that collects on the ground surface or is carried in the stormwater system when it rains. In runoff events where the amount of stormwater is too great for the system, or if the channel system is disrupted by vegetation or other debris that blocks inlets or pipes, excess water remains on the surface. This water may pond in low-lying areas, often in street intersections. Stormwater ponding, also known as localized flooding, may result in deep water and pollution. Stormwater can pick up debris, chemicals, dirt, and other pollutants from impervious surfaces.

The potential for flooding is altered by land use changes that change the impervious characteristics of the 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.

Levees are embankments (typically earthen) designed to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems were built for agricultural purposes and provide flood protection and flood loss reduction for farm fields and other land used for agricultural purposes. Urban levee systems are built to provide flood protection and flood loss reduction for population centers and the industrial, commercial, and residential facilities within them. Urban levee systems, because they are designed to protect urban areas, have typically been built to higher standards. No levee system

[3] Colorado Flood Hazard Mitigation Plan, Colorado Water Conservation Board, November 2013, p. 16

provides full protection from all flooding events to the people and structures located behind it. Some level of flood risk exists in these levee-impacted areas.

Past Occurrences

According to the National Centers for Environmental Information (NCEI), 44 significant flooding events have been recorded in the six counties in San Luis Valley since 1950. These events have resulted in nearly $61 million worth of property damage and $10,000 in crop damage that has been recorded.

Table 4-32 Summary of San Luis Valley Flooding Events, 1950-2022

County	# of Events	Property Damage	Crop Damage	Injury	Fatalities
Alamosa	6	$10,625,000	$0	-	-
Conejos	3	$14,000,000	$0	-	-
Costilla	19	$25,280,000	$0	-	-
Mineral	2	$0	$0	-	-
Rio Grande	5	$25,000	$0	-	-
Saguache	9	$10,665,000	$10,000	-	-
Total	**44**	**$60,620,000**	**$10,000**	**-**	**-**

Source: NCEI

Details on several damaging flooding events were reported by the NCEI:

- **July 27th, 1999**: Heavy rainfall flooded Saguache Creek and its tributaries both north and south of highway 114. County roads and a few bridges were washed out. Property adjacent to the creeks was inundated, washing out driveways to ranch houses and destroying some hay fields.
- **July 20th, 2009:** A thunderstorm produced intense rainfall which caused flash flooding and a mudslide just east of Fort Garland, closing or restricting travel on U.S. Highway 160 for over two hours. (Conejos Co.)
- **Sept. 06, 2019:** Costilla County Emergency Manager reported flash flood and rockslide in Forbes Park, CO off the spring burn scar. Several dozen 36-inch boulders moved down the hill and a newly built retention pond was nearly blown out by the force of the water. 15-20 tons of sediment now fill the new pond. (Costilla Co.)
- **August 20, 2021:** Slow moving thunderstorms developed over the mountains, as the monsoon plume remained in place on this day. With the heavy rain that stemmed from these thunderstorms along with high antecedent soil moistures from rainfall over the past several days, the flash flood threat remained high with a few reports of flash flooding noted near the higher terrain. (Saguache Co.)

Alamosa, Costilla, and Saguache Counties have experienced the greatest property and crop losses from flooding events. With Costilla County having experienced the greatest number of flooding events when compared to the rest of the counties within the planning area. Out of the 44 total events, 19 took place in Costilla County.

There also has been a total of four federally declared disasters within the San Luis Valley related to flooding, with the most current event occurring in 2015. All six counties were federally declared a disaster area during the 1970 flooding event. During the 1973 event five out of the six counties were federally declared due to flood damages sustained, with Saguache County being the only exclusion. Conversely Saguache was the only county within the study area affected by a 1984 event. No federally declared flooding disasters were recorded within the San Luis Valley in 31 years until 2015 when Saguache County sustained flooding, landslide, and tornado damage. Federally declared flood disasters for the San Luis Valley from 1970 to 2022 are highlighted in Table 4-33 below.

Table 4-33 Federally Declared Flooding Events San Luis Valley 1970-2022

Year	Declaration Title	Disaster Number	County Impacted
1970	HEAVY RAINS & FLOODING	DR-293-CO	Costilla
1970	HEAVY RAINS & FLOODING	DR-293-CO	Rio Grande
1970	HEAVY RAINS & FLOODING	DR-293-CO	Conejos
1970	HEAVY RAINS & FLOODING	DR-293-CO	Saguache
1970	HEAVY RAINS & FLOODING	DR-293-CO	Mineral
1970	HEAVY RAINS & FLOODING	DR-293-CO	Alamosa
1973	FLOODING & LANDSLIDES	DR-396-CO	Mineral
1973	FLOODING & LANDSLIDES	DR-396-CO	Conejos
1973	FLOODING & LANDSLIDES	DR-396-CO	Alamosa
1973	FLOODING & LANDSLIDES	DR-396-CO	Costilla
1973	FLOODING & LANDSLIDES	DR-396-CO	Rio Grande
1984	SEVERE STORMS, MUDSLIDES, LANDSLIDES & FLOODING	DR-719-CO	Saguache
2015	SEVERE STORMS, TORNADOES, FLOODING, LANDSLIDES, AND MUDSLIDES	DR-4229-CO	Saguache

Source: FEMA.gov

Geographical Area Affected

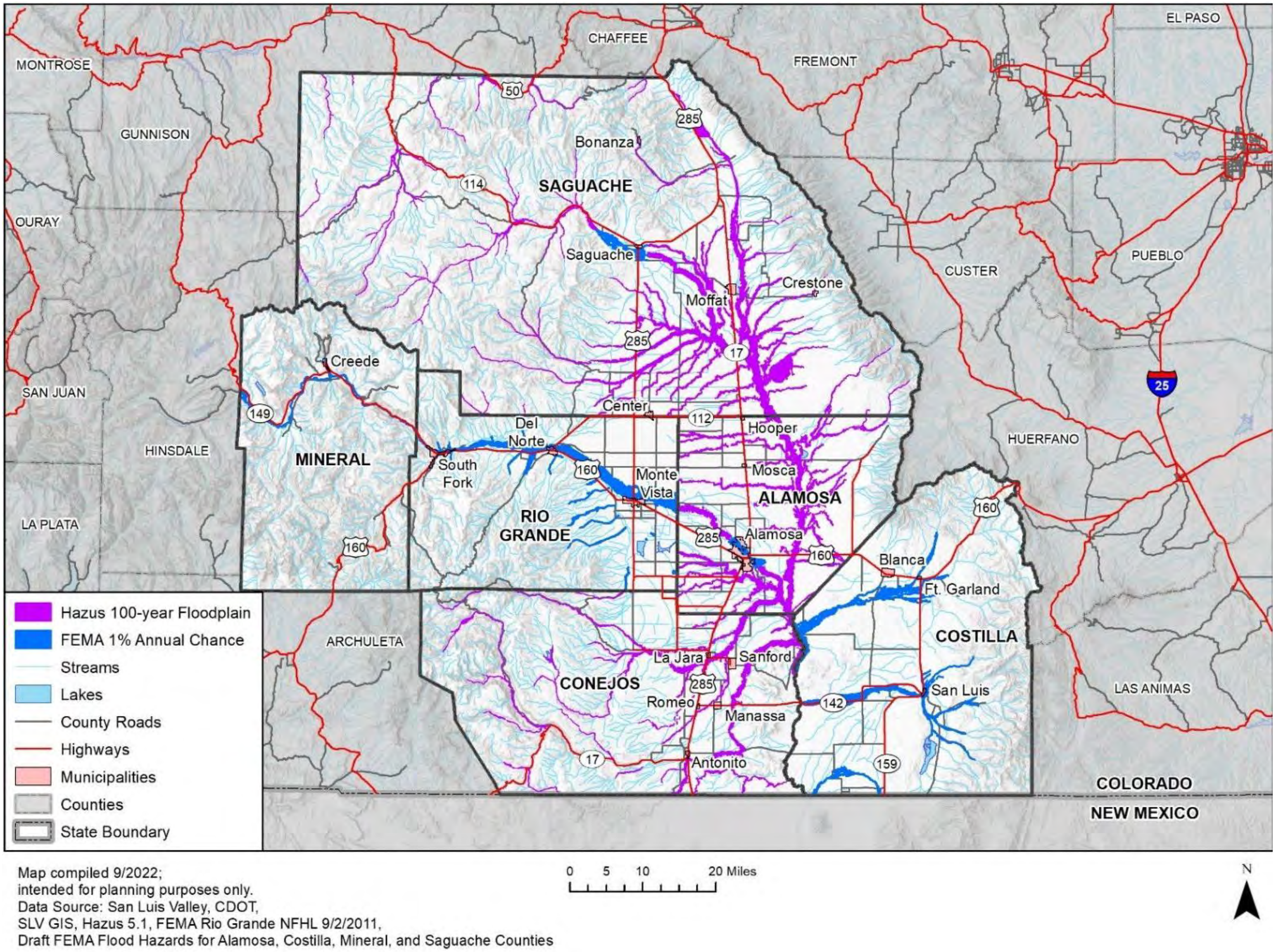
The San Luis Valley is located within the Rio Grande River drainage basin in central and south Colorado. The Rio Grande River is the greatest source of flood hazards. The San Luis Valley is particularly vulnerable to flooding related to severe weather events between May and June when snowmelt runoff fills the Rio Grande River to its capacity.

According to the 2018 Colorado Natural Hazards Mitigation Plan, flooding along the Rio Grande River has caused damage in the San Luis Valley for over a century. A particularly destructive flood occurred in June 1927. Caused by snowmelt and heavy rains, the flood destroyed five bridges, halted train service, and contributed to three deaths. Mitigation measures along the river include levees that have reduced, but not eliminated the vulnerability of The City of Alamosa and Alamosa County residents.

The Special Flood Hazard Analysis for the San Luis Valley was ascertained by utilizing data from a variety of sources, including draft flood hazard mapping acquired by the WSP USA Water Resources (WSP) group in Denver, Colorado. Alamosa County's flood data was acquired by utilizing a combination of draft FEMA floodplains contracted by WSP for the City of Alamosa while Alamosa County used Hazus modeled 100-year floodplains. For Conejos County, Hazus modeled 100-year floodplains were applied for the whole county. Both Costilla and Mineral Counties used draft FEMA floodplains contracted by WSP for each of their entire counties. Saguache used a combination of draft WSP created FEMA floodplains for the Town of Saguache and the county overall used Hazus modeled 100-year floodplains. Rio Grande County utilized FEMA's NFHL flood plains for analysis with an effective date of 9/2/2011. The extent of each of these floodplains is depicted in Figure 4-9 below.

A substantial levee system provides flood protection for parts of the City of Alamosa and unincorporated Alamosa County. The Alamosa levee, which parallels approximately four miles of the Rio Grande River, does not comply with current U.S. Army Corps of Engineers (USACE) and FEMA regulations. The levee, built in 1997, is laden with cottonwood and willow trees which are viewed by the USACE as potential weakening factors in the overall levee stability. A levee certification study is underway in 2022 to review options to bring the levee into compliance.

Figure 4-9 San Luis Valley FEMA & Hazus Floodplain Annual Chance Flood Hazard Areas



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, Hazus 5.1, FEMA Rio Grande NFHL 9/2/2011,
Draft FEMA Flood Hazards for Alamosa, Costilla, Mineral, and Saguache Counties

Magnitude/Severity

Flooding presents a risk to life and property, including buildings, their contents, and their use. Floods can also affect lifeline utilities (e.g., water, sewage, and power), transportation, the environment, jobs, and the local economy. The extent of damage depends on the depth and velocity of floodwaters.

Past flood events in the San Luis Valley have damaged roads, bridges, private property, businesses, and public facilities. Future events may result in greater damages depending on patterns of growth and land use development. Large areas within the City of Alamosa are protected by a levee system. A failure of the levee would likely result in devastating impacts. The potential severity of flooding is therefore rated catastrophic by the Planning Team, meaning that a major flood could result in multiple deaths, property destruction, population displacement, infrastructure damages, and service disruptions of 72 hours are more.

Frequency/Likelihood of Occurrence

The 1% annual chance flood event is the standard national measurement for flood mitigation actions and insurance. This recurrence level is an average and does not mean that a flood of that magnitude will occur exactly every 100 years. Likewise, the 500-year flood event has a 0.2% (or 1 in 500) chance of occurring each year.

Although flood events in the San Luis Valley are moderate, severe weather and snowmelt runoff present a threat of serious flooding along the Rio Grande River each year. As a result, the Planning Team has rated the probability of future flood events in the San Luis Valley as likely, with a recurrence interval of 10 years or less (10-100% chance in a given year).

Vulnerability Assessment

All assets located in San Luis Valley can be considered at risk from flooding events. This includes 100% of the planning area's population, and all buildings and infrastructure within the area.

National Flood Insurance Program

Alamosa County joined the NFIP in 1978. Any structure built in the floodplain must meet Alamosa County's floodplain regulations. According to FEMA's NFIP Policy and Claims Report (June 10, 2022), there are 36 flood insurance policies in effect in Alamosa County with $9,512,600 in total coverage and 12 policies in effect for the City of Alamosa, with $7,157,300 in total coverage. Within the city's incorporated areas. There are no repetitive loss properties identified in Alamosa County.

Conejos County joined the NFIP in 1990. There are eight flood insurance policies in effect in Conejos County with $1,303,800 million in total coverage. There are no repetitive loss properties identified in Conejos County.

Costilla County joined the NFIP in 1991. There are 16 flood insurance policies in effect in Costilla County with $3,504,400 in total coverage. There are no repetitive loss properties identified in Costilla County.

Mineral County also joined the NFIP in 1991. There are currently five flood insurance policies in effect within Mineral County with $1,082,500 in total coverage. There are currently no repetitive loss properties identified in Mineral County.

Rio Grande County joined the NFIP in 1977. There are 111 flood insurance policies in effect in Rio Grande County with $29,562,000 in total coverage. Rio Grande has the largest number of NFIP policies within the San Luis Valley. There are currently no repetitive loss properties identified in Rio Grande County.

Saguache County joined the NFIP in 1976. There are three flood insurance policies in effect in Saguache County with $280,000 million in total coverage. There are no repetitive loss properties identified in Saguache County.

Table 4-34 provides information on the NFIP participation of communities in the San Luis Valley. In total there are 179 policies currently in force with $45,245,300 and 38 total claims. Of these 38 total claims $33,964 has been paid out cumulatively. NFIP data for the San Luis Valley is detailed in Table 4-34.

Table 4-34 San Luis Valley NFIP Information

County	Jurisdiction	Date Joined	Effective FIRM Date	Policies in Force	Insurance in Force ($)	Number of Claims	Total Claims ($)
Alamosa County	Alamosa Co.	1/19/1978	4/21/1999	10	$2,355,300	5	$1,215
	City of Alamosa	9/15/1977	4/21/1999	26	$7,157,300	16	$9,226
Conejos County	Conejos Co.	11/16/1990	4/21/1999	8	$1,303,800	4	$0
	Antonito	11/5/1985	(NSFHA)	-	-	1	-
	Manassa	2/19/1986	02/19/89(M)	2	$280,000	1	-
Costilla County	Costilla Co.	7/16/1991	7/16/1991	16	$3,504,400	2	$10,317
Mineral County	Mineral Co.	4/16/1991	4/16/1991	5	$1,082,500	1	$268
	Creede	1/1/1986	01/01/86(L)	5	$1,082,500	-	-
Rio Grande County	Rio Grande Co.	4/29/1977	9/2/2011	76	$21,474,000	8	$11,592
	Del Norte	9/30/1982	9/2/2011	10	$1,181,400	2	$1,346
	Monte Vista	9/30/1982	9/2/2011	2	$678,200	-	-
	South Fork	6/5/1995	9/2/2011	23	$6,228,400	-	-
Saguache County	City of Saguache	5/28/1976	05/28/76	3	$280,000	-	-
Total				**186**	**$46,607,800**	**40**	**$33,964**

Source: FEMA Community Status Book Report (July 2022); NFIP BureauNet Reports (July 31, 2022)

New development in the floodplain is controlled through development regulations. The levee protecting properties within the City of Alamosa requires ongoing maintenance to remain an effective mitigation measure.

People

People can be vulnerable to flooding hazards if they are caught in areas of inundation or possible secondary/cascading effects such as debris flow, which may lead to injury or death. There is also a danger to drivers operating vehicles, as rocks and debris carried by flood waters can strike vehicles passing through the hazard area or cause dangerous shifts in roadways. In addition, a flood may cause persons to drown or ingest contaminated waters. For populations at risk, the Microsoft Footprints that intersected a flood hazard multiplied by the Average Household values was developed. An assumption was then made that most of these structures are residential.

Rio Grande County not only has the highest estimated losses due to the 1% annual chance of flooding but also the highest number of potential people located in the floodplain with 2,196 people total. Conejos and Saguache Counties also have 907 and 746 located in the floodplain respectively. Regarding the 0.2% floodplain in the San Luis Valley, Alamosa County has an estimated population of 2,606 people located within the 0.2% floodplain. This is the majority of the 3,906 people total determined throughout the study area to be living within what is considered to be a Zone X (Shaded) flood zones. The populations located within the Special Flood Hazard Area (SFHA) can be found in Table 4-35 and Table 4-36 below.

Property

People, buildings, critical facilities and infrastructure, and other important assets in the San Luis Valley are potentially exposed to the flood hazards identified in this plan. Typically parcel and assessor's data can be used to quantify the number and values of improved parcels as an estimate of structures exposed. This data was not available on a consistent basis across the region. In lieu of assessor's data, a GIS database of structure footprints developed by Microsoft was used as the basis for structures. The value of structures was based on Building Inventory extracted from Hazus 5.1. and summarizes the property inventory for each county and the participating jurisdictions; the additional tables break out the building types and values grouped by occupancy type and jurisdiction. Average building values were calculated based on the Building Inventory extracted from Hazus 5.1. The content values were estimated to be 50% of the estimated improved values from Hazus. This was used as the basis to estimate losses from specific hazards where applicable, where the number of structures at risk was multiplied by the average value and was assumed to be residential for most instances.

Estimated loss valuations were determined based on 0.25% of the total values of the structures located within the floodplain, generally based on FEMA depth-damage relationships. Rio Grande County has the highest estimated losses due to the 1% annual chance of flooding with $57,241,915. Followed by Conejos, Saguache, and Alamosa Counties with $18,021,027, $16,659,252 and $14,401,130 respectively. This also coincides with the structure counts being the highest in Rio Grande County with 921 total. Conejos has a structure count of 355, Saguache 334 and Alamosa having 212 total structures located in the SFHA as summarized in Table 4-35 below.

While the 0.2% annual chance of flooding floodplain is not considered to be within the SFHA, it can still face severe adverse impacts due to flooding. It is a total of $102,305,759 of estimated losses in the San Luis Valley overall due to the 500-year floodplain. Alamosa County has the highest number of estimated losses with $73,092,526 total and is summarized cumulatively in Table 4-36 below.

Table 4-35 Structures at Risk to 1% Flood Hazard (FEMA & Hazus) by County and Jurisdiction

County	Jurisdiction	Structure Count	Estimated Structure Value	Estimated Content	Total Value	Estimated Loss	Estimated Population
Alamosa	Alamosa	28	$5,072,096	$2,536,048	$7,608,144	$1,902,036	68
	Alamosa County	184	$33,330,916	$16,665,458	$49,996,375	$12,499,094	446
	Total	**212**	**$38,403,012**	**$19,201,506**	**$57,604,519**	**$14,401,130**	**513**
Conejos	Conejos County	355	$48,056,073	$24,028,036	$72,084,109	$18,021,027	907
	Total	**355**	**$48,056,073**	**$24,028,036**	**$72,084,109**	**$18,021,027**	**907**
Costilla	Ft. Garland	1	$123,191	$61,596	$184,787	$46,197	2
	San Luis	22	$2,710,209	$1,355,104	$4,065,313	$1,016,328	48
	Costilla County	114	$14,043,808	$7,021,904	$21,065,712	$5,266,428	250
	Total	**137**	**$16,877,208**	**$8,438,604**	**$25,315,812**	**$6,328,953**	**300**
Mineral	Mineral County	25	$5,055,145	$2,527,573	$7,582,718	$1,895,679	51
	Total	**25**	**$5,055,145**	**$2,527,573**	**$7,582,718**	**$1,895,679**	**51**
Rio Grande	Del Norte	113	$18,728,444	$9,364,222	$28,092,666	$7,023,167	269
	Monte Vista	25	$4,143,461	$2,071,731	$6,215,192	$1,553,798	60
	South Fork	59	$9,778,568	$4,889,284	$14,667,852	$3,666,963	141
	Rio Grande County	724	$119,994,634	$59,997,317	$179,991,951	$44,997,988	1,726
	Total	**921**	**$152,645,107**	**$76,322,554**	**$228,967,661**	**$57,241,915**	**2,196**
Saguache	Bonanza	10	$1,330,080	$665,040	$1,995,120	$498,780	22
	Crestone	15	$1,995,120	$997,560	$2,992,680	$748,170	33
	Saguache	2	$266,016	$133,008	$399,024	$99,756	4
	Saguache County	307	$40,833,456	$20,416,728	$61,250,184	$15,312,546	686
	Total	**334**	**$44,424,672**	**$22,212,336**	**$66,637,008**	**$16,659,252**	**746**
	Grand Total	**1,984**	**$305,461,218**	**$152,730,609**	**$458,191,827**	**$114,547,957**	**4,713**

Source: Microsoft Footprints 2021, Rio Grande FEMA NFHL Effective Data 9/2/2011, Draft FEMA Flood Hazards for Alamosa, Costilla, Mineral, and Saguache Counties, Hazus 5.1, WSP GIS Analysis

Table 4-36 Structures at Risk to 0.2% Flood Hazard (FEMA) by County and Jurisdiction

County	Jurisdiction	Structure Count	Estimated Structure Value	Estimated Content	Total Value	Estimated Loss	Estimated Population
Alamosa	Alamosa	395	$71,552,782	$35,776,391	$107,329,174	$26,832,293	957
	Alamosa County	681	$123,360,620	$61,680,310	$185,040,930	$46,260,232	1,649
	Total	**1,076**	**$194,913,402**	**$97,456,701**	**$292,370,103**	**$73,092,526**	**2,606**
Costilla	San Luis	188	$23,159,965	$11,579,982	$34,739,947	$8,684,987	412
	Costilla County	132	$16,261,252	$8,130,626	$24,391,878	$6,097,969	289
	Total	**320**	**$39,421,216**	**$19,710,608**	**$59,131,824**	**$14,782,956**	**702**
Mineral	Mineral County	1	$202,206	$101,103	$303,309	$75,827	2
	Total	**1**	**$202,206**	**$101,103**	**$303,309**	**$75,827**	**2**
Rio Grande	Del Norte	38	$6,298,061	$3,149,030	$9,447,091	$2,361,773	91
	Monte Vista	3	$497,215	$248,608	$745,823	$186,456	7
	South Fork	14	$2,320,338	$1,160,169	$3,480,507	$870,127	33
	Rio Grande County	62	$10,275,784	$5,137,892	$15,413,675	$3,853,419	148
	Total	**117**	**$19,391,398**	**$9,695,699**	**$29,087,097**	**$7,271,774**	**279**
Saguache	Saguache	103	$13,699,824	$6,849,912	$20,549,736	$5,137,434	230
	Saguache County	39	$5,187,312	$2,593,656	$7,780,968	$1,945,242	87
	Total	**142**	**$18,887,136**	**$9,443,568**	**$28,330,704**	**$7,082,676**	**317**
	Grand Total	**1,656**	**$272,815,358**	**$136,407,679**	**$409,223,038**	**$102,305,759**	**3,906**

Source: Microsoft Footprints 2021, Rio Grande FEMA NFHL Effective Data 9/2/2011, Draft FEMA Flood Hazards for Alamosa, Costilla, Mineral, and Saguache Counties, Hazus 5.1, WSP GIS Analysis

Critical Facilities & Infrastructure

Key support facilities and structures most necessary to withstand the impacts of, and respond to, natural disasters are referred to as critical facilities. Examples of these critical facility types include utilities, transportation infrastructure, and emergency response and services facilities. Failures of components along major lifelines or even closures or inaccessibility to key emergency facilities could limit if not completely cut off transmission of commodities, essential services, and lead to other potentially catastrophic repercussions.

The San Luis Valley has 82 critical facilities within the 100-year floodplain. Alamosa County has a total of one lifeline facility in the floodplain of which is a non-scour bridge. Conejos County has a total of 18 with two being health and medical facilities and 16 being transportation. Costilla County has a total of 16 lifeline facilities within the Special Flood Hazard Area (SFHA) which consist of bridges that could be at risk to floodwater. Mineral County has a total of seven lifeline facilities within the floodplain. Like the other counties in the study area the majority of which are in the transportation sector. Rio Grande County has 24 lifeline facilities total. Including seven communications towers, one energy substation, one food, water, and shelter facility. Transportation facilities consist of the majority oy lifeline facilities at risk with 15. Saguache County has 16 lifeline facilities located in the 100-year floodplain. All of which are transportation. Most lifeline facilities within the SFHA are in the Transportation sector and consist of non-scour bridges. A full breakdown of San Luis's lifeline facilities within the SFHA are listed in Table 4-37 below.

Table 4-37 Critical Facilities at Risk to 1% Annual Chance of Flooding

County	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Alamosa	-	-	-	-	-	-	1	**1**
Conejos	-	-	-	-	2	-	16	**18**
Costilla	-	-	-	-	-	-	16	**16**
Mineral	-	-	-	-	-	-	7	**7**
Rio Grande	7	1	1	-	-	-	15	**24**
Saguache	-	-	-	-	-	-	16	**16**
Total	**7**	**1**	**1**	**0**	**2**	**0**	**71**	**82**

Source: CDPHE, CEPC, HIFLD, NBI, Rio Grande FEMA NFHL Effective Data 9/2/2011, Draft FEMA Flood Hazards for Alamosa, Costilla, Mineral, and Saguache Counties, Hazus, WSP GIS Analysis

The San Luis Valley has 19 critical facilities within the 0.2% annual chance flood hazard area The majority of which are in Costilla County with four in medical and five in the transportation sector. While the 0.2% annual chance of flooding is considered to be out of the SFHA many of these areas can be subjected to higher chances of flood risk than what is actually recorded. In contrast to the 1% SFHA noted in Table 4-37 above, San Luis Valley's 0.2% floodplain has a wider range of lifeline facilities at risk. A breakdown of San Lui Valley's lifeline facilities within the SFHA are listed in Table 4-38 below.

Table 4-38 Critical Facilities at Risk to 0.2% Annual Chance of Flooding

County	Communications	Energy	Food, Water, Shelter	HAZMAT	Health and Medical	Safety and Security	Transportation	Total
Alamosa	2	-	-	1	3	1	-	7

County	Communications	Energy	Food, Water, Shelter	HAZMAT	Health and Medical	Safety and Security	Transportation	Total
Costilla	-	-	-	1	-	4	5	10
Saguache	1	-	-	-	-	-	1	2
Total	3	0	0	2	3	5	6	19

Source: CDPHE, CEPC, HIFLD, NBI, Rio Grande FEMA NFHL Effective Data 9/2/2011, Draft FEMA Flood Hazards for Alamosa, Costilla, Mineral, and Saguache Counties, WSP GIS Analysis

Economy

Flooding can have a major economic impact on the economy, including indirect losses such as business interruption, lost wages, and other downtime costs. Flooding often coincides with the busy summer tourism months in Alamosa County. Even the threat of flooding can have an impact. This was observed during the flooding event in 1999 when local business was down more than normal due to anticipated flooding.

Historical, Environmental, and Cultural Resources

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

Development Trends

For NFIP participating communities with the Region floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. Development trends in the region are not anticipated to increase vulnerability to flooding.

Risk Summary

Table 4-39 Flooding Risk Summary Table

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Significant	Likely	Critical	High
Conejos County	Significant	Likely	Critical	Medium
Costilla County	Significant	Likely	Critical	High
Mineral County	Significant	Likely	Limited	Low
Rio Grande County	Significant	Likely	Critical	High
Saguache County	Significant	Likely	Negligible	High

- The overall significance of this hazard to the planning area is **high.**
- There have been 4 federally declared flooding events throughout the San Luis Valley since 1970 and a total of 44 events reported to the NCEI with $60,620,000 in property damages and $10,000 in crop damages.
- Rio Grande County has the highest estimated losses due to flood damages and the greatest number of people living within the floodplain.
- Each county is a participant in the NFIP, and Rio Grande County has the highest number of flood insurance policies. There are also a total of 82 FEMA Lifelines, also known as critical facilities, located in

the floodplain. With the highest number being in the Transportation sector and consisting primarily of non-scour bridges.

4.2.7 Hailstorm

Hazard/Problem Description

Hail forms when updrafts carry raindrops into extremely cold areas of the atmosphere where the drops freeze into ice. Hail falls when it becomes heavy enough to overcome the strength of the updraft and is pulled by gravity towards the earth. The process of falling, thawing, moving up into the updraft and refreezing before falling again may repeat many times, increasing the size of the hailstone. Hailstones are usually less than two inches in diameter but have been reported much larger and may fall at speeds of up to 120 mph.

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

The NWS classifies hail by diameter size in comparison to everyday objects to help relay scope and severity to the population. Table 4-40 below indicates the hailstone measurements utilized by the NWS.

Table 4-40 Hailstone Measurements

Severity	Description	Hail Diameter Size (Inches
Non-Severe Hail Does not typically cause damage and does not warrant severe thunderstorm warning from NWS.	Pea	0.25
	M&M Plain	0.50
	Penny	0.75
	Nickel	0.875
Severe Hail Research has shown that damage occurs after hail reaches about 1” in diameter and larger. Hail of this size will trigger a severe thunderstorm warning from NWS.	Quarter	1.00
	Half Dollar	1.25
	Ping Pong Ball/Walnut	1.50
	Golf Ball	1.75
	Hen Egg/Lime	2.00
	Tennis Ball	2.50
	Baseball	2.75
	Teacup/Large Apple	3.00
	Grapefruit	4.00
	Softball	4.50
	Average	**0.75-1.50**

Source: NWS, Severe Weather 101 Hail Basics

Past Occurrences

According to the National Centers for Environmental Information (NCEI), 86 significant hailstorm events have been recorded in San Luis Valley from 1955 to March 2022. Of these 86 events, 39 were severe hailstorms with hail 1-inch or greater in diameter. No hailstorm events were recorded in Mineral County. One event in the dataset, which occurred on June 29th of 1995, was documented to have impacted both Rio Grande County and Saguache County. Table 4-41 displays a summary of hail events in San Luis Valley from 1955-2022 by County.

Table 4-41 Summary of San Luis Valley Hail Events, 1955-2022

County	# of Events	Largest Hail Diameter Size (inches)	Property Damage	Crop Damage	Injury	Fatalities
Alamosa	14	2.5	$500,000	$500,000	0	0
Conejos	8	1.75	$0	$0	0	0
Costilla	6	1.75	$455,000	$250,000	0	0
Mineral	0	-	-	-	-	-
Rio Grande	19	1.75	$5,000	$0	0	0
Saguache	40	1.75	$5,000	$250,000	1	0
Total	**86**	**2.5**	**$965,000**	**$1,000,000**	**1**	**0**

Source: NCEI

Details on several damaging hail events were reported by the NCEI:

- **May 10, 1989:** One injury was reported due to 1.75-inch hail in Saguache County.
- **August 19, 1993:** Marble-size hail caused an estimated $75,000 damage to nine aircraft at the Alamosa Airport. In addition, the hail damaged vehicles in the airport parking lot, as well as destroying barley fields southwest of Alamosa. Property damage was estimated to be $500,000 and crop damage was estimated to be $500,000.
- **August 22, 1993:** Marble-size hail caused major crop damage as well as damaging vehicles and buildings north of Center in Saguache County. An estimated $5,000 in property damages and $50,000 in crop damages was reported.
- **July 29, 1994:** A spotter in Rio Grande County reported marble-size hail caused damage to homes east of South Fork (38 miles west northwest of Alamosa), and stripped leaves off trees, resulting in $5,000 in reported property damage.
- **September 2, 1994:** Thunderstorms ripped through a large broccoli and cabbage patch killing an estimated 90% to 100% of the season's crop in Saguache County, resulting in $200,000 in estimated crop losses.
- **June 30, 1995:** Hail collected on Highway 159 and caused vehicles to slide into each other in Costilla County. Plows had to clear the roadway. An estimated $5,000 was reported in property damages.
- **August 7, 1996**: Strong winds combined with the great volume of hail to produce extensive damage to structures and crops in Costilla County, resulting in $450,000 in estimated property damages and $250,000 in estimated crop damages.

While Alamosa County has experienced the greatest property and crop losses from hail events, Saguache County has experienced the greatest number of hail events when compared to the rest of the counties in the planning area. Out of the 86 total events, 40 took place in Saguache County. Figure 4-10 displays a breakdown of hail events in San Luis Valley by county.

Figure 4-10 Hail Events by County, 1955-2022

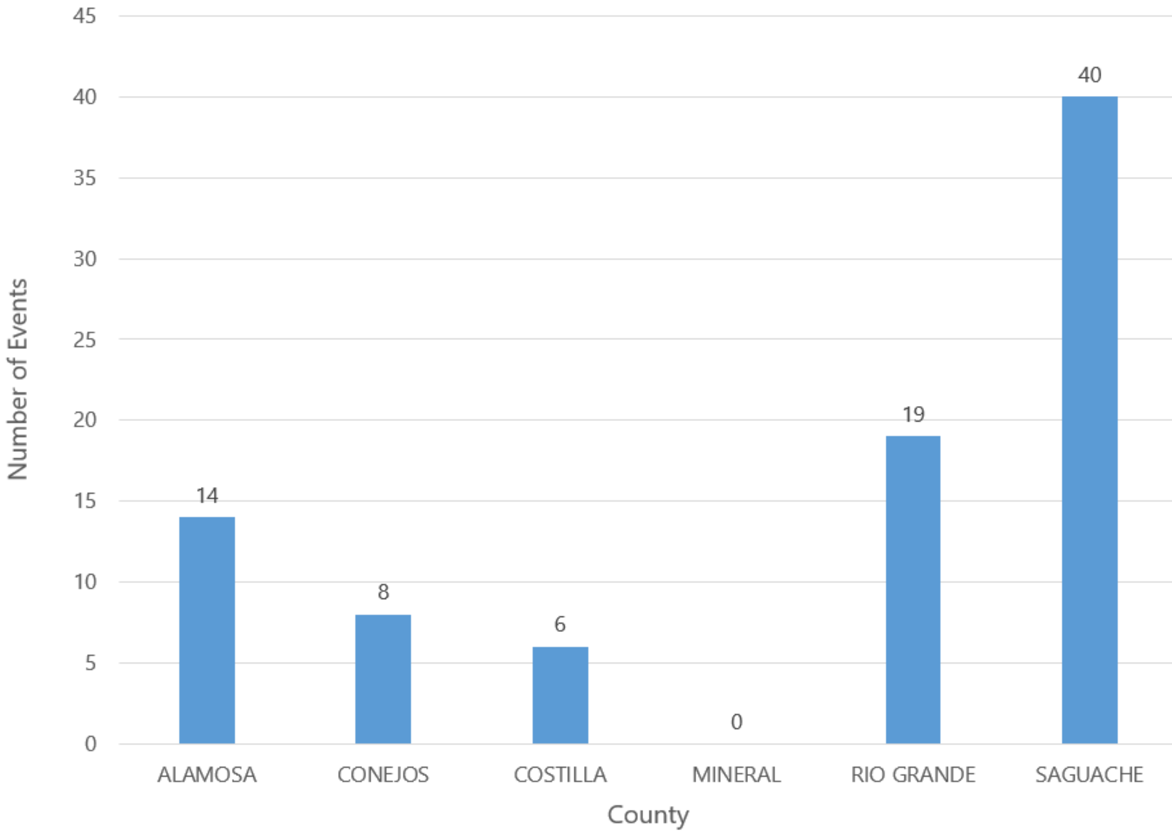


Figure by WSP, Data Source: NCEI

In San Luis Valley, the most common sized hail reported is 0.75 inches in diameter, which is not considered severe. However, 45% of the recorded hailstorm events are considered severe, with hail 1-inch or greater in diameter. The largest sized hail reported in San Luis Valley was 2.5 inches and occurred in Alamosa County. Figure 4-11 displays the distribution of historic hail events by size in inches.

Figure 4-11 Hail Events by Size (Diameter in Inches), 1955-2022

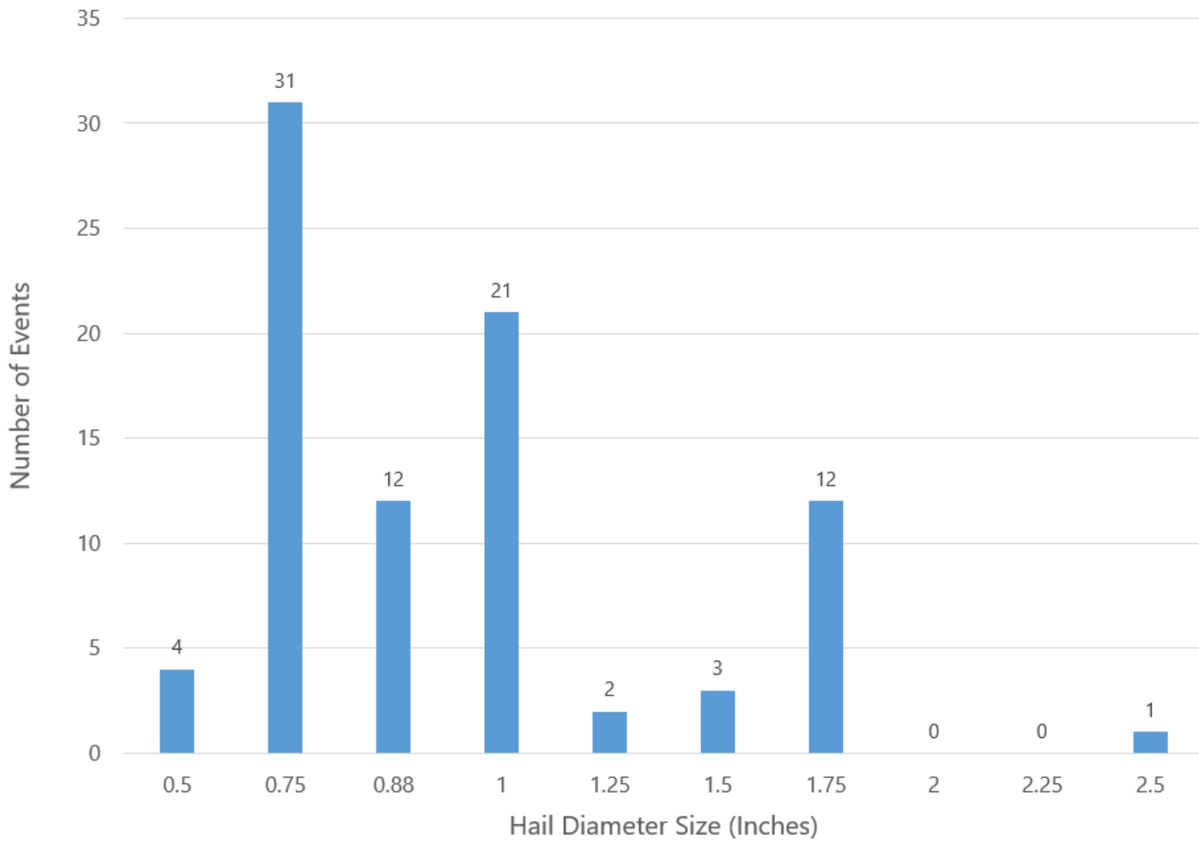


Figure by WSP, Data Source: NCEI

Historic hail data in the region indicates that July will experience the greatest frequency of hail events and the hail season is typically from April to October. displays the distribution of hail events in San Luis Valley by month.

Figure 4-12 Hail Events by Month, 1955-2022

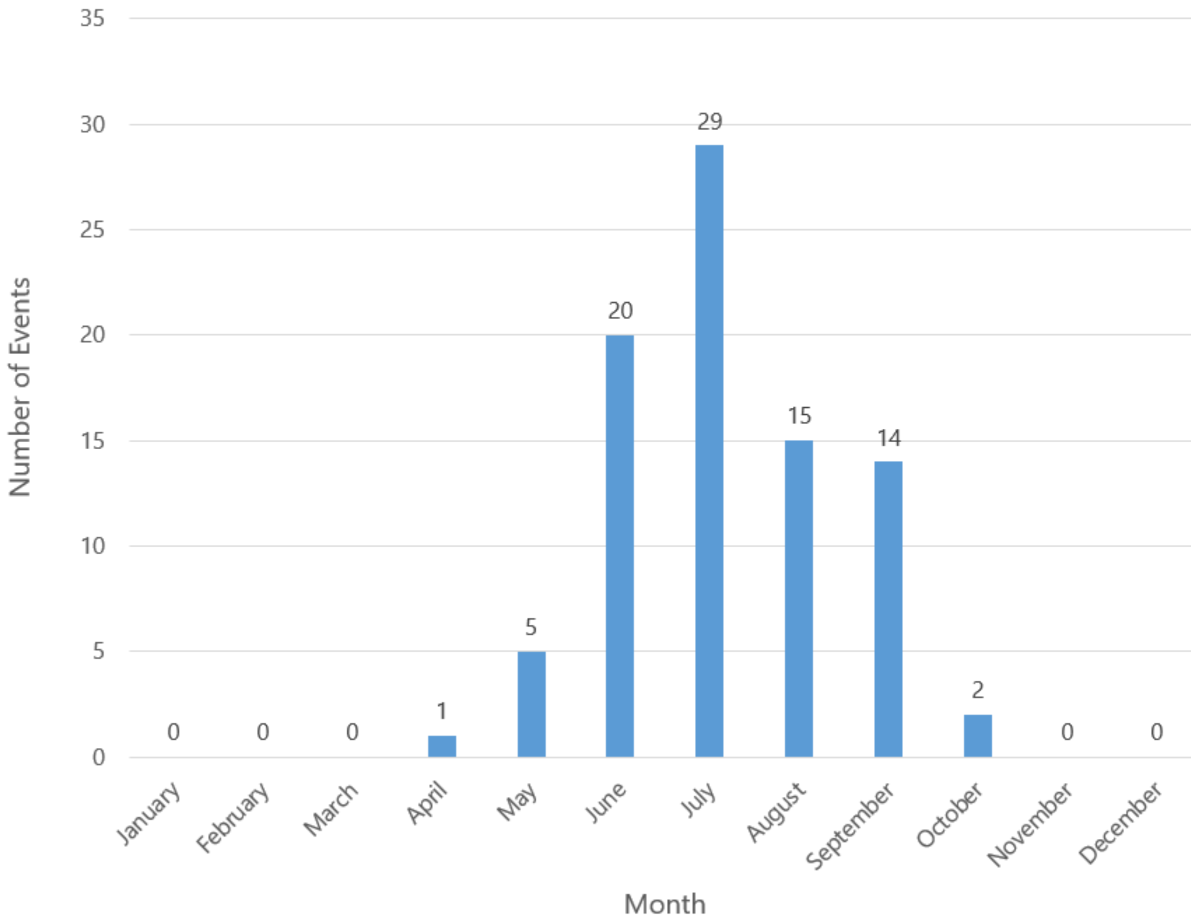
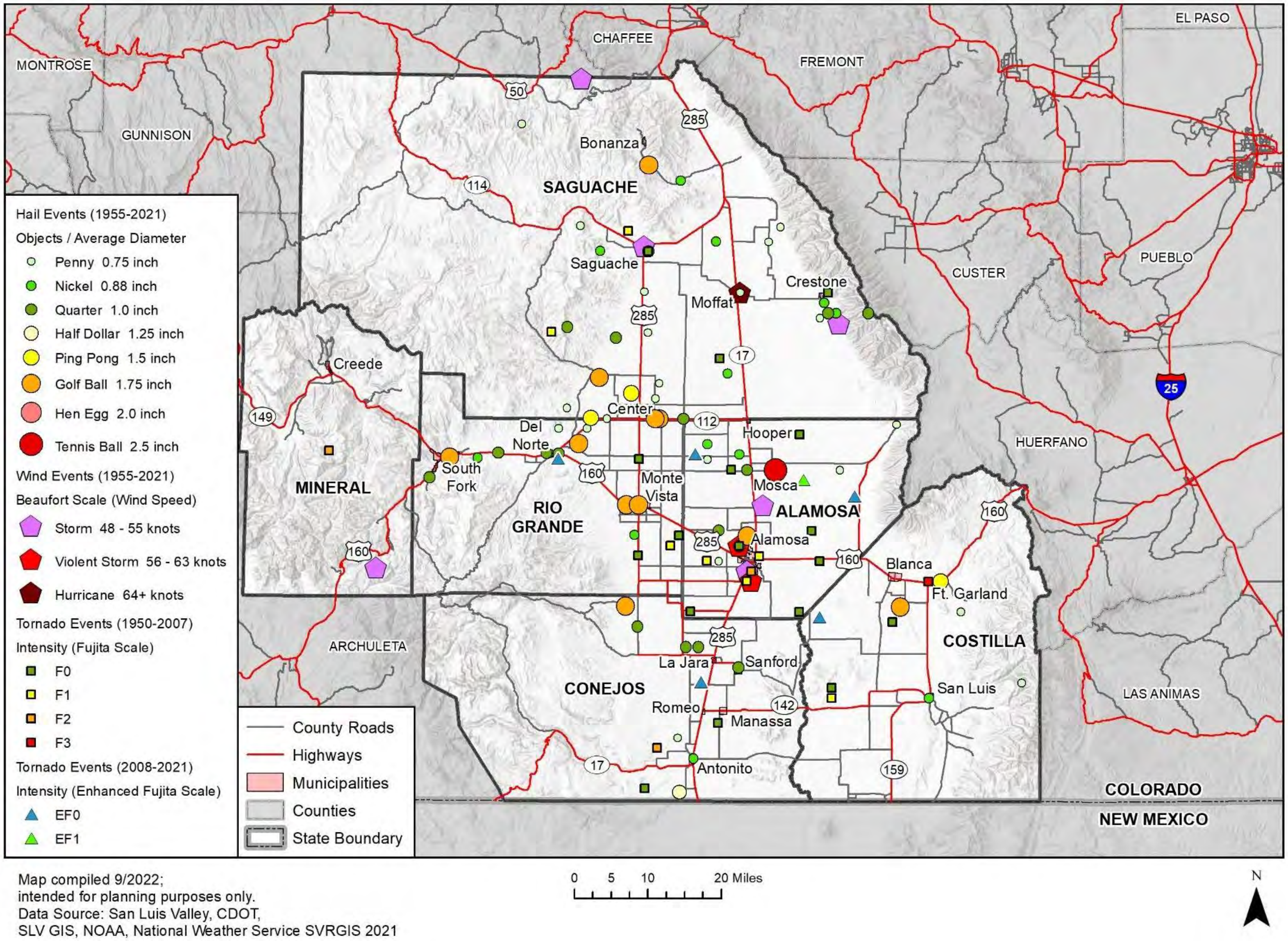


Figure by WSP, Data Source: NCEI

Geographical Area Affected

Damaging hailstorms can occur anywhere in San Luis Valley and pose a risk to people and property in all participating jurisdictions. While the NCEI database has no recorded events in Mineral County, this is likely due to events going unreported or because damages were negligible, not because Mineral County does not experience hailstorms. Figure 4-13 displays the location of past weather events, including hail, from 1955-2021. While many of the reported events seem to occur along roadways and in cities, hailstorms can occur anywhere in the planning area. The most likely explanation for the patterns seen on the map is that hailstorms that occur on roadways and in cities are likely to cause more damage due to the concentration of property and infrastructure in these areas. Based on this information, the geographic extent rating for hailstorms is **extensive**.

Figure 4-13 Historic Hail Events in San Luis Valley Region, 1955-2021



Magnitude/Severity

The severity of a hailstorm is influenced by a variety of factors, including hail diameter, hail density, fall speed and surface wind speeds. Hail is primarily a risk to property -- vehicles, roofs and landscaping are the property most damaged by hail. However, large hail can also cause death or injury to people caught outside and exposed to the elements. Hailstorms also cause damage to crops and the environment and kill and injure livestock. Hail can also block culverts and drainage ditches, causing flooding. Although large hail events frequently result in high aggregate insured losses, property damages are generally limited, serious injuries are rare, and there is typically little or no impact to critical facilities, which are generally able to operate without disruption to services. In San Luis Valley, more than half of the recorded hail events are not considered severe. As a result, the severity of the hail hazard in San Luis Valley is rated as **limited**.

Frequency/Likelihood of Occurrence

Although hail is a regular occurrence in the San Luis Valley, it is impossible to pre-determine where hail may fall more than a few hours ahead of the storm. Atmospheric convection activity producing conditions favorable to hail events is expected to occur in the future as in the past. A hailstorm with the potential to cause damage to crops and property can be expected to occur nearly every year. With 86 reported hail events occurring in San Luis Valley over the past 71 years, the frequency of events in the region is 1.2 events per year, however, a vast majority of these events occurred in Saguache County. Hail events in San Luis Valley are considered highly likely, with at least one event occurring in the region every year. The hail events in San Luis Valley are likely to occur in the summer months, with greatest damages occurring in July.

Climate Change Considerations

According to the 2018-2023 Colorado State Hazard Mitigation Plan, the impacts of climate change are expected to influence future hail events. A study published in February of 2021 by Nature Reviews Earth & Environment found that warming temperatures due to climate change will enhance conditions for hailstorms, increasing the frequency of hailstorms and enabling larger hailstones to form. Ongoing efforts to reduce Colorado's greenhouse gas emissions and adapt to a changing climate, such as the Colorado Climate Plan and the Climate Change in Colorado Report, will help to reduce the impacts of climate induced hazards such as hail.

Vulnerability Assessment

All assets located in San Luis Valley can be considered at risk from severe hail events. This includes 100% of the planning area's population, and all buildings and infrastructure within the area.

People

Exposure is the greatest for people caught outside in the open without shelter. Large hail can cause significant bruising, concussions, the potential for broken bones, and even death. There has been one injury due to hail reported in San Luis Valley, but details on the injury were not provided in the NCEI dataset. The impacts of hail on vulnerable populations can be more severe. Low-income families are more likely to live in poorly constructed homes that are more likely to be damaged, and are more likely to be uninsured or underinsured, making it more difficult for them to recover from hail events. Individuals with disabilities may need more assistance after a major event, especially if transportation or utility services are disrupted. Severe weather warnings must use methods that reach vision or hearing-impaired people and those with limited English proficiency.

Property

Research into the damages inflicted by this hazard indicates the hazard has a high impact on the entire planning area, and perhaps the greatest potential damage impacts to property. Hail impacts anything exposed to the event, including structures, infrastructure, landscaping, personal property and vehicles, people, agriculture, and livestock. Several instances of damages to vehicles, planes, and homes were reported in San Luis Valley, totaling $965,000 in property damages overall. Hail is also the costliest insured-loss natural disaster to impact the State of Colorado, with nine separate incidents falling within the top ten disasters list for the state. Existing development remains exposed to hail with minimal mitigation opportunities. Individuals can mitigate exposure by remaining indoors and away from windows during hailstorm events. Vehicles can be parked under shelters to help minimize damage costs incurred in that arena. However, in many cases it is impossible to move existing development away from the impact areas. For example, hail heavily impacts the economic contributors who house merchandise outdoors, such as car retailers, home improvement stores and gardening stores. Damage to landscape and agriculture is also almost impossible to prevent, as the plants cannot be transported indoors for the storm.

Critical Facilities and Infrastructure

Hail can lead to the temporary incapacitation of roads when small hail stones build up so deep, they block roads. This occurred in San Luis Valley in 1995 when hail collected on Highway 159 and caused vehicles to slide into each other in Costilla County. Hail has also been observed to block storm drains and prevent proper runoff, potentially resulting in localized flooding as a secondary hazard. Most structures, including the County's critical facilities, should be able to provide adequate protection from hail to individuals but the structures themselves could suffer broken windows and dented exteriors. Those facilities with backup generators are better equipped to handle a severe weather situation should the power go out. Significant damage to an essential government facility could force the temporary closure of that facility, disrupting the ability of local governments to provide the usual level of service to residents.

Economy

The economic impact from hail can be severe and potentially long lasting. As mentioned throughout this section, hail is the costliest insured hazard in Colorado. Direct damages have totaled $5 billion over the last 10 years statewide, but severe indirect economic impacts can also be felt through businesses forced to close for repairs. In the San Luis Valley, $1,965,000 in direct losses were recorded due to crop and property damages. Additional indirect losses could have occurred in the planning area from incidents such as the hail event that caused an accident and road closure in Costilla County.

Historic, Cultural, and Natural Resources

While hail is a natural environmental process, it can cause significant environmental damage. As discussed throughout this section, hail poses a significant threat to crops. Additionally, hail can cause tree limbs to break, damage to trees and other plants in bloom, and shred foliage. Some cultural and historic properties may also potentially be at risk of damage from hail.

Development Trends

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

Risk Summary

Table 4-42 Hailstorm Hazard Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
San Luis Valley	Extensive	Highly Likely	Limited	Medium

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Extensive	Likely	Limited	Medium
Conejos County	Extensive	Likely	Critical	Medium
Costilla County	Extensive	Likely	Limited	Medium
Mineral County	Extensive	Likely	Limited	Medium
Rio Grande County	Extensive	Likely	Critical	Medium
Saguache County	Extensive	Highly Likely	Critical	Medium

- The overall significance of this hazard to the planning area is **medium**.
- San Luis Valley experiences typically 1.2 hail events per year, with most of these events occurring in Saguache County.
- While no damaging hail events were recorded in Mineral County, the entire planning area is susceptible to extreme hail events. Damages from hail events are likely to occur along roadways and in cities with concentrated infrastructure.
- The NCEI documented $950,000 in property losses and $1,000,000 in crop losses between 1955-2022, and most of these losses are insured; therefore, severity of hail is rated as limited for San Luis Valley.
- Historic structures and those made of less durable materials could be highly vulnerable to severe hail events.
- Hail is not as high of a profile as hazards such as tornadoes, blizzards, or floods, because losses are typically covered by insurance, but hail events consistently inflict one of the highest rates of damage on the planning area.
- Severe hail events can cause significant damage to buildings, vehicles, and above ground utility lines, as well as catastrophic damage to vegetation and crops.
- For people caught outdoors in the open, large hail has the potential to cause significant bruising, concussions, broken bones, and even death.

4.2.8 High Winds and Tornadoes

Hazard/Problem Description

High Winds and Thunderstorm Winds

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

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

Tornadoes

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most violent of all atmospheric storms. They can have the same pressure differential that fuels 300-mile-wide hurricanes across a path less than 300 yards wide. Closely associated with tornadoes are funnel clouds, which are rotating columns of air and condensed water droplets that, unlike tornadoes, do not contact the ground.

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

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

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita Scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis, better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. Table 4-43 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at various levels of intensity. Table 4-44 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4-43 Original Fujita Scale

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

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

Table 4-44 Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF-0	65-85
EF-1	86-110
EF-2	111-135
EF-3	136-165
EF4	166-200
EF-5	Over 200

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

Past Occurrences

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

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

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

The tables below identify significant high wind, thunderstorm wind, and tornado events that have occurred in San Luis Valley. Between the three hazards, the San Luis Valley has lost an estimated $4.2 million in property damages, had 21 injuries, and one fatality. Damage amounts are not adjusted for inflation. It is important to note that due to the nature of the high wind data being recorded by zone rather than by county, one high wind event may have been duplicated in several counties in the NCEI record, therefore, the estimated losses might be higher than actual losses.

Table 4-45 High Events in San Luis Valley, 1996-2022

High Wind	Total Events	Days with Events	Highest Magnitude (mph)	Property	Injury	Fatality
Alamosa	179	104	105	$360,000	6	0
Conejos	103	61	104	$1,050,000	0	0
Costilla	309	114	108	$1,990,000	9	1
Mineral	66	46	104	$20,000	0	0
Rio Grande	133	70	104	$144,000	0	0
Saguache	109	107	149	$364,000	6	0
Total	**899**	**502**	**149**	**$3,928,000**	**21**	**1**

Source: NCEI

Table 4-46 Thunderstorm Wind Events in San Luis Valley, 1955-2022

Thunderstorm Wind	Total Events	Days with Events	Highest Magnitude (mph)	Property	Injury	Fatality
Alamosa	11	11	69	$0	0	0
Conejos	0	-	-	-	-	-
Costilla	0	-	-	-	-	-
Mineral	1	1	61	$0	0	0
Rio Grande	3	3	0	$0	0	0
Saguache	6	6	81	$0	0	0
Total	**21**	**21**	**81**	**$0**	**0**	**0**

Source: NCEI

Table 4-47 Tornado Wind Events in San Luis Valley, 1950-2022

Tornado	Total Events	Days with Events	Highest	Property	Injury	Fatality
Alamosa	17	17	F2	$21,840	0	0
Conejos	5	5	F2	$25,250	0	0
Costilla	7	7	F3	$5,000	0	0
Mineral	1	1	F2	$10,000	0	0
Rio Grande	2	2	F0	$8,000	0	0
Saguache	5	5	F1	$252,500	0	0
Total	**37**	**37**	**F3**	**$322,590**	**0**	**0**

Source: NCEI

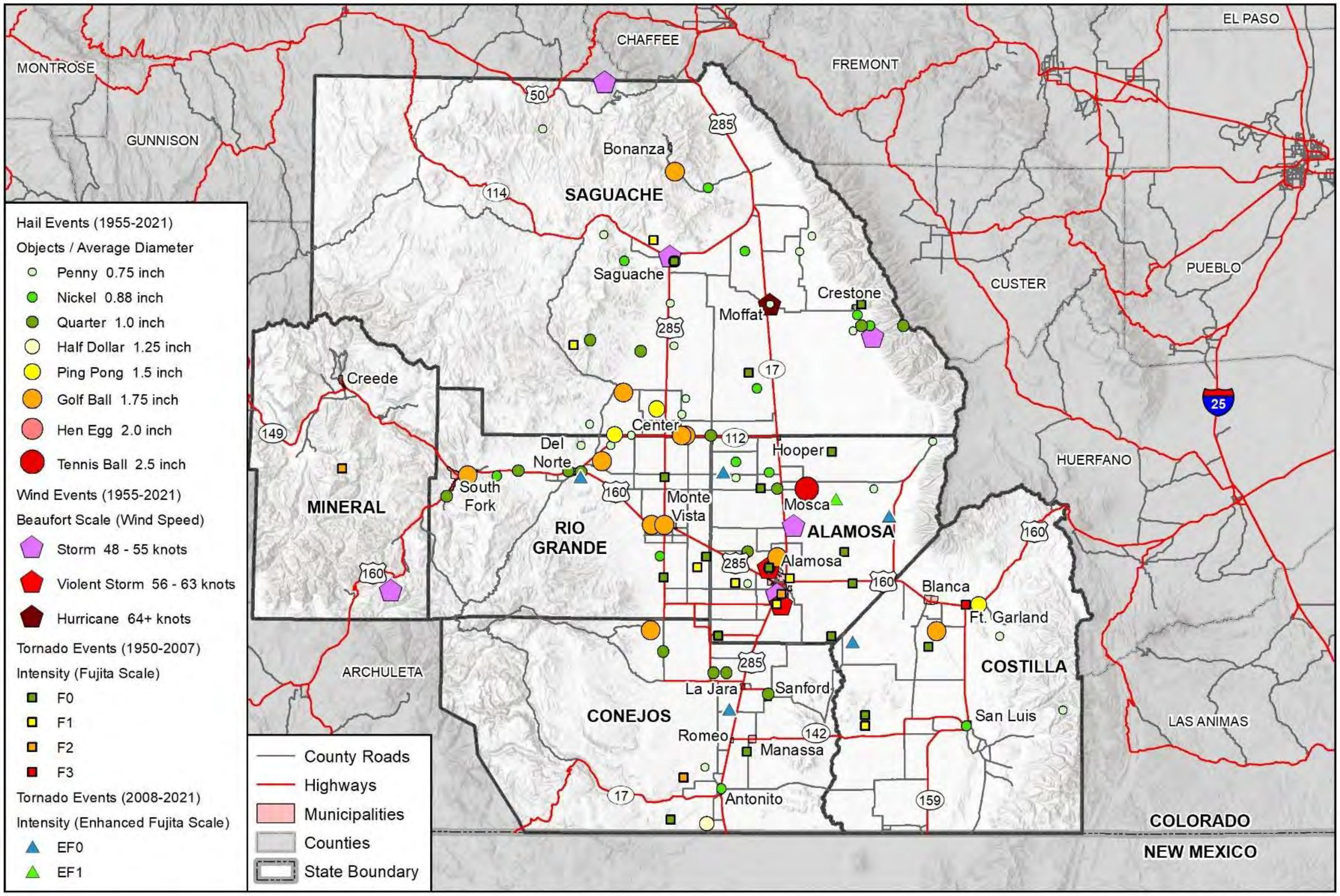
There has been no high wind or tornado events that have resulted in documented damage, injury, or death, in the San Luis Valley Region since the previous plan update. The NCEI dataset reported details on several historic severe wind and tornado events in San Luis Valley that resulted in damages:

- **June 16, 1991:** An estimated $250,000 in property damages due to a tornado was recorded in Saguache County.
- **February 2, 1996:** High wind caused extensive damage to roofs, shingles, and fences. Over 2,600 homes lost power for between 2 and 6 hours. Several mobile homes were rolled over and caused 6 injuries, as well as $150,000 in reported losses.
- **June 3, 2005:** An estimated $100,000 was reported in Saguache County due to thunderstorm winds when microburst thunderstorm winds caused significant roof damage to the elementary school in Moffat.

Geographical Area Affected

Tornadoes and severe wind events are possible throughout the San Luis Valley Region. Figure 4-14 displays the location of historic wind and tornado events in San Luis Valley, with documented events in each of the six counties in the planning area. Wind speed is correlated with elevation, so higher, more exposed areas within the county are more susceptible to high winds, but all areas of the planning are potentially vulnerable. The severe weather conditions that spawn tornadoes and severe wind events may impact any extent of the planning at a given time, and in this regard, the possible geographic extent for wind and tornadoes is extensive.

Figure 4-14 Historic Severe Weather Events in San Luis Valley Region, 1950-2022



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, NOAA, National Weather Service SVRGIS 2021

Magnitude/Severity

Tornadoes are potentially the most dangerous of atmospheric storms. If a major tornado were to strike the urbanized areas of San Luis Valley, 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. The potential for damage is significant, however based on the past record of occurrence it is unlikely for a high magnitude event to strike the planning area.

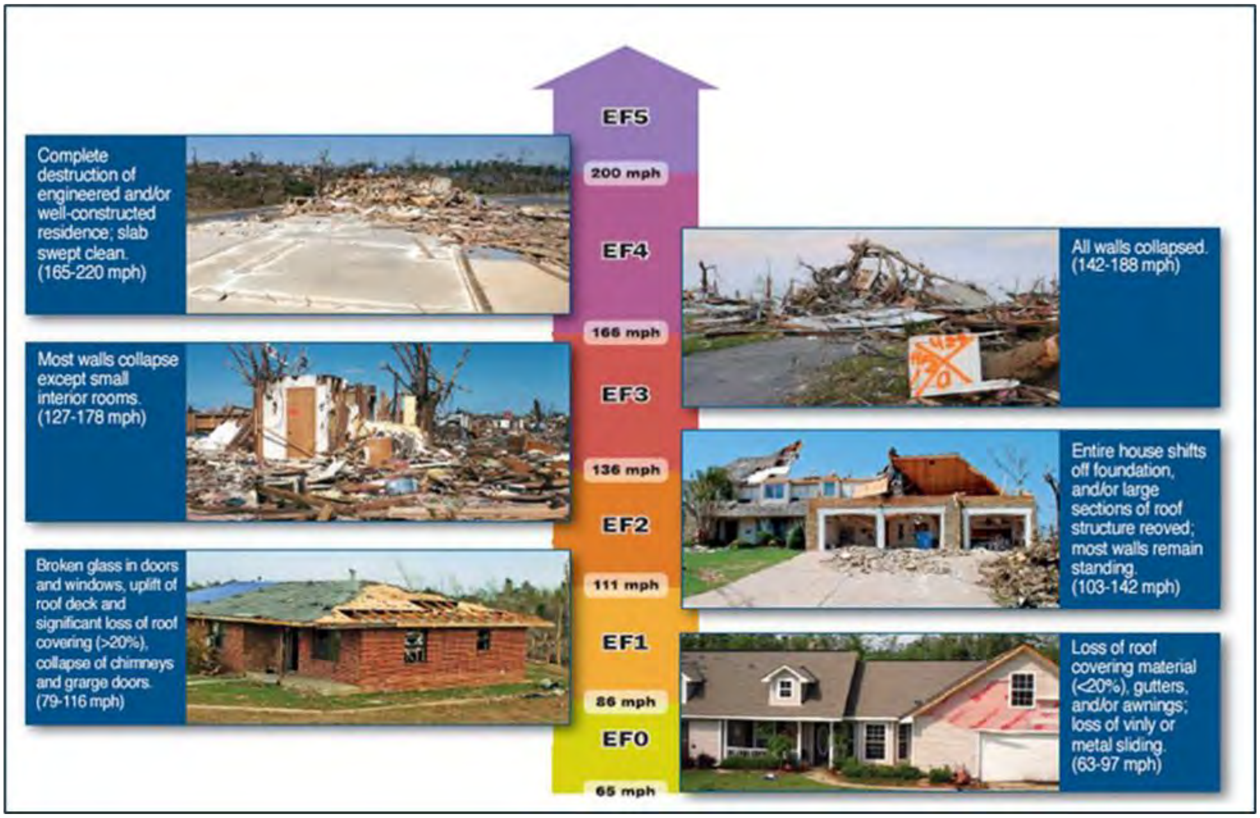
The EF-scale is a set of wind estimates (not measurements) based on damage. Standard measurements are taken by weather stations in open exposures. Table 4-48 shows the wind speeds associated with the EF Scale ratings and the associated damage indicators associated with each rating. Visual examples of the degree of damage which could be expected with each EF rating are shown in Figure 4-15 below.

Table 4-48 Enhanced Fujita Scale with Damage Descriptions

EF Scale			
Scale	**Wind Speed (mph)**	**Relative Frequency**	**Potential Damage**
EF0	65-85	53.5%	Light. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are always rated EF0).
EF1	86-110	31.6%	Moderate. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	10.7%	Considerable. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	136-165	3.4%	Severe. Entire stores of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	0.7%	Devastating. Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
EF5	>200	<0.1%	Explosive. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 300 ft.; steel reinforced concrete structure badly damaged; high rise buildings have significant structural deformation; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration

Figure 4-15 Potential Damage Impacts from a Tornado



Source: National Oceanic and Atmospheric Administration

According to the Colorado Natural Hazards Mitigation Plan, the physical impacts of high wind events can be compared to those of a weak tornado in terms of the severity of property damage, but with a more widespread area of impact. "Structural collapse, and damages caused by falling trees/limbs, can cause injury and impairment of the residential and commercial use of the affected properties. It is very common for winds to cause trees and their limbs to break communication and power lines." [4]

Windstorms in San Luis Valley are rarely life threatening but do disrupt agriculture and cause damage to buildings. Impacts of strong, straight-line winds can be erosion, dryland farming seed loss, windblown weeds, and building damage. The severity of severe wind and tornado hazards in San Luis Valley is rated as critical, meaning that minor injuries and minor property damages are possible, with minimal disruptions to infrastructure and critical services.

Frequency/Likelihood of Occurrence

According to the record, as indicated above, windstorms occur regularly in San Luis Valley and are considered highly likely to occur in the future (annual event or occurs at least once per year, i.e., 100% chance). Some counties are more likely to experience these hazards than others. The NCEI dataset reported that Costilla County experienced the greatest number of reported high wind events with the greatest property loss. Alamosa County experienced the greatest number of tornado events and Saguache County

[4] Colorado Natural Hazards Mitigation Plan (2018-2023), Colorado Division of Homeland Security and Emergency Management, p. 3-95

reported highest property losses from tornado events. The HMPC noted that the typical "wind season" in the region seems to be expanding.

Climate Change Considerations

Climate change impacts on the frequency and severity of tornadoes and severe winds is 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 do not, beyond knowing that they require a certain type of wind shear. Tornadoes spawn from approximately one percent of thunderstorms, usually supercell 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. The 2018-2023 Colorado Enhanced State Hazard Mitigation Plan reports that the area at risk, extent, intensity, and frequency of severe wind events are not projected to change. However, it is unknown if the duration of severe wind events may be affected by climate change.

Vulnerability Assessment

People

Per NCEI records, high winds have resulted in one death and 21 injuries reported in San Luis Valley since 1996. No recorded deaths or injuries occurred due to tornado or thunderstorm wind events. 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. Most of the injuries and fatality documented in the NCEI dataset were to people driving semi-trailers and were flipped on the road.

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. People who are dependent on electricity, such as Medicare beneficiaries, are likely to face isolation and exposure after tornado events and could suffer more secondary effects of the hazard. These populations face isolation and exposure after tornado events and could suffer more secondary effects of the hazard.

Figure 4-16 displays several social variables that increase vulnerability to wind and tornado events by county; percent population of householders living alone (65+ years), percent population living in mobile homes, and percent population in poverty. The data for this figure was taken from the U.S. Census Bureau in 2020 and indicates that Conejos and Costilla Counties have a significant portion of the population that are disproportionately vulnerable to losses from wind and tornado events.

Figure 4-16 Vulnerable Populations in San Luis Valley, 2020

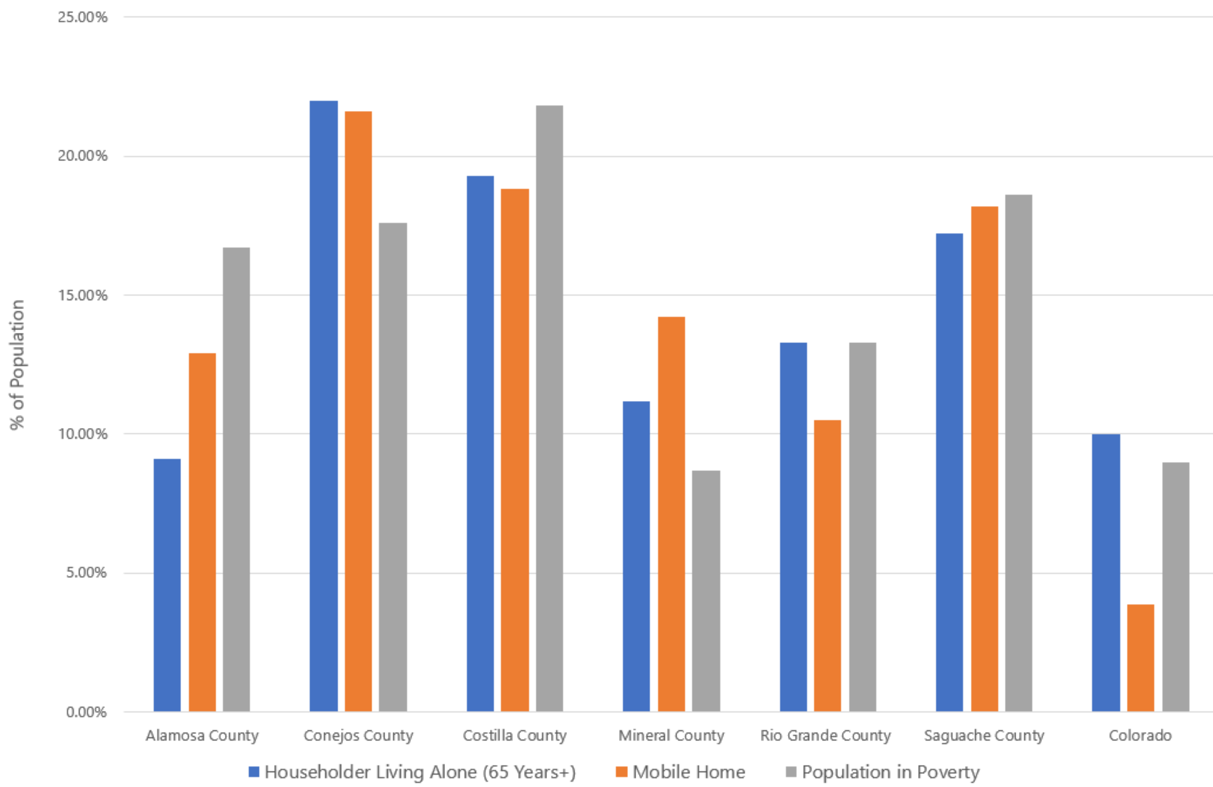


Figure by WSP, Data Source: U.S. Census Bureau 2020

Property

All buildings in San Luis Valley can be considered at risk from severe wind and tornadoes. Older buildings, which are often subject to less advanced building codes, suffer increased vulnerability to wind over time. For example, per FEMA's Guidelines for Wind Vulnerability Assessments of Existing Critical Facilities, roof structure blow-off or collapse typically occurs to buildings constructed before 1990 due to building codes and standards. Mobile homes, which are most often occupied by low-income, socially vulnerable residents, are the most dangerous places during a windstorm or tornado. Studies indicate that 45% of all fatalities during tornadoes occur in mobile homes, compared to 26% in traditional site-built homes. Overall, mobile homes in San Luis Valley make up anywhere from 10.5% in Rio Grande County to 21.6% in Costilla County of total housing, which is significantly higher than the Colorado state average mobile homes comprising 3.9% of housing.

Secondary impacts of damage caused by tornado events often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies. These indirect impacts of a tornado put tremendous strain on a community. In the immediate aftermath, the focus is on emergency services.

Critical Facilities & Infrastructure

Infrastructure damage from tornadoes and severe wind is dependent on the age of the building, type, construction material used, and condition of the structure. Possible losses to critical infrastructure include:

- Electric power disruption
- Communication disruption
- Water and fuel shortages

- Road closures to roads that provide access to isolated areas and to the elderly
- Damaged infrastructure components, such as sewer lift stations and treatment plants
- Damage to structures and shelters

Downed electrical lines following a storm can increase the potential for lethal electrical shock and can also lead to other hazard events such as wildfires. HAZMAT may be released if a structure is damaged that houses such materials or if such a material is in transport. The HMPC noted that dust and windstorms have been a significant problem in the region and have led to vehicle collisions on Highway 17. Additionally, high winds in combination with wildfires have led to near blackout conditions from wind driven smoke on Highway 160. The HMPC also noted that high wind has caused issues with flights used for emergency hospital transportation, reducing responders' ability to aid people in the community.

Economy

Economic losses may result from business interruption or lost productivity due to damages to infrastructure or property or interruption of services. However, most financial losses due to wind are related to direct property damages as well as subsequent debris removal, response, and repair activities. Loss of power and minimal damage following a tornado could cause disruptions to the local economy through forced temporary closures of businesses and preventing people from traveling to work. More severe tornadoes could result in significant economic disruption and hinder recovery through the forced extended or permanent closure of businesses damaged in the event. Per NCEI records, high wind events have caused $3,928,000 in property damages in San Luis Valley and tornadoes have resulted in $322,590 in property damages.

Historical, Environmental, and Cultural 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.

Severe winds can cause erosion and damage trees and vegetation. Environmental impacts may also result from secondary effects of wind. Severe winds can trigger or spread wildfires under some conditions. Winds may also lead to HAZMAT releases; for example, a past event recorded by NCEI noted that winds toppled a semi-truck hauling hazardous material.

Development Trends

All future development will be potentially exposed to tornadoes. Development regulations that require safe rooms, basements, or other structures that reduce risk to people would decrease vulnerability but may not be cost-effective given the relative infrequency of damaging tornadoes in the planning area.

Population growth and development in the planning area will result in an increase in exposure to severe winds. However, development trends are not expected to affect the probability or severity of wind hazards.

Risk Summary

Table 4-49 High Winds and Tornadoes Hazard Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
San Luis Valley	Extensive	Highly Likely	Critical	Medium
Alamosa County	Extensive	Highly Likely	Critical	Medium
Conejos County	Extensive	Likely	Critical	Medium
Costilla County	Extensive	Likely	Critical	Medium

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Mineral County	Extensive	Likely	Limited	Medium
Rio Grande County	Extensive	Likely	Limited	Medium
Saguache County	Extensive	Highly Likely	Critical	Medium

- The overall significance of this hazard to the planning area is **medium**.
- 899 high wind events have been recorded, 21 thunderstorm wind events, and 37 tornado events have been recorded in San Luis Valley since 1950. San Luis Valley can expect multiple high wind events per year and a tornado roughly once every other year somewhere in the region.
- Elderly and individuals who depend on electricity for medical needs are vulnerable to power outages caused by a tornado or high wind. Costilla and Conejos Counties have the greatest vulnerable populations to high wind and tornado events in the region.
- 21 injuries and one fatality occurred in San Luis Valley due to high winds.
- Over $4 million in property damages has occurred in the region due to wind and tornado events since 1950.
- All property is potentially vulnerable during tornado events, but mobile homes are disproportionately at risk due to the design of the homes.

4.2.9 Landslide/Rockfall/Debris Flow

Hazard/Problem Description

Landslides, rockfalls, and debris flows are all forms of a geological process known as mass movements. There are various types of landslides, including slumps, rockslides, debris slides, lateral spreading, debris flows, earth flows, and soil creep. Rock falls are the falling of a detached mass of rock from a cliff or down a very steep slope. In general, areas prone to the landslide hazard are also susceptible to debris flows and rock falls as well.

Landslide

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

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

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

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

In this chapter, the discussion of landslides is more extensive than that of rockfall or debris flow. The primary reason is availability of information. Additionally, landslides potentially present a very serious threat to the planning area.

Rockfall

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

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

Debris Flow

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

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

The debris flow problem can be exacerbated by wildland fires that remove vegetation that serves to stabilize soil from erosion. Heavy rains on the denuded landscape can lead to rapid development of destructive mudflows. Nearby La Plata County experienced damaging mudflows in the area burned by the Missionary Ridge Fire in 2002.

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

- **Very High Hazard Zone** – This is the zone of greatest hazard. It is estimated that in this area the greatest impact from, and most frequent exposure to, debris flows and floods. The zone is characterized by steep slopes, deposits of large boulders (greater than two feet in diameter), tree scars and burial, channels, levees, and lobes. Damage in this zone could include structural damage, such as buildings being moved off their foundations, walls, and windows being broken, large accumulations of debris being piled in and around buildings, trees being toppled or severely damaged, and severe mud and water damage. Plugs of debris should be expected in this zone, and loss of life is possible.

- **High Hazard Zone** – This is the zone of high hazard. This zone is subject to debris flows and floods but does not experience the maximum impact of the events. However, events may be just as frequent as in the Very High Hazard Zone. The zone is generally characterized by moderate to steep slopes, boulders, levees, lobes, tree scars and burial, and channels. Damage in this zone could include moderate damage to structures resulting from the pounding of boulders and logs, broken windows, basements filled with mud and debris, piles of debris in and around structures and in yards and streets, and severe mud and water damage.
- **Moderate to Low Hazard Zone** – This hazard zone is usually subjected primarily to mud and water flooding because of debris-flow events. This zone is characterized by low to moderate slopes, and deposits of abundant mud, and minor debris (small boulders, one foot or less and logs). Damage is usually comparatively minor, consisting of mud and water damage to outer walls of buildings, basements, and yards.

Past Occurrences

During the 1980s and 1990s, landslide activity intensified due to an extended period of higher-than-normal annual precipitation levels. During this period Saguache County was one of 15 counties in Colorado included on a Federal Disaster Declaration (DR-719) involving flooding, mudslides, and landslides. In total, more than $6.6 million was spent in federal, state, and local disaster assistance.

According to the NCEI database, there have been at least three reported incidents of debris flow events which have occurred in the San Luis Valley. There events are detailed below based off information reported to NCEI:

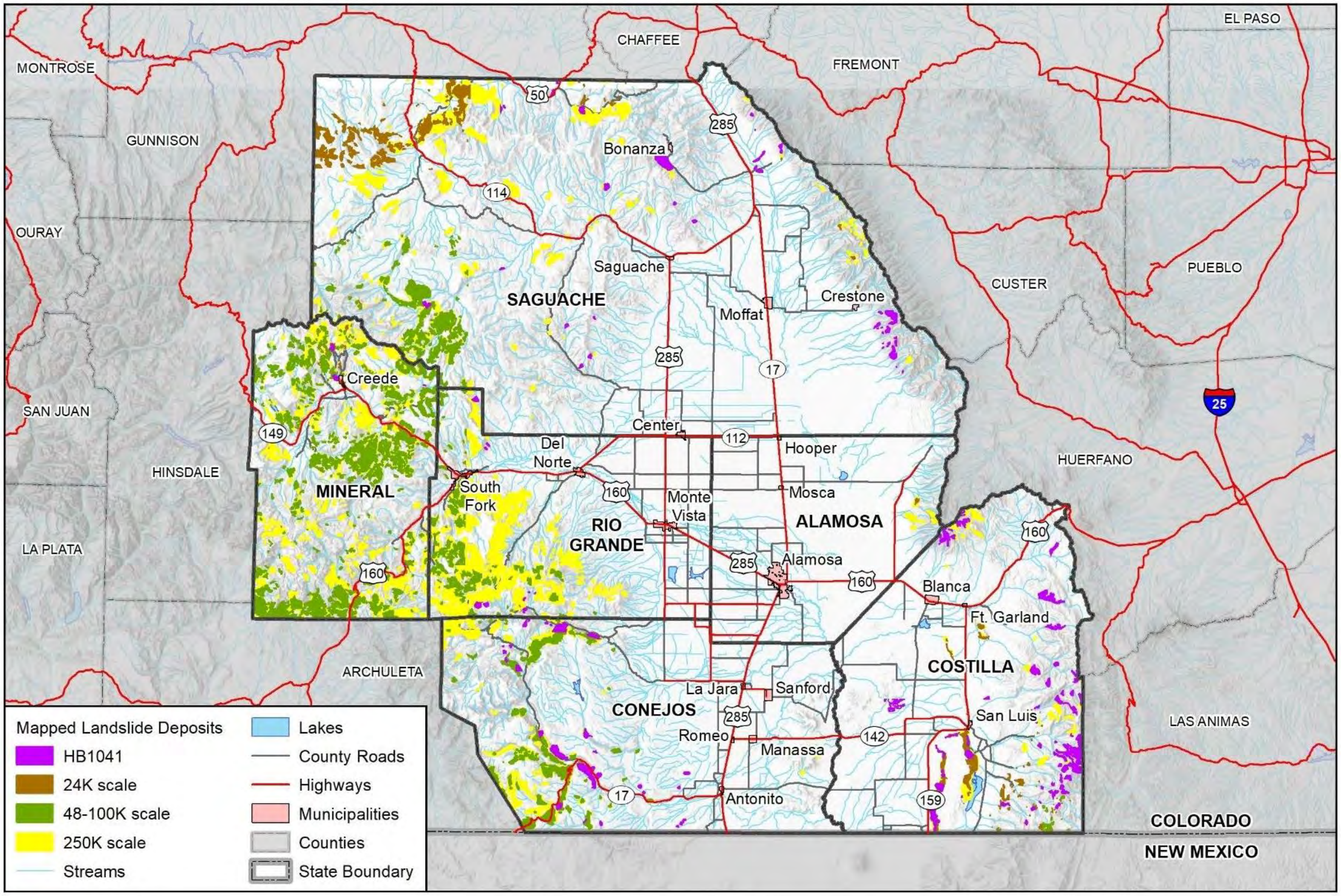
- **August 8, 2006 – Mineral County:** Heavy rain on the steep slopes near Wagon Wheel Gap on Colorado Highway 149 caused four landslides which blocked traffic for several hours. One landslide was between Blue Creek Lodge and South Fork. Three others were between Blue Creek Lodge and Cottonwood Cove Guest Ranch. The most massive landslide deposited four to eight feet of mud and rocks on the roadway. Two vehicles were trapped between two slides but were not caught in the mud or rocks.
- **July 28, 2008 – Costilla County:** A massive mud and debris slide occurred near the summit of La Veta Pass across Highway 160 in Costilla County. The slide was 300-feet wide and up to 6 feet deep. This major east-west highway was closed for four hours.
- **August 23, 2008 – Saguache County:** A heavy thunderstorm brought heavy rain to Poncha Pass mid evening, which caused some landslides in the area. A three-mile stretch of Highway 285 was closed until 1:00 a.m. One slide was 50-feet wide and two feet deep.

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

Geographical Area Affected

As noted in the 2018 Colorado Natural Hazards Mitigation Plan, many of Colorado's landslides occur along transportation networks. This is often because soil and rock along major transportation corridors has been disturbed by roadway construction. Construction along roads can occur with or without proper landslide hazard mitigation procedures, which increases the likelihood of future events. Movement related to landslides, mud and debris flows, and rock falls occurs naturally across Colorado on an ongoing basis. The landslide hazard occurs in all mountainous regions of the state, including the Sangre de Cristo and San Juan Mountain ranges. Factors that influence risk from landslides include elevation, slope, soil moisture and susceptibility. Figure 4-17 below shows the locations of mapped landslide deposits in the San Luis Valley based on data from the Colorado Geological Survey (CGS).

Figure 4-17 San Luis Valley Landslides Mapped by Colorado Geological Survey



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, Colorado Geological Survey

Most of Alamosa County consists of flat desert and is not as susceptible to landslides as the rest of the San Luis Valley Counties. The greatest potential risk for landslides is in eastern Alamosa County in the Sangre de Cristo Mountains. There is a fair amount of steep terrain in this area, particularly near the boundaries with Costilla and Huerfano Counties. As shown in Figure 4-17 above, Mineral and Rio Grande Counties have the greatest extent of mapped landslide deposits in the region.

Magnitude/Severity

Saturated soils due to heavy precipitation or melting snowpack are often the determining factors in the frequency and magnitude of land movements. Landslides can also be triggered by loss of vegetation after a wildfire or by erosion of the toe of the slope by rivers. Earthquakes or land development activities can also disturb slopes and trigger landslides. Landslides, mudslides, debris flows, and rock fall can all damage and destroy homes and buildings, roads, railroads, utility lines, bridges, and other lifeline facilities.

More typically however, landslide events are gradual movements in areas of steep topography and where the soil conditions contribute to the movement of the slope. Damages are often limited to cracks in foundations and damage to roads. Individual property owners may experience damage depending on site specific movement. Rockfall, on the other hand, is a sudden movement, and could potentially result in significant damages, injuries, or death.

The potential magnitude of landslide impacts in the San Luis Valley is likely to be limited, meaning that minor injuries and minor property damages are possible, with minimal disruptions to infrastructure and critical services.

Frequency/Likelihood of Occurrence

Landslides are likely to occur in the planning area, meaning these hazards have between a 10 and 100 percent chance of occurrence in next year, or have a recurrence interval of 10 years or less. Landslides occur somewhere in the state almost every year, if not annually, and as such it can be expected that landslides will occur in the planning area in the future. According to the 2018 Colorado State HMP, geologic hazards such as landslides, mud, and debris flows, and rockfalls may be sporadic and somewhat unpredictable; however, geologic studies can determine the location of historic paths and deposits as a potential indicator of future events. Known instabilities of hillsides and cliff faces can be instrumentally measured to determine if movement is occurring.

Rockfall is also likely to occur in the planning area on a somewhat annual basis, with areas like Highway 160 through Mineral and Rio Grande Counties being a very common location for this hazard.

Climate Change Considerations

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Climate change projections for more intense precipitation events have the potential to increase landslide incidence, particularly debris flows. With increases in heavy precipitation events, the San Luis Valley could see an elevated risk of landslide and debris flow occurrence in the future. Additionally, warming temperatures also could increase the occurrence and duration of droughts, which would likely increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. Each of these factors would increase the probability for landslide and debris flow occurrences.

Vulnerability Assessment

In and around the San Luis Valley, most areas susceptible to landslides are publicly owned lands and there is a relatively low risk for injury, loss of life, or damage to property. The most significant risk is likely along the highways. Ongoing pressures for residential and business growth in areas highly impacted by landslides will continue as available land for development decreases in mountain communities.

The conditions resulting in a landslide are site-specific. A major landslide could potentially destroy anything in its path. The vulnerability of individual structures could be assessed through detailed studies of buildings and infrastructure located within known landslide areas. Future development in areas where landslide potential exists should undergo geotechnical studies to determine slope stability.

People

Past events in the San Luis Valley have not caused loss of life or major injuries to date, although the potential for both in the future does exist. People could be caught in a landslide or debris flow while participating in outdoor recreation activities such as hiking or backpacking, potentially leading to injury or death. There is also a danger to drivers operating vehicles, as rocks and debris can strike vehicles passing through the hazard area or cause dangerous shifts in roadways. Based on the past notable landslides in the county it is not likely that landslides will occur without warning and direct impacts to people are suspected to be minimal. However, rockfall and debris flow occurrences do tend to occur more suddenly, making advance warning difficult.

Property

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

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

During the 2022 creation of this plan, a GIS analysis of exposure to landslide hazard areas was performed. GIS analysis indicates approximately $149 million of total property value exposed, which takes into account improved values of structures based on average residential values data from Hazus. Table 4-50 summarizes landslide exposure by jurisdiction. GIS was used to intersect the Microsoft Building Footprints point layer with landslide hazard data from CGS.

Based on this analysis there are a total of 650 structures potentially within landslide hazard areas. The majority of this exposure is in unincorporated Rio Grande County. There is a high level of uncertainty as to the actual risk to these exposed structures, thus a more specific loss estimation is not provided. A more detailed, site-specific analysis would be needed to assess actual risk within the identified structures.

Table 4-50 San Luis Valley Structures at Risk to Landslide by County and Jurisdiction

County	Jurisdiction	Structure Count	Estimated Structure Value	Estimated Content	Total Value	Estimated Population
Alamosa	Alamosa County	12	$2,173,755	$1,086,878	$3,260,633	29
Conejos	Conejos County	135	$18,274,845	$9,137,422	$27,412,267	345
Costilla	Costilla County	59	$7,268,287	$3,634,143	$10,902,430	129
Rio Grande	South Fork	6	$994,431	$497,215	$1,491,646	14
	Rio Grande County	373	$61,820,440	$30,910,220	$92,730,660	889
Saguache	Saguache County	65	$8,645,520	$4,322,760	$12,968,280	145
	Total	**650**	**$99,177,277**	**$49,588,639**	**$148,765,916**	**1,552**

Source: Microsoft Footprints 2021, Colorado Geological Survey, Hazus 5.1, WSP GIS Analysis

Critical Facilities & Infrastructure

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

Transportation networks are typically the most exposed critical facility type in the region to rockfall, landslide and debris flow incidents. Residents and visitors alike are impacted when roads are damaged by rockfall and landslides. This includes Highway 149, 160 and Highway 285, all of which have experienced past events and are some of the primary access points for commerce and transportation in the region. The loss of transportation networks could potentially cause secondary damage to the overall region's infrastructure, including revenue, transportation availability, emergency response mechanisms and other essential capabilities by preventing the means of these resources from activating or moving between locations.

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

Table 4-51 and Table 4-52 below summarize the results of the critical facilities analysis, highlighting the exposure of critical facilities throughout the region to landslide and rockfall hazards. Communications and transportation lifeline facilities have the greatest risk to this hazard.

Table 4-51 Critical Facilities at Risk to Landslide Hazards by Jurisdiction and Facility Type

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Conejos	-	-	-	-	-	-	1	1
Costilla	-	-	-	-	-	1	-	1
Mineral	6	-	-	1	-	-	3	10
Saguache	1	-	-	-	-	-	-	1
Total	**7**	**0**	**0**	**1**	**0**	**1**	**4**	**13**

Source: CGS, CDPHE, CEPC, HIFLD, NBI, WSP GIS Analysis

Table 4-52 Critical Facilities at Risk to Rockfall Hazards by Jurisdiction and Facility Type

County	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Costilla	2	-	-	-	-	-	-	2
Mineral	-	-	-	-	-	2	1	3
Rio Grande	1	-	-	-	-	-	-	1
Saguache	8	-	-	-	-	1	4	13
Total	**11**	**0**	**0**	**0**	**0**	**3**	**5**	**19**

Source: CGS, CDPHE, CEPC, HIFLD, NBI, WSP GIS Analysis

Economy

Economic impacts typically center around transportation routes temporarily closed by rockfall, debris flow, mudflow, or landslide activity. These roads may be used to transport goods across the region or provide access by visitors and tourists. Depending on the amount of damage, the road may simply need to be cleaned off, or it may need some level of reconstruction and thereby affect the local economy indirectly. Economic losses can also come in the form of direct property damages to buildings.

Historical, Environmental, and Cultural Resources

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

Development Trends

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

Steep slope regulations limit problems from these hazards for future development, thus the exposure of infrastructure to these hazards is not anticipated to grow. As expansion of the tourism and recreational activity grows in the San Luis Valley Counties, the amount of traffic within and through the region will continue to increase, and thus the amount of people exposed to danger from rockfall hazards may increase. The Wolf Creek Pass area commonly has rockfall which affects vehicular traffic on Highway 160.

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

Risk Summary

Table 4-53 Landslide/Rockfall/Debris Flow Risk Summary Table

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Limited	Occasional	Negligible	Low
Conejos County	Significant	Likely	Limited	Low
Costilla County	Significant	Likely	Limited	Low
Mineral County	Significant	Likely	Limited	Medium
Rio Grande County	Significant	Likely	Limited	Medium
Saguache County	Significant	Likely	Limited	Medium

Overall landslide, rockfall, and debris flow is a medium to low significance hazard.

- This hazard occurs on an annual basis in Colorado, and the frequency of future events in the region is likely. Rockfall is an annually occurring hazard throughout the planning area.
- Effects on people: Landslides, rockfall, and debris flow all have the potential to cause death or injury, although past events in the San Luis Valley have not caused either to date.
- Effects on property: Impacts on property include direct damage to structures in the path of mass movements, as well as damages to the foundations of structures as land around them shifts.
- Effects on the economy: economic impacts typically center around transportation impacts, such as the impediment to tourists and the shipment of goods caused by blocked roads.
- Effects on critical facilities and infrastructure: Linear facilities, such as pipelines, railroads, and roadways, are largely at much greater risk than other facility types.
- Unique jurisdictional vulnerability: There is some variability in the frequency and impacts of this hazard throughout the San Luis Valley, specifically the lower likelihood and magnitude expected in much of Alamosa County which largely is flat and makes up a large portion of the San Luis Valley floor, compared to Mineral, Rio Grande, and Saguache Counties, which each have vulnerable and heavily trafficked transportation routes through mountainous areas with history of mass movements.
- Related hazards: Wildland fires, earthquakes.

4.2.10 Lightning

Hazard/Problem Description

Each year, lightning is responsible for deaths, injuries, and property damage, including damage to buildings, communications systems, power lines, and electrical systems. According to the NWS, Colorado ranked 4th in the County for lightning fatalities from 1959-2019, with an average of two facilities per year in the State. Additionally, Colorado averages 12 injuries due to lightning per year, and is ranked 19th in the County regarding the total number of cloud-to-ground lighting.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is also less common. It frequently strikes away from the rain core, either ahead or behind the thunderstorm and can strike 5-10 miles from the storm in areas that most people do not consider to be a threat. The NWS reported that Colorado experiences an average of 500,000 cloud-to-ground lightning flashes per year. The Vaisala Lightning Report 2021 reported that Colorado experienced 3,451,756 total lightning strikes (cloud-to-ground and intracloud lightning) in 2021, which was an increase from 2020. displays the formation of cloud-to-ground lightning.

Past Occurrences

According to data from the National Centers for Environmental Information (NCEI), six lightning events were recorded in San Luis Valley from 1996 to March of 2022 that have caused injury, property damage, and death. Table 4-54 summarizes these events.

Table 4-54 Major Lightning Events in San Luis Valley, 1996-2021

County	City/Town	Date	Property Damages	Deaths	Injuries
Alamosa County		August 19, 1996	$0	0	1
Alamosa County		September 6, 1997	$40,000	0	0
Saguache County	Crestone	July 27, 2003	$0	1	1
Alamosa County		August 2, 2003	$0	1	0
Alamosa County	Hooper	July 15, 2007	$2,000	0	0
Mineral County	Creede	July 28, 2008	$0	1	0
Total			**$42,000**	**3**	**2**

Source: National Centers for Environmental Information

Several of the events recorded by the NCEI were described in detail:

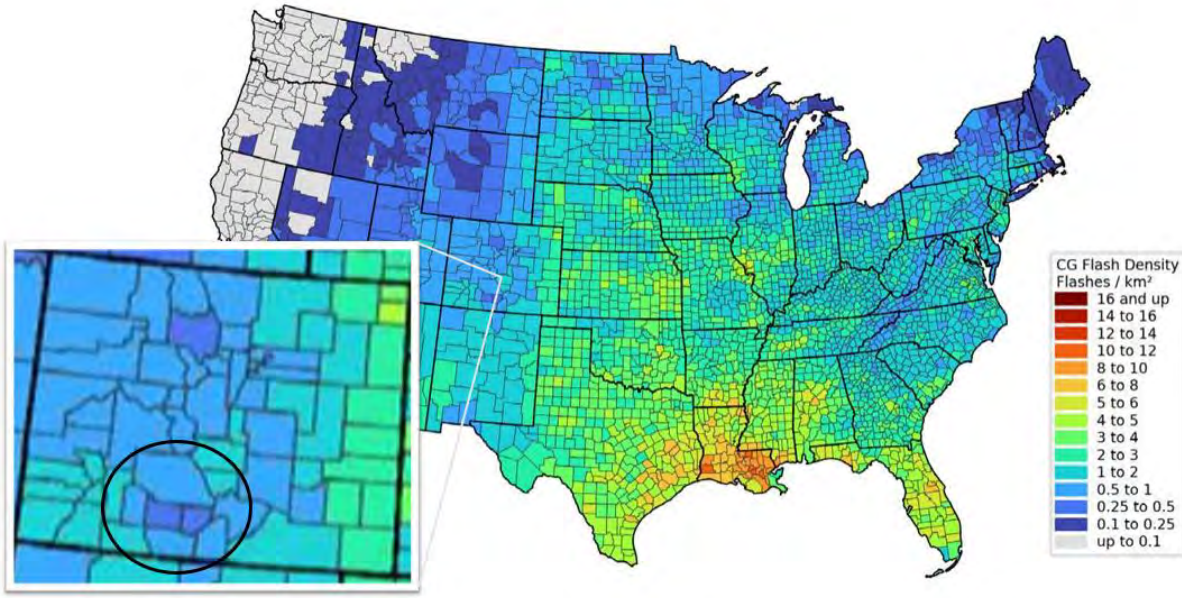
- **On August 19, 1996**, two students from Alamosa High School were struck by lightning and knocked to the ground. One student suffered a minor burn.
- **On September 6, 1997**, a mobile home was destroyed by a lighting-ignited fire, resulting in $40,000 in damages in Alamosa County.
- **On July 27, 2003**, a woman was struck and killed by lightning while on a hike with her husband, who was injured by the strike in the Town of Crestone, Saguache County.
- **On August 2, 2003**, a man slipped and fell to his death as he hurried down a mountain to avoid several lightning strikes in Alamosa County.
- **On July 15, 2007**, a lightning strike just west of the Town of Hooper set 14 bales of hay on fire, resulting in $2,000 in damages.
- **On July 28, 2008**, a shepherd and a mule were killed by a lightning strike in the town of Creede, Mineral County.

The HMPC noted that Alamosa County experiences significant lightning strikes in the valley, and it is lucky that no wildfires have been sparked by them to date. The HMPC also commented that there seems to be an increase in the probability of wildfires due to lightning strikes because of the beetle kill and drought conditions leading to an excess in dry, downed fuel. The HMPC is mitigating this risk through active monitoring.

Geographical Area Affected

Major lightning events can occur anywhere in San Luis Valley and the participating jurisdictions in this planning effort. Vaisala Lightning Report 2021 indicates that lightning can happen in each of the six counties in San Luis Valley. Figure 4-18 displays a map of lightning density across the U.S. in 2021, with the planning area circled. San Luis Valley experienced 0.25 to 1 cloud-to-ground flashes per km^2 in 2021. According to this figure, Alamosa and Rio Grande Counties experience slightly lower flash density than the rest of San Luis Valley.

Figure 4-18 Cloud-to-ground Flash Density by County in U.S., 2021



Source: Vaisala Lightning Report 2021

Magnitude/Severity

People attending large outdoor gatherings (i.e., sporting events, concerts, fairs, festivals, etc.) are particularly vulnerable to death and injury from lightning strikes. Men are notably more likely to die from a lightning strike than women. According to the Centers for Disease Control, during the period 2006-2021, male fatalities outnumbered female fatalities 4-1. Outdoor recreationists generally face a higher risk when hiking or camping in the lightning-prone high country. Wildfires and grass fires are frequently ignited by lightning strikes. The Alamosa HMPC noted that the County experiences a significant amount of lightning strikes in the valley, and they are lucky that none of these strikes have sparked a wildfire.

Buildings and equipment exposed to lightning strikes may be damaged and power surges can damage electronic equipment. Direct flash strikes near utility infrastructure can disrupt services. Many critical facilities are equipped with grounding systems. Most lightning events result in only personal property damage and do not significantly impact infrastructure or the delivery of critical services. Disruptions of electrical power due to lightning are generally short in duration (less than 24 hours). In San Luis Valley, three deaths, two injuries, and $42,000 in property damage has been recorded since 1996. The severity of the lightning hazard is rated limited by the Planning Team, meaning that minor injuries and minor property damages are possible, with minimal disruptions to infrastructure and critical services.

Frequency/Likelihood of Occurrence

Lightning can occur anywhere there is a thunderstorm. The average number of lightning flashes by month is shown in Figure 4-19. Over 4,000 lightning flashes are expected to occur on any given day during the months of July and August. Most lightning strikes that result in casualties occur between the hours of noon and 5:00 pm, spiking between 2:00 and 4:00 pm.

Figure 4-19 Lightning Flashes in Colorado per Day by Month (Averages from 1950-2017)

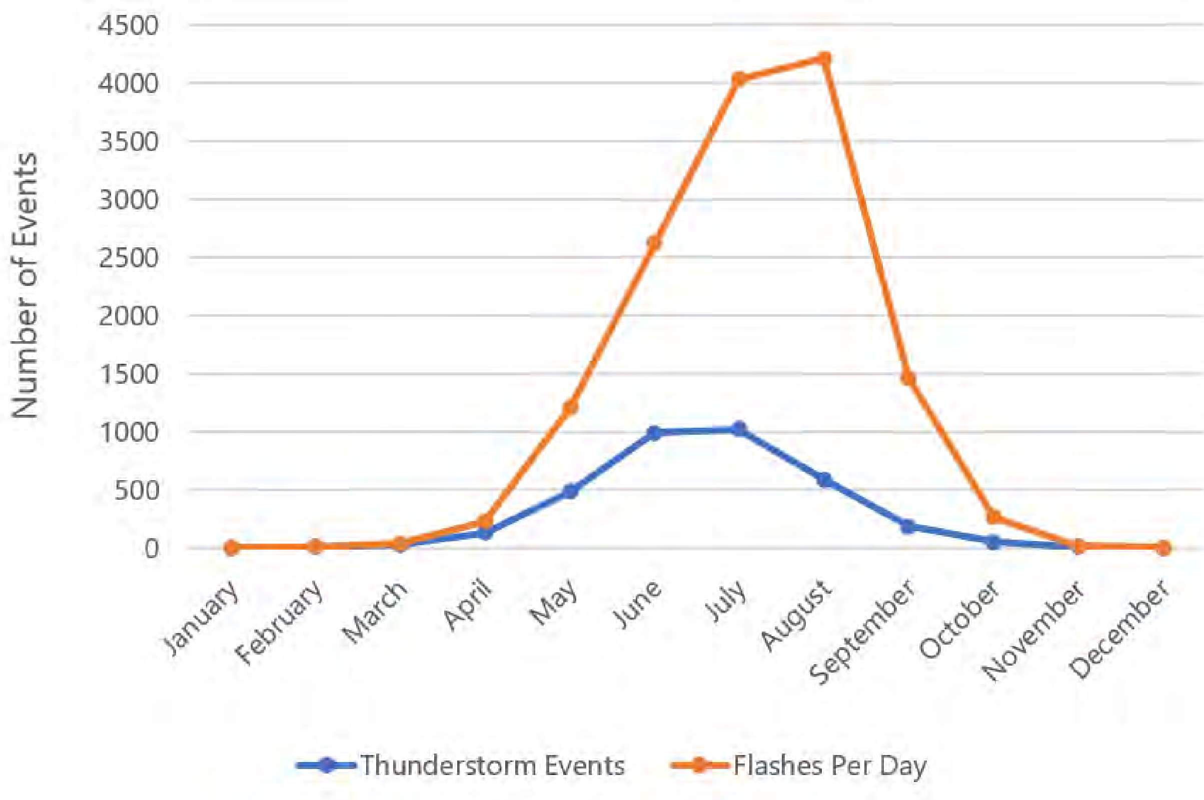


Figure by WSP, Source: NCEI

Most lightning occurs during the summer months, but it can also strike in the winter months during rare weather events known as thunder snowstorms. Pockets of lightning intensity are found in the mountains where the topography causes thunderstorms to form with regularity. While lightning will occur in the region every year, it is rarer for damaging lighting events to occur. Therefore, the probability of lightning strikes in San Luis Valley is **likely**, with a recurrence interval of 10 years or less (10-100% chance each year).

Climate Change Considerations

Per the 2018-2023 Colorado State Hazard Mitigation Plan, the future impacts of climate change on lightning are unclear. A 2014 report in *Science* suggested that lightning strikes over the contiguous United States may increase by 12% for every degree rise in global average air temperature due to potential increases in convective available potential energy. However, more research is needed to better understand this potential connection.

Vulnerability Assessment

All assets located in San Luis Valley can be considered at risk from severe hail events. This includes 100% of the planning area's population, and all buildings and infrastructure within the area.

People

Cloud-to-ground lightning can kill or injure people by direct or indirect means. The lightning current can branch off to a person from a tree, fence, pole, or other tall object. In addition, lightning strikes may conduct their current through the ground to a person after the lightning strikes a nearby tree, antenna, or another tall object. The current also may travel through power or telephone lines, or plumbing pipes to a person who is in contact with an electric appliance, telephone, or plumbing fixture. Individuals who are caught outdoors during a lightning event without shelter are the most vulnerable to risk of injury or death. Additionally, individuals who are dependent on electricity to survive, are at risk of injury or death during prolonged periods of power loss due to lightning. In San Luis Valley, all three deaths and two injuries and deaths occurred to people who were caught outside during a lightning event.

Property
Lightning strikes can damage property. If struck by lightning, structural damage is possible, as well as the potential for a fire. Electrical equipment and structures located at high elevation are particularly vulnerable to lightning strikes. In San Luis Valley, all recorded monetary losses from property damage resulted from fires that were ignited due to a lightning strike.

Critical Facilities and Infrastructure
Like impacts on property, lightning strikes can damage critical facilities and infrastructure. Structural damage or fires may result from lightning strikes. Facilities lacking proper surge protection may suffer damages to electrical systems. The preparation of site-specific emergency procedures for outdoor events by event organizers, response agencies and emergency management can help mitigate the public safety risk, especially when combined with technology that provides adequate early detection, monitoring, and warning of approaching thunderstorms. Communications systems are also at risk and could create barriers to share information with the public during an event. Lightning is unlikely to disrupt government services. However, if lightning strikes a government facility lacking appropriate surge protection or backup power, localized, temporary interruptions may result.

Economy
Lightning is unlikely to have significant local economic impacts; however, business interruption can occur if lightning causes power outages. Localized business losses could occur if a structure catches fire due to a lightning strike. In total, the NCEI reported $42,000 in property losses in the San Luis Valley area, with all losses occurring in Alamosa County.

Historic, Cultural, and Natural Resources
Lightning strikes may cause wildfires, which can cause significant impacts on natural resources. See the Wildfire Hazard for more detail. Structures without proper grounding measures, which can often include historic structures, are vulnerable to damages if struck by lightning.

Development Trends
New development and population increase in the planning area will result in increased exposure to lightning. However, development trends are not expected to affect the probability or severity of lightning strikes.

Risk Summary

Table 4-55 Lightning Hazard Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
San Luis Valley	Extensive	Likely	Limited	Low
Alamosa County	Extensive	Likely	Limited	Low
Conejos County	Extensive	Occasional	Limited	Low
Costilla County	Extensive	Likely	Limited	Low
Mineral County	Extensive	Likely	Critical	Medium
Rio Grande County	Extensive	Occasional	Limited	Low
Saguache County	Extensive	Likely	Limited	Low

- Despite limited records of past damages, lightning is highly likely in the planning area, particularly during summer months. However, damaging lightning events are less likely, therefore lightning is ranked as **low.**
- People who are stuck outdoors during a lightning event, especially those at high elevation, are vulnerable to death or injury due to lightning.
- All exposed property is vulnerable to lighting, particularly electrical equipment, and structures at high elevation.
- Fires can also ignite due to lightning, resulting in wildfires and damage to homes and property.
- Damages from lightning are typically localized to a single person or piece of property.
- Related Hazards: Severe Wind, Hail.

4.2.11 Severe Winter Storm

Hazard/Problem Description

Heavy snow, severe winter storms, severe winter weather, and blizzards are common occurrences in Colorado. Hazardous winter weather includes events related to heavy snow, blowing snow, ice, sleet or freezing rain, and extreme cold temperatures. Blizzards are severe winter storms that pack a combination of blowing snow and wind resulting in very low visibilities. While heavy snowfalls and severe cold often accompany blizzards, they are not required. Sometimes strong winds pick up snow that has already fallen, creating a blizzard."5

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Extreme cold often accompanies or follows a winter storm.

The NWS Glossary defines common winter storm characteristics as follows:

- **Blizzard:** A blizzard means that the following conditions are expected to prevail for a period of 3 hours or longer:
  - Sustained wind or frequent gusts to 35 miles an hour or greater; and
  - Considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than ¼ mile).
- **Heavy Snow:** This generally means:
  - snowfall accumulation of 4" or more in depth in 12 hours or less; or
  - snowfall accumulation of 6" or more in depth in 24 hours or less.
  - In forecasts, snowfall amounts are expressed as a range of values, e.g., "8 to 12 inches." However, in heavy snow situations where there is considerable uncertainty concerning the range of values, more appropriate phrases are used, such as "...up to 12 inches..." or alternatively "...8 inches or more..."
- **Winter Storm:** This product is issued by the NWS when a winter storm is producing or is forecast to produce heavy snow or significant ice accumulations. The criteria for this warning can vary from place to place.
- **Winter Weather:** This product is issued by the NWS when a low-pressure system produces a combination of winter weather (snow, freezing rain, sleet, etc.) that presents a hazard, but does not meet warning criteria.

[5] Colorado Natural Hazards Mitigation Plan, Colorado Division of Homeland Security and Emergency Management, December 2013, p. 3-120

Past Occurrences

According to the NCEI dataset, San Luis Valley has experienced 3,451 severe winter storm events from 1996 to March of 2022. The most frequently reported severe winter storm event in San Luis Valley are winter storms and the least reported are blizzards. In total, blizzard events are the costliest type of severe winter storm, totaling over $10 million in damages across the planning area. There were no monetary losses recorded for heavy snow events or winter weather events. A total of 12 injuries and 21 fatalities have been recorded in San Luis Valley due to severe winter weather. The tables below summarize the NCEI data for the four types of severe winter weather events. It is important to note that, because severe winter weather events are recorded on a zonal scale, it is likely that one event was documented in multiple counties. Therefore, the estimated losses in the tables are likely greater than actual losses.

Table 4-56 Historic Blizzard Events, 1996-2022

Blizzard	Total Events	Days with Events	Property	Injury	Fatality
Alamosa	6	3	$4,450,000	0	1
Conejos	5	4	$350,000	2	4
Costilla	11	4	$5,000,000	2	5
Mineral	7	4	$100,000	0	0
Rio Grande	9	4	$200,000	0	0
Saguache	12	6	$4,500,000	0	1
Total	**50**	**25**	**$10,100,000**	**4**	**10**

Source: NCEI

Table 4-57 Historic Heavy Snow Events, 1996-2022

Heavy Snow	Total Events	Days with Events	Property	Injury	Fatality
Alamosa	107	71	$0	0	1
Conejos	128	95	$0	4	2
Costilla	174	92	$0	4	2
Mineral	154	110	$0	0	1
Rio Grande	235	127	$0	0	1
Saguache	198	118	$0	0	1
Total	**996**	**613**	**$0**	**8**	**8**

Source: NCEI

Table 4-58 Historic Winter Storm Events, 1996-2022

Winter Storm	Total Events	Days with Events	Property	Injury	Fatality
Alamosa	246	134	$0	0	0
Conejos	256	191	$70,000	0	1
Costilla	431	152	$0	0	0
Mineral	334	199	$70,000	0	1
Rio Grande	468	204	$270,000	0	1
Saguache	535	257	$200,000	0	0
Total	**2,270**	**1,137**	**$610,000**	**0**	**3**

Source: NCEI

Table 4-59 Historic Winter Weather Events, 1996-2022

Winter Weather	Total Events	Days with Events	Property	Injury	Fatality
Alamosa	16	7	$0	0	0
Conejos	17	17	$0	0	0
Costilla	33	13	$0	0	0
Mineral	18	16	$0	0	0
Rio Grande	22	18	$0	0	0
Saguache	29	19	$0	0	0
Total	**135**	**90**	**$0**	**0**	**0**

Source: NCEI

Details from notable severe winter weather events in the NCEI dataset include:

- **November 27, 1997:** A severe winter storm resulted in high winds and heavy snow. Thousands of homes were left without power. An elderly woman accidentally locked herself out of her home then slipped and fell on her back porch and froze to death.
- **December 24, 1997:** Heavy snow, which accumulated from 4 to 8 inches, brought traffic to a crawl, and resulted in one traffic-related death.
- **December 25, 1997:** 18 inches of snow in northern San Luis Valley resulted in accidents along I-25 and resulted in a 3-car pile-up, resulting in four injuries and one death.
- **March 11, 2001:** A blizzard resulted in 8-18 inches of snow. Several hundred power poles were knocked down, leaving thousands of people without power. People in buses and motorcyclists had to be rescued on I-25. NCEI estimates $4 million in property losses.
- **December 31, 2018:** A storm system produced snow, heavy at times over many portions of southern Colorado. Six to eight inches of snow was measured in Alamosa and Conejos.
- **September 8, 2020:** Strong northerly winds, heavy snow across the mountains and mountain valleys, and a wintry mix of rain, snow, sleet, and freezing rain across parts of the I-25 corridor were all observed during this time. Additionally, well below normal temperatures brought an end to the growing season over much of the area.

Geographical Area Affected

All of San Luis Valley is subject to severe winter storms, such as blizzards, heavy snowfall, winter weather, and winter storms; therefore, the hazard is rated as extensive. The size of events varies and may range from isolated (impacting only a portion of the area) to statewide. Most severe winter storms are widespread events, impacting multiple counties simultaneously and for extended time periods.

Magnitude/Severity

Heavy snow can immobilize a region by stranding motorists, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and tear down trees and power lines. Loss of power affects homes, businesses, and water, sewer, and other utility services operated by electric pumps. The cost of snow removal, damage repair, and business losses can have a tremendous impact.

Communications and power can be disrupted for days until damage can be repaired. Blowing snow can severely reduce visibility. Serious vehicle accidents can result in injuries and deaths. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening; infants and the elderly are most at risk.

Extremely cold temperatures pose a risk to public safety and disrupt farm and ranch operations. The table below shows the average minimum and extreme minimum temperatures for Alamosa County for the four coldest winter months.

The NCEI records extreme temperatures for counties in the United States. According to the NCEI Climate at a Glance dataset, San Luis Valley has experienced extreme cold temperatures reaching well below 0 degrees Fahrenheit. The HMPC noted that Counties in the region experience temperatures reaching -30 with windchill nearly every year. The general trend of the dataset displayed that all counties in San Luis Valley have been experiencing less days with below zero temperatures over the decades, with peak minimum temperatures occurring in the early to mid-1900's. Table 4-60 below displays a summary of the dataset.

Table 4-60 Extreme Minimum Temperatures in San Luis Valley, 1895-2022

Jurisdiction	Extreme Minimum (°F)	Date
Alamosa	-11.2	January, 1919
Conejos	-8.6	January, 1919
Costilla	-5.5	January, 1919
Mineral	-8.4	February, 1939
Rio Grande	-10.7	January, 1919
Saguache	-7.9	January, 1919

Source: NOAA NCEI, Climate at a Glance: County Time Series, published August 2022, retrieved on August 23, 2022, from https://www.ncei.noaa.gov/cag/

The Planning Team has rated the severity of the winter storm hazard in San Luis Valley as critical, meaning that isolated deaths/injuries; major or long-term impacts to property, infrastructure, and critical services; and service disruptions of 24-72 hours are possible.

Frequency/Likelihood of Occurrence

Atmospheric activity that produces winter weather conditions such as ice, snow, extreme cold, and high winds will continue to occur, and several winter storm events can be expected to occur each year in the San Luis Valley. The probability of future events is therefore rated **highly likely**.

Climate Change Considerations

According to the 2018-2023 Colorado State Hazard Mitigation Plan, winter storm events are projected to become more severe, and winter precipitation events are expected to increase in frequency. However, the Fourth National Climate Assessment reports that portions of the Southwest are experiencing an increase in the proportion of rain to snow in precipitation patterns and projections indicate continuations of this trend as well as a shorter snowfall season.

Vulnerability Assessment

People

Vulnerable populations include the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. The HMPC noted power outages due to severe winter storms, which 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. A total of 12 injuries and 21 fatalities have been recorded in San Luis Valley due to severe winter weather, with most of these incidents occurring due to worsened road conditions from snow and ice resulting in car crashes and pileups. An incident where an elder slipped outdoors and froze was also recorded in the NCEI dataset.

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. The water content or weight of the snow often determines the level of damages to structures, trees, and utility lines. Structures not built to code are more likely to experience damages if heavy snow or ice accumulate on the roof. Vehicles on the road during severe winter weather conditions are also vulnerable to damages in the event of a crash or pile-up.

Critical Facilities & Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from severe winter weather, mostly associated with secondary hazards. Major roadways such as I-285 and I-160 run through San Luis Valley. Hazardous conditions to motorists if blizzards or severe winter weather conditions occur, especially to portions of highways and other major roads that are narrow and curved. Major accidents could lead to delays for emergency vehicles. The HMPC noted La Manga and Poncha Passes as areas in the region that frequently experience transportation issues during a winter storm.

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. Although winter weather in the San Luis Valley is generally mild and dry, severe winter storms can occasionally strand motorists, disrupt emergency and medical services, bring down trees and power lines, freeze water pipes, and damage homes.

Economy

Roads may become impassable due to ice or snow. Ice accumulation on roadways can create dangerous driving conditions. There are limited county roads that are available to move people and supplies throughout the region. Many of the small side roads are narrow and curved. As noted above, there are several major highways that run through the County. These roads are vital to transportation within and through San Luis Valley. Accidents on the highway can cause a major disruption in the flow of goods and services in and out of the County.

Historical, Environmental, and Cultural 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. Livestock and crops are also vulnerable to winter weather conditions. The HMPC also noted livestock as being a common loss from severe winter weather in the region.

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. New structures and facilities built to code should be able to withstand snow loads associated with winter storms. Future development, particularly in more isolated areas, will create emergency access issues and increase demand on road crews and emergency services.

Risk Summary

Table 4-61 Severe Winter Storm Hazard Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
San Luis Valley	Extensive	Highly Likely	Critical	High
Alamosa County	Extensive	Likely	Critical	High
Conejos County	Extensive	Highly Likely	Limited	High
Costilla County	Extensive	Likely	Critical	High
Mineral County	Extensive	Highly Likely	Limited	High
Rio Grande County	Extensive	Highly Likely	Limited	High
Saguache County	Extensive	Highly Likely	Critical	High

- Severe winter storms are considered a high significance hazard for the planning area.
- Severe winter storms can produce strong winds and significant accumulations of snow and ice. These events are likely to continue occurring in the future and impact all counties in the planning area.
- The NCEI recorded 3,451 events over 1,865 days since 1996; therefore, probability of future occurrence is ranked as highly likely to occur each year in the region.
- $10 million in property damages, 12 injuries, and 21 fatalities have been recorded in San Luis Valley since 1996. Magnitude of severe winter storms is therefore ranked as critical.
- Alamosa, Costilla, and Saguache Counties suffered greatest monetary losses in the region from severe winter weather.
- Power outages and poor road conditions are likely impacts of severe winter storms.
- Vulnerable populations include the elderly, individuals without appropriate shelter, electricity-dependent persons, and outdoor workers.
- Related hazards: High Winds, Avalanche, Flooding.

4.2.12 Wildland Fires

Hazard/Problem Description

According to the 2018 Colorado Natural Hazards Mitigation Plan, a wildfire is an unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, and escaped prescribed fire projects:

- Wildland fire – fuel consists mainly of natural vegetation;
- Interface or intermix fire – urban/wildland fires that consist of vegetation and manmade fuel;
- Catastrophic fire – a very intense event that makes suppression very difficult and negatively impacts human values;
- Prescribed fire – Any fire ignited by management actions to meet specific objectives."[6]

Three factors that contribute to fire growth are fuel, topography, and weather. Fuel sources include dead tree needles, leaves, twigs, branches, dead standing trees, live trees, brush, and cured grasses. Light fuels such as grasses burn quickly and serve as a catalyst for the spread of fire. "Ladder fuels" can spread a ground

[6] Colorado Natural Hazards Mitigation Plan (2018), Colorado Division of Homeland Security and Emergency Management, p. 3-214

fire up through brush into trees, leading to a devastating crown fire in the upper canopy that cannot be controlled.

Topography, or an area's terrain and land slope, affects its susceptibility to wildfire spread. Due to the convection of heat, both fire intensity and rate of fire spread increases as slope increases. Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Winds are the most dangerous and unpredictable weather factor that affects fire behavior.

Past Occurrences

Grassland and forest fires occur throughout the state, including the San Luis Valley, and every county has some area determined at least a moderate risk. The traditional wildfire season runs from March through August, but wildfires and grass fires can occur any time of the year.

An analysis of historic fire records helps to define the area's fire season and patterns of fire occurrence over time and by jurisdiction. The most comprehensive fire data was available from the United States Department of Agriculture (USDA) Research Data Archive from 1992 to 2018. Data from the National Centers for Environmental Information (NCEI) from 1996 to March of 2022, as well as the counties' Community Wildfire Protection Plans (CWPP) were used for wildfire data in San Luis Valley. The HMPC also noted the increasing dangers for wildland fires becoming large urban conflagrations and noted two urban fires in Alamosa County in 2002 and 2018.

Saguache County had the most reported number of wildfires in the San Luis Valley Region and Costilla County experienced the least, as seen in Figure 4-20. It is important to note that not all fires go reported, therefore, the actual number of fires may be higher than displayed in the dataset. Figure 4-21 displays the breakdown of fires per county by year. This figure illustrates that Saguache County experienced around 120 wildfires in 2016 alone, which partly explains why the County has the greatest number of total wildfires (the County is also the largest in the Region). Figure 4-22 displays the temporal trend in frequency of wildfires since 1992. These figures indicate that, on average, the San Luis Valley Region is experiencing a general trend of increasing number of wildfire events and more acres are being burned annually in the region.

Figure 4-20 Number of Wildland Fires in San Luis Valley by County: 1997-2018

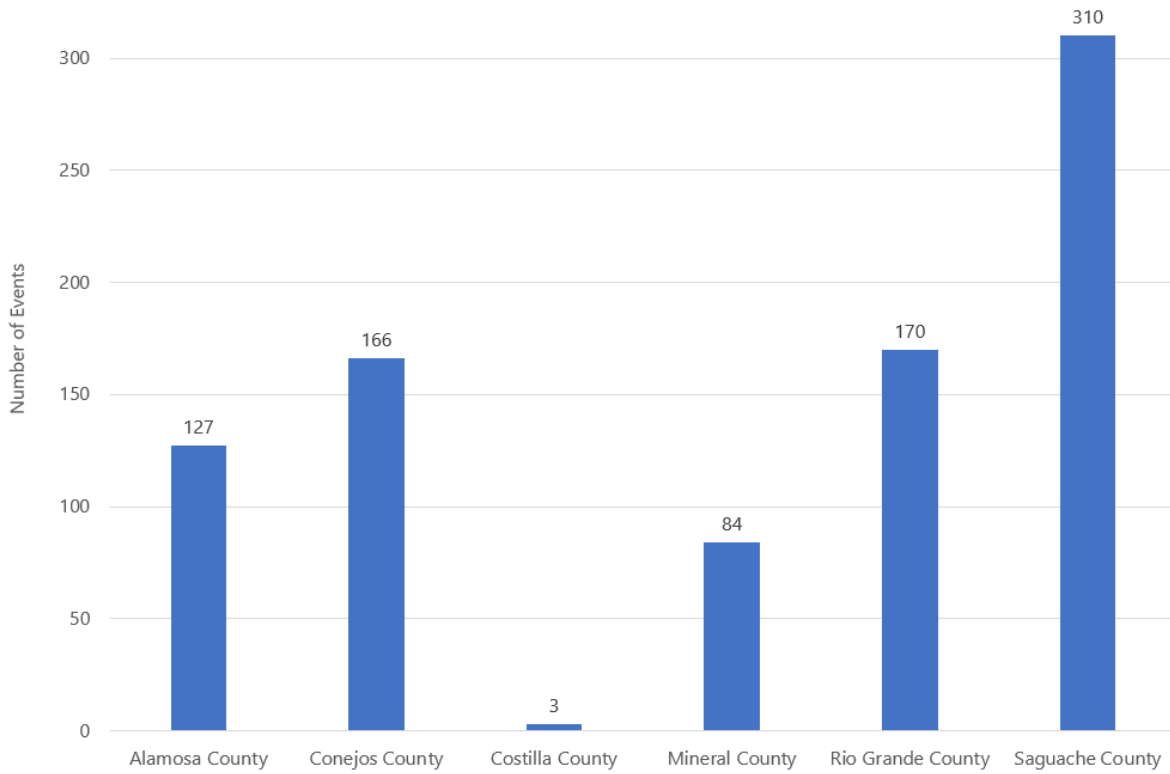


Figure by WSP, Date Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

Figure 4-21 Number of Wildland Fires in San Luis Valley by County and Year: 1997-2018

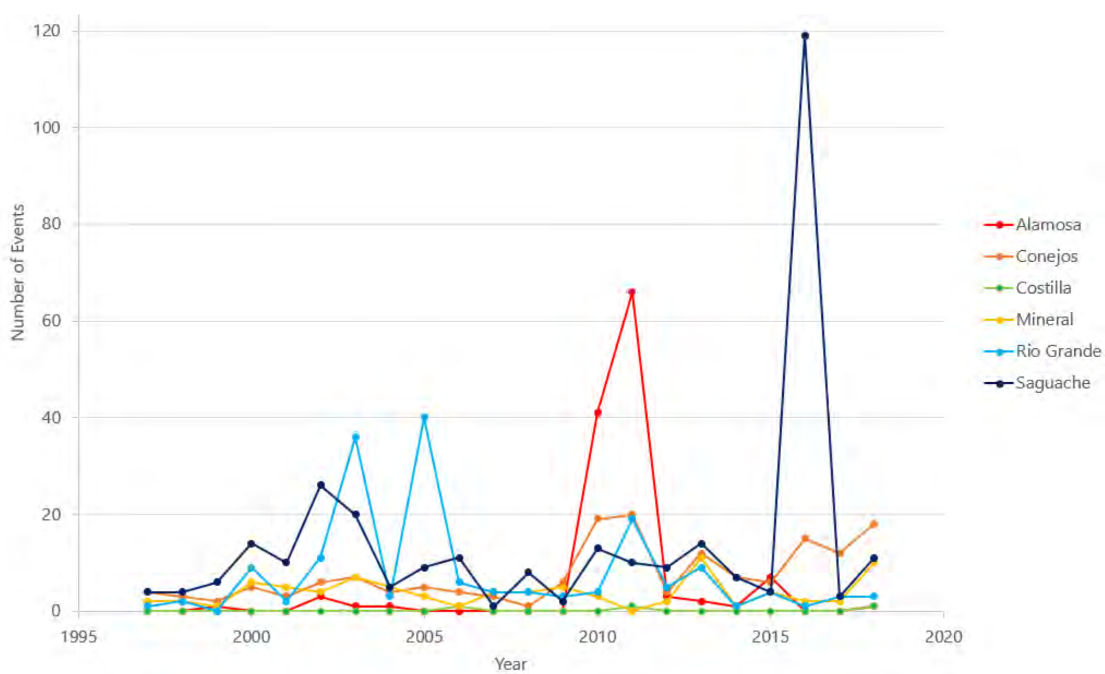


Figure by WSP, Date Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

Figure 4-22 Annual Trend of Wildland Fires in San Luis Valley by Year: 1997-2018

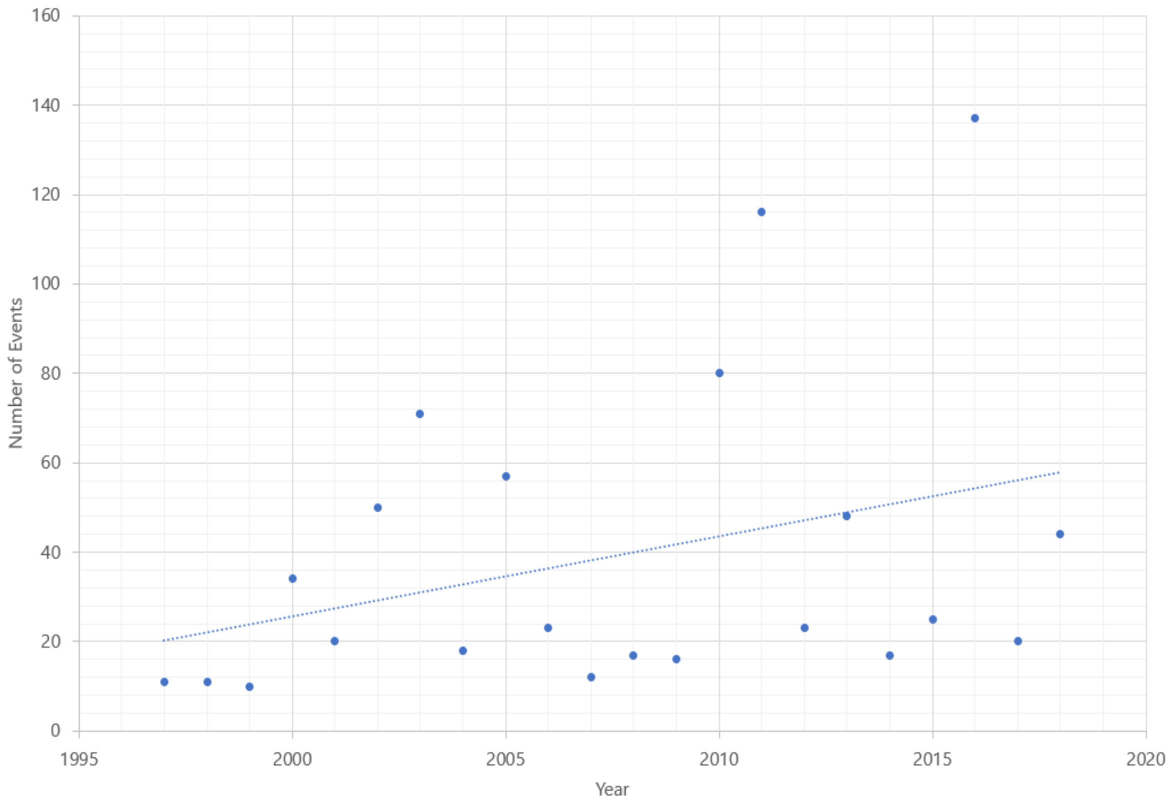


Figure by WSP, Date Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

The USDA dataset also reported on the total acres burned in San Luis Valley since 1997. The dataset reported that 196,156 total acres have been burned in San Luis Valley due to wildfires since 1997. Table 4-62 displays the total acres burned each year in the region. The Spring Creek Fire, which occurred in Costilla County, burned 107,995 acres in 2018 and the West Fork Fire in Mineral and Rio Grande Counties burned 58,570 in 2013. The entire West Fork Fire Complex burned a total of 109,000 acres across 3 large fires primarily on pubic lands managed by the Rio Grande and San Juan National Forests.

Figure 4-23 displays the total acres burned in each county since 1997.

Table 4-62 Total Acres Burned due to Wildfires by Year in San Luis Valley: 1997-2018

Year	Acres
1997	46
1998	7
1999	15
2000	68
2001	12
2002	9,703
2003	76
2004	5
2005	178
2006	14,073

Year	Acres
2007	55
2008	14
2009	41
2010	162
2011	810
2012	153
2013	62,435
2014	6
2015	60
2016	30
2017	50
2018	108,157

Source: USDA Forest Service Research Data Archive; https://www.fs.usda.gov/rds/archive/Catalog/RDS-2013-0009.5

Figure 4-23 Total Acres Burned due to Wildfires by County in San Luis Valley: 1997-2018

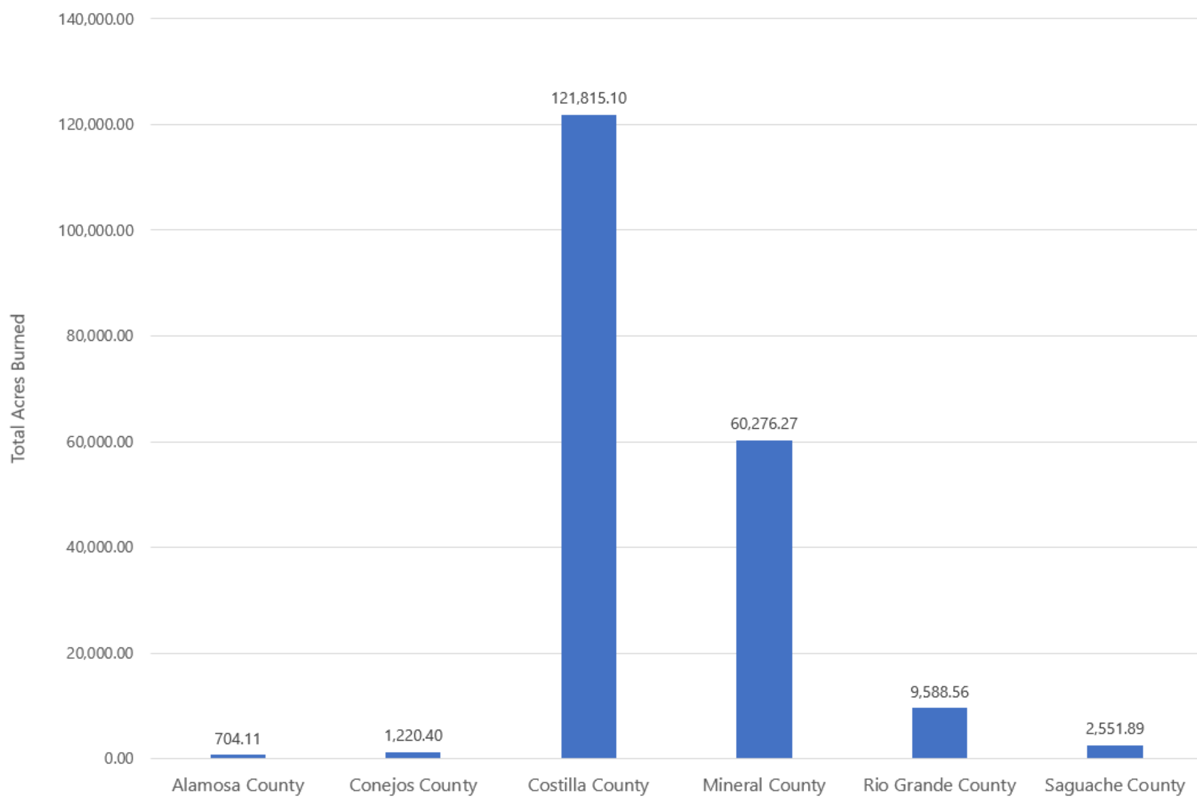


Table 4-63 Disaster Declarations from Fire

Year	County	Title	Disaster Number
2002	Alamosa, Conejos, Costilla, Mineral, Saguache, Rio Grande	Wildfires (Statewide)	1421
2002	Rio Grande	Million Fire	2428
2006	Costilla	Malo Vega Fire	2646

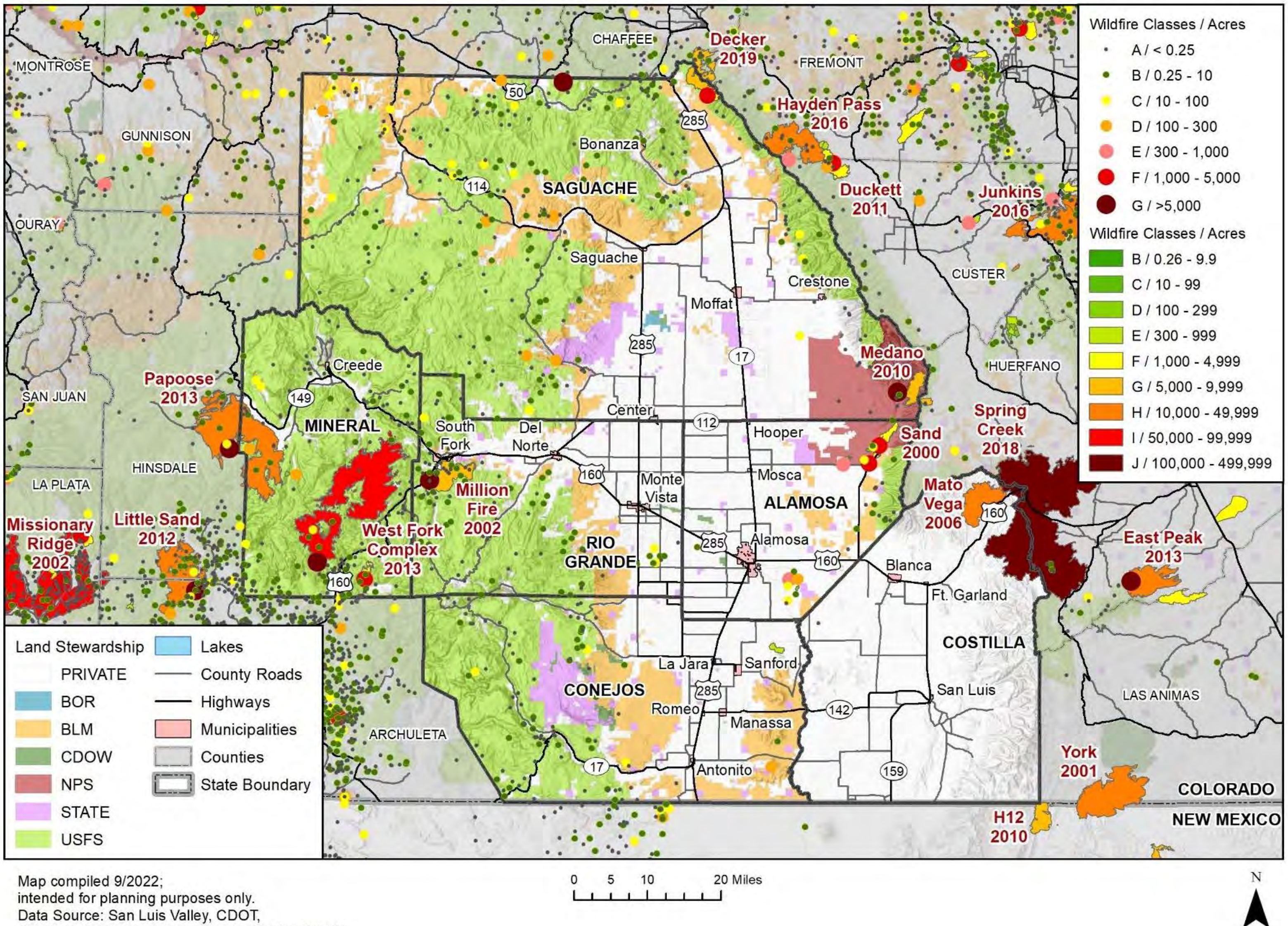
Year	County	Title	Disaster Number
2013	Mineral, Rio Grande	West Fork Fire Complex	5031
2018	Costilla	Spring Creek Fire	5246

Source: FEMA Disaster Declarations for States and Counties
https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties?msclkid=f75a651cb9ac11ec9aa0ba504a50ba22

Table 4-64 Significant Wildfire Events in San Luis Valley

Year	Fire Name	Location	Costs/Losses	Source
1997	Merry-Go-Round Fire	Saguache County	400 acres	Saguache County HMP
2000	Sand Dunes Fire	Alamosa County, Saguache County, Costilla County	8,500+ acres	Costilla County HMP
2002	Vulcan Fire	Saguache County	220 acres	Saguache County HMP
2002	Million Fire	Rio Grande County	9,346 acres, 11 structures	Colorado State HMP
2005	Buck Park #2 Fire	Saguache County	112 acres	Saguache County HMP
2005	Four Mile Fire	Saguache County	100 acres	Saguache County HMP
2006	Coolbroth Fire	Saguache County	250 acres	Saguache County HMP
2006	Hell's Gates Fire	Saguache County	250 acres	Saguache County HMP
2010	Mato Vega Fire	Costilla County	13,820 acres	Colorado State HMP
2013	Ox Cart Fire	Saguache County	1,152 acres	Colorado State HMP
2013	West Fork Fire Complex	Mineral County, Rio Grande County	110,405 acres $31,433,000 to contain	Colorado State HMP, Mineral County HMP, Rio Grande County HMP
2018	Spring Creek Fire	Costilla County	107,995 acres Estimated $32,000,000 to contain	USDA, NCEI
2019	Decker Fire	Saguache, Fremont, and Chaffee Counties	8,959 acres	HMPC

Figure 4-24 Significant Wildfire Events in San Luis Valley



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, National Interagency Fire Center (NIFC),
USGS: BLM, FS, FWS, NPS

Geographical Area Affected

As noted in the 2018 Colorado Natural Hazards Mitigation Plan, periodic and prolonged drought has resulted in extremely dry and volatile fuels and a corresponding upswing in large, erratic wildfires, on grasslands as well as in the forests. Wildfires occur naturally (often through lightning strikes) and from human causes, including illegal outdoor fires, sparks from trains, discarded cigarettes, and outdoor cooking grills. Wildfires can occur in all counties in the San Luis Valley, and almost the entirety of the planning area has some level of risk to wildfires. Therefore, the geographic extent of wildfires in San Luis Valley is ranked as **extensive**.

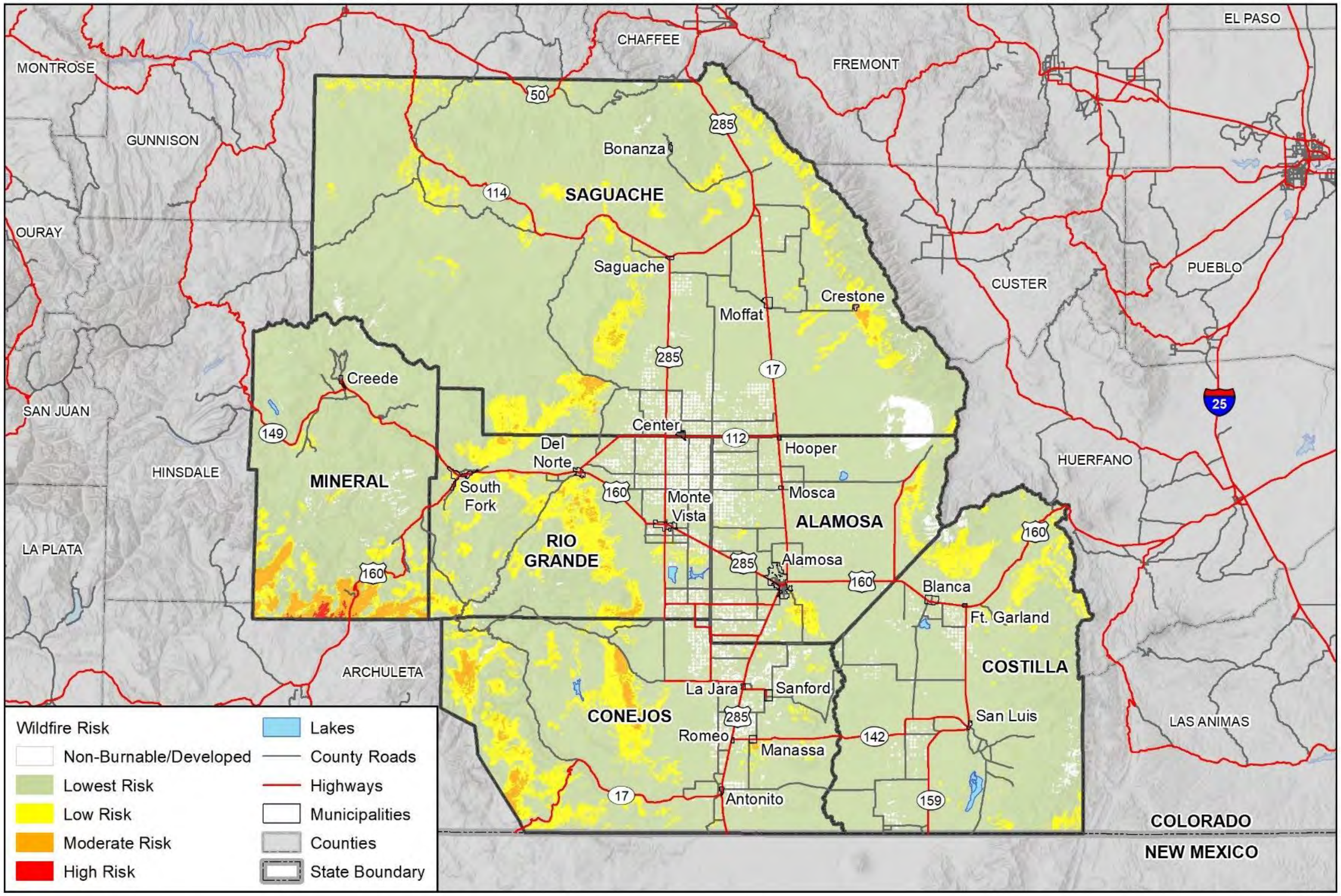
San Luis Valley has a diverse range of vegetation types from the dense cottonwoods in the riparian edge of the Rio Grande River to the desert shrubs on the valley floor. Vegetation on the slopes of the Sangre de Cristo Mountains includes high- elevation cold desert shrubs, pinyon-juniper, Ponderosa Pine, Douglas-fir, Aspen, Engelmann Spruce, and Alpine meadows. The Ponderosa Pine and Douglas-fir forests are typically at higher risk for dense fire susceptibility.

Much of the wildfire risk in the Valley is derived from agricultural ditches and overgrown grasses and weeds in the vicinity of these ditches. Most of the wildland fires in the Valley occur when controlled burns ignite their immediate surroundings. Spring ditch burning season typically results in escaped wildfires.

Figure 4-25 below shows the overall risk composite ranking for San Luis Valley. The map indicates that the wildfire hazard in San Luis Valley is elevated near the southwestern portion of the region, along the foothills of the San Juan Mountains. The wildfire risk is predominantly associated with wildland-urban interface (WUI) areas (areas where development occurs within or immediately adjacent to wildlands, near fire-prone trees, brush, and/or other vegetation).

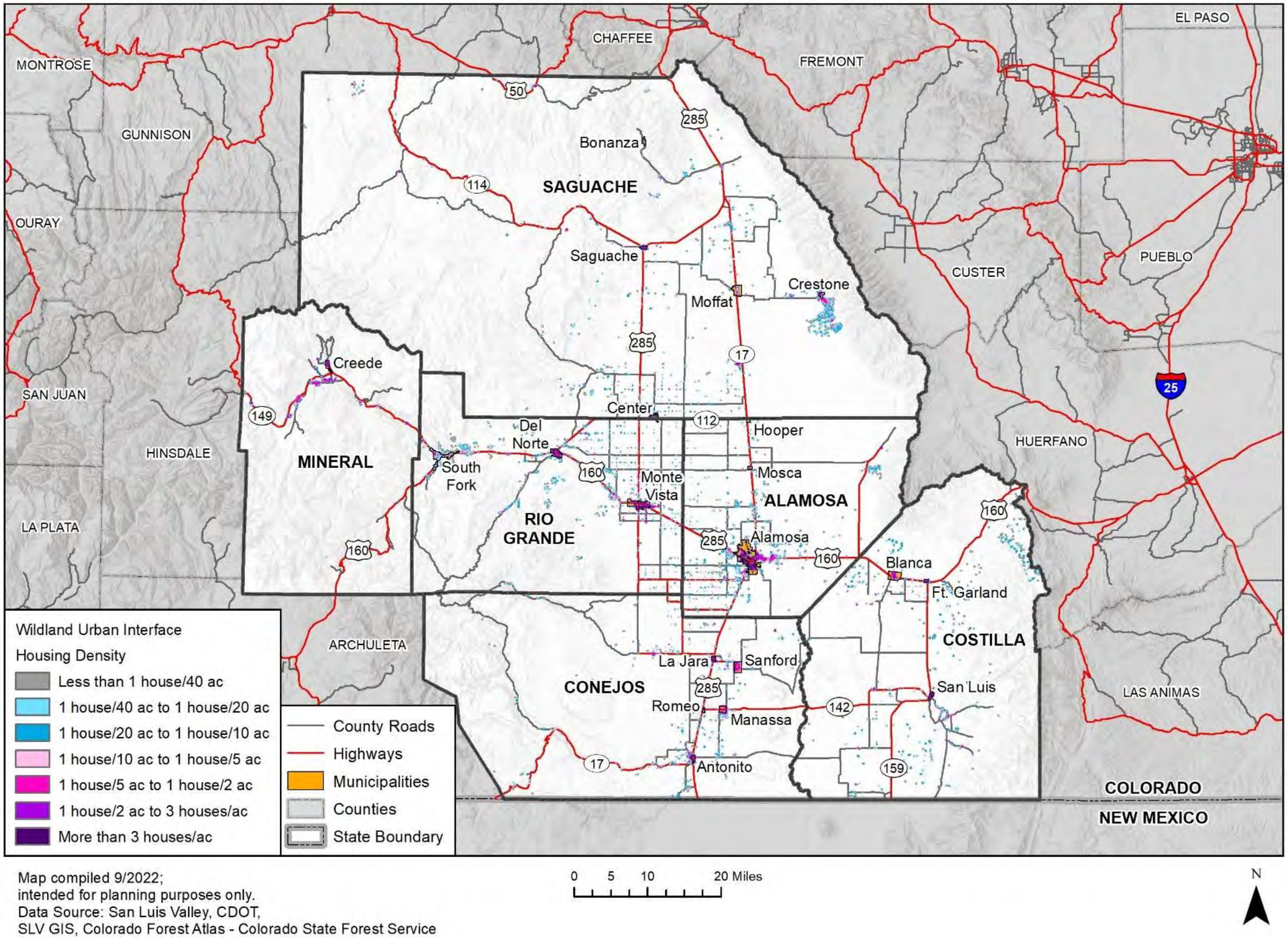
Figure 4-25 displays the WUI areas in San Luis Valley, predominantly located near large cities in San Luis Valley such as the City of Alamosa. displays the WUI risk in these counties. A similar pattern is evident between these two figures, with greatest WUI risk occurring in large cities, particularly the Cities of Alamosa and Creede.

Figure 4-25 Wildfire Risk in San Luis Valley



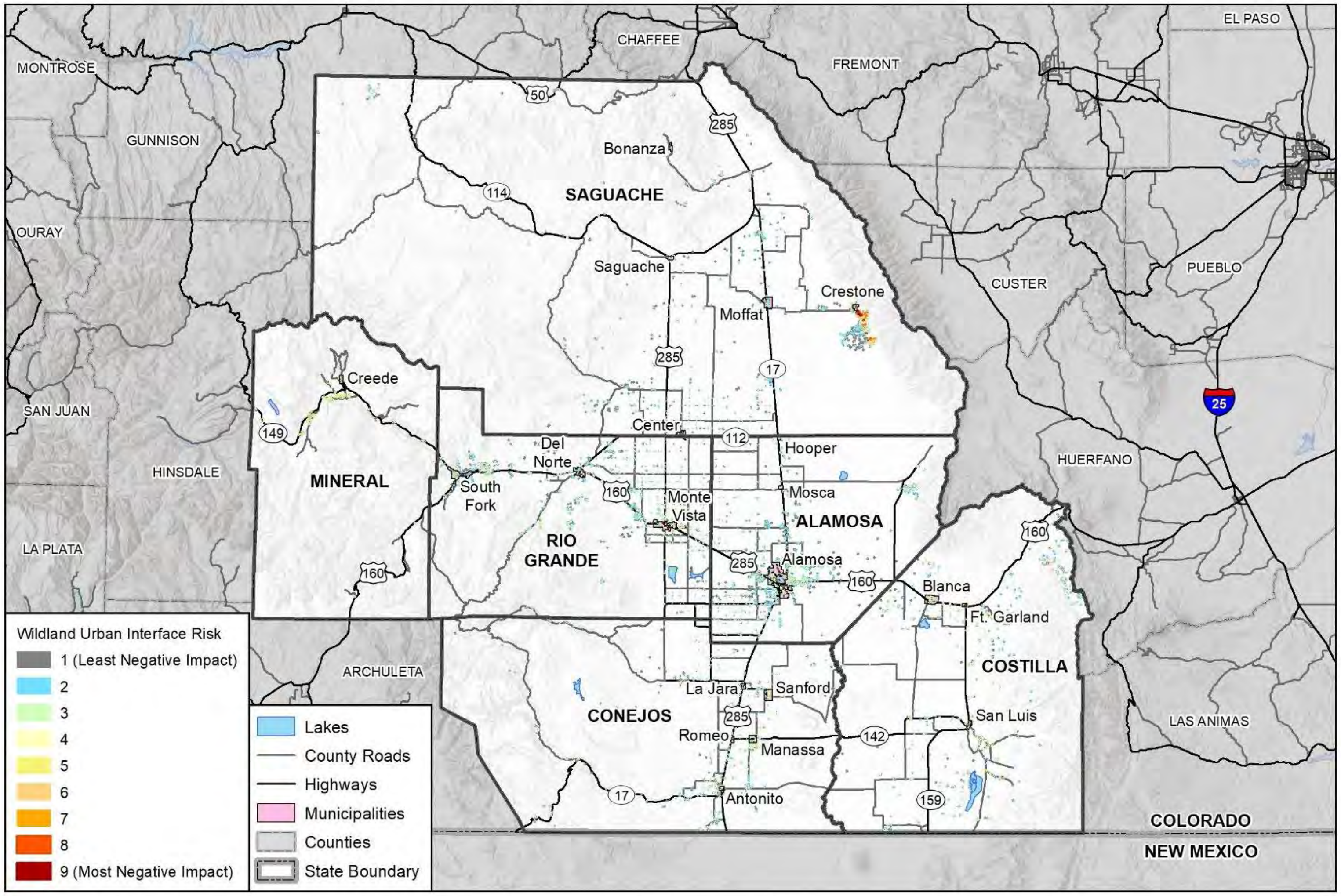
Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, Colorado Forest Atlas - Colorado State Forest Service

Figure 4-26 San Luis Valley Wildland-Urban Interface



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, Colorado Forest Atlas - Colorado State Forest Service

Figure 4-27 San Luis Valley Wildland-Urban Interface Risk



Map compiled 9/2022;
intended for planning purposes only.
Data Source: San Luis Valley, CDOT,
SLV GIS, Colorado Forest Atlas - Colorado State Forest Service

Magnitude/Severity

The growth and behavior of wildfires and grass fires are influenced by topography, fuel, and weather. Additionally, other hazards can trigger wildfires, such as lightning or power lines brought down by high winds. Drought conditions increase wildfire potential by decreasing fuel moisture. When conditions combine to cause a fast-moving wildfire or grassfire, potential impacts include destruction of structures, vehicles, signage, and other property, as well as smoke damage to buildings.

Wildfires and grass fires can also impact utilities, watersheds, natural and cultural resources, range and crop lands, and local economies (e.g., fire expenditures/loss of tourism). Smoke and air pollution from wildfires can be a severe health hazard. Other secondary impacts include future flooding and erosion during heavy rains. The severity of the wildfire/grassland hazard in San Luis Valley is rated catastrophic, meaning that potential widespread impact such as injuries and significant property damages are possible, with significant disruptions to infrastructure and critical services.

Frequency/Likelihood of Occurrence

The location of a fire is almost impossible to predict, since the factors which contribute to a fire are highly variable, including weather conditions, drought cycles, fuel-loading, lightning strikes, and human activities.

Chances for wildfires increase with periods of drought, high winds, and extreme heat conditions. Much of the wildfire risk in the San Luis Valley is associated with agricultural ditches and overgrown grasses and weeds (spring ditch burning season) and other controlled burns can ignite their immediate surroundings and result in escaped wildfires. In San Luis Valley, Saguache County has experienced the greatest frequency of wildfire events, but Costilla County has experienced the greatest magnitude.

Considering the trend of increasing frequency and magnitude of wildfire events over the past several decades, the Planning Team has rated the probability of future fire events in San Luis Valley as highly likely, with a recurrence interval of once every year somewhere in the Region.

Climate Change Considerations

According to the 2018 Colorado State Hazard Mitigation Plan, Wildfire intensity is projected to increase due to additional dry vegetation that can fuel wildfires. Extent is projected to increase. Total area burned per year is projected to increase substantially into the 21st century in the Rocky Mountain West and Colorado. An increase in droughts is also predicted to increase the frequency of wildfires, and the length of the fire season is expected to increase by several weeks.

Vulnerability Assessment

People

The most exposed population are those that are living within the WUI. The WUI in San Luis Valley is generally highest in the region's more populated municipalities/towns. More populated areas, generally, have more property and, thus, a greater degree of property exposure to wildfire.

Smoke and air pollution from wildfires, even those burning many hundreds of miles away, can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gasses (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility. A study from the University of California San Diego found that wildfire smoke is more harmful to respiratory health in humans than pollution from cars (NPR 2021). Studies have also shown an increase in ambulance calls, hospital visits and an increase of people experiencing respiratory or cardiac emergencies (NPR 2020).

Wildfires can 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. Exposure exists to response personnel performing routine duties when an event occurs; fire-related duties may cause significant danger to response personnel including evacuation, suppression, law enforcement, and damage assessments.

The table below reports population at risk to wildfire by County and Jurisdiction. The methodology for analysis reported in this table consisted of using Microsoft Building Footprints, a dataset containing information on location and extent of buildings, to determine the quantity of structures and total population in San Luis Valley located in areas of risk to wildfire. The analysis found 57,930 people living in areas at risk to wildfire in the San Luis Valley Region. Rio Grande has the greatest number of people at risk in the Region.

Property

Buildings, vehicles, signage, and/or any unsecured property may be affected during an event. Property may be destroyed, have significant structural damage, or be affected by smoke. State historical, recreational, natural, and wildlife properties/facilities are also at risk. A structure analysis was conducted to determine the total number of structures and total value of structures at risk to wildfire by county and jurisdiction in San Luis Valley. As stated above, the methodology for analysis consisted of using Microsoft Building Footprints, a dataset containing information on location and extent of buildings, to determine the quantity of structures in San Luis Valley located in areas of risk to wildfire. The table below is a summary of results from the structure analysis. Based on the analysis, Saguache County has the greatest number of structures at risk to wildfire in San Luis Valley.

Table 4-65 Structures at Risk to Wildfire by County and Jurisdiction

County	Jurisdiction	Structure Count Moderate	Structure Count Lowest	Structure Count Low	Total Structure Count	Estimated Structure Value	Estimated Content	Total Value	Estimated Population
Alamosa	Alamosa	-	422	-	422	$76,443,732	$38,221,866	$114,665,598	1,022
	Hooper	-	25	-	25	$4,528,657	$2,264,329	$6,792,986	61
	Mosca	-	14	-	14	$2,536,048	$1,268,024	$3,804,072	34
	Alamosa County	30	4,277	116	4,423	$801,210,017	$400,605,009	$1,201,815,026	10,711
	Total	**30**	**4,738**	**116**	**4,884**	**$884,718,454**	**$442,359,227**	**$1,327,077,682**	**11,828**
Conejos	Antonito	-	37	-	37	$5,008,661	$2,504,331	$7,512,992	95
	La Jara	-	12	-	12	$1,624,431	$812,215	$2,436,646	31
	Manassa	-	110	5	115	$15,567,460	$7,783,730	$23,351,190	294
	Romeo	-	13	-	13	$1,759,800	$879,900	$2,639,700	33
	Sanford	-	123	-	123	$16,650,414	$8,325,207	$24,975,621	314
	Conejos County	48	3,392	245	3,685	$498,835,574	$249,417,787	$748,253,362	9,415
	Total	**48**	**3,687**	**250**	**3,985**	**$539,446,340**	**$269,723,170**	**$809,169,510**	**10,181**
Costilla	Blanca	-	48	-	48	$5,913,182	$2,956,591	$8,869,774	105
	Ft. Garland	-	29	-	29	$3,572,548	$1,786,274	$5,358,822	64
	San Luis	-	54	-	54	$6,652,330	$3,326,165	$9,978,495	118
	Costilla County	-	2,685	255	2,940	$362,182,424	$181,091,212	$543,273,637	6,447
	Total	**0**	**2,816**	**255**	**3,071**	**$378,320,485**	**$189,160,242**	**$567,480,727**	**6,734**
Mineral	Creede	-	221	5	226	$45,698,513	$22,849,256	$68,547,769	461
	Mineral County	42	1,512	65	1,619	$327,371,205	$163,685,602	$491,056,807	3,303
	Total	**42**	**1,733**	**70**	**1,845**	**$373,069,718**	**$186,534,859**	**$559,604,577**	**3,764**

County	Jurisdiction	Structure Count Moderate	Structure Count Lowest	Structure Count Low	Total Structure Count	Estimated Structure Value	Estimated Content	Total Value	Estimated Population
Rio Grande	Center	-	1	-	1	$165,738	$82,869	$248,608	2
	Del Norte	11	44	11	66	$10,938,737	$5,469,369	$16,408,106	157
	Monte Vista	-	130	6	136	$22,540,428	$11,270,214	$33,810,643	324
	South Fork	1	396	80	477	$79,057,238	$39,528,619	$118,585,857	1,137
	Rio Grande County	33	4,717	495	5,245	$869,298,141	$434,649,070	$1,303,947,211	12,503
	Total	**45**	**5,288**	**592**	**5,925**	**$982,000,283**	**$491,000,141**	**$1,473,000,424**	**14,124**
Saguache	Bonanza	-	47	-	47	$6,251,376	$3,125,688	$9,377,064	105
	Center	-	24	-	24	$3,192,192	$1,596,096	$4,788,288	54
	Crestone	43	41	46	130	$17,291,040	$8,645,520	$25,936,560	290
	Moffat	-	91	-	91	$12,103,728	$6,051,864	$18,155,592	203
	Saguache	-	41	1	42	$5,586,336	$2,793,168	$8,379,504	94
	Saguache County	339	3,763	624	4,726	$628,595,808	$314,297,904	$942,893,712	10,553
	Total	**382**	**4,007**	**671**	**5,060**	**$673,020,480**	**$336,510,240**	**$1,009,530,720**	**11,299**
	Grand Total	**547**	**22,269**	**1,954**	**24,770**	**$3,830,575,760**	**$1,915,287,880**	**$5,745,863,641**	**57,930**

Source: Microsoft Footprints 2021, Colorado Forest Atlas, Hazus, WSP GIS Analysis

Critical Facilities & Infrastructure

Buildings, equipment, vehicles, and communications and utility infrastructure are exposed and lost to wildfires every year in Colorado. Potential impact to water treatment facilities, government buildings, public safety facilities and equipment, and healthcare services. Scour on bridge pilings may result in bridge and road closures. A critical facilities and infrastructure analysis was conducted to determine the total number and types of critical facilities vulnerable to wildfire risk. The table below displays the results of the analysis. Most of the structures in San Luis Valley are at the lowest risk to wildfire. Communications and transportation facilities are the most at-risk structures to wildfire in San Luis Valley.

Table 4-66 Critical Facilities and Infrastructure at Risk to Wildfire by County and Jurisdiction

Jurisdiction	Risk	Communications	Energy	Food, Water, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Total
Mineral	Moderate	-	-	-	-	-	-	1	**1**
Rio Grande	Moderate	1	-	-	-	-	-	-	**1**
Saguache	Moderate	1	-	-	-	-	1	-	**2**
Total Moderate		**2**	**0**	**0**	**0**	**0**	**1**	**1**	**4**
Conejos	Low	-	-	-	-	-	1	4	**5**
Mineral	Low	-	-	-	-	-	-	1	**1**
Rio Grande	Low	-	1	-	-	-	-	1	**2**
Saguache	Low	1	-	-	-	-	-	4	**5**
Total Low		**1**	**1**	**0**	**0**	**0**	**1**	**10**	**13**
Alamosa	Lowest	24	12	-	4	8	7	6	**61**
Conejos	Lowest	14	6	-	2	2	6	14	**44**
Costilla	Lowest	17	2	1	2	1	4	29	**56**
Mineral	Lowest	13	1	1	1	-	5	13	**34**
Rio Grande	Lowest	31	12	3	5	6	7	21	**85**
Saguache	Lowest	32	9	-	2	-	8	19	**70**
Total Lowest		**131**	**42**	**5**	**16**	**17**	**37**	**102**	**350**
Grand Total		**134**	**43**	**5**	**16**	**17**	**39**	**113**	

Source: Microsoft Footprints 2021, Colorado Forest Atlas, Hazus, WSP GIS Analysis

Economy

The at-risk structure analysis found that $5,745,863,641 in structure value is exposed to wildfire risk in San Luis Valley. Potential loss of facilities or infrastructure function or accessibility and uninsured damages. Potential impact to tourism and land development activities depending on severity of the fire season and location of fire events. Depending on the nature of the area where fire occurs, many home-based businesses will be impacted due to evacuation, lack of utility service, or through destruction of property.

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

Table 4-67 displays the results of the FACE tool by County for highest population growth rate and most severe climate in the Region. Based on these results, given a more severe climate and high growth in population, Rio Grande, Saguache, and Alamosa Counties are likely to experience significant losses due to wildfire events in the future. The FACE tool reported an estimated total of $959,000 in annual losses given severe climate conditions and high population growth rate in the San Luis Valley Region overall.

Table 4-67 Future Avoided Cost Explorer: Wildfire

County	Estimated Total Annual Losses	Estimated Losses Per Person	Change from Current
Alamosa	$200,000	<$10	5.0x
Conejos	$130,000	$10	2.1x
Costilla	$99,000	$20	2.5x
Mineral	$80,000	$70	2.0x
Rio Grande	$230,000	$20	2.3x
Saguache	$220,000	$30	2.3x
Total	$959,000	-	-

Source: Colorado Water Conservation Board, https://cwcb.colorado.gov/FACE

Historical, Environmental, and Cultural Resources

Significant impact related to loss of forest or grasslands, impacts to water quality, erosion, and sedimentation may affect critical infrastructure and natural waterways. Loss of ground vegetation may encourage landslides, mudslides, or other geologic movement of land. Dead or damaged trees are at risk of falling. An annual average of 160 square miles of state and private land is burned.

Development Trends

Development and population growth can contribute to increased exposure of people and property to hazards. Understanding changes in hazard exposure over time is an important element of comprehensive hazard mitigation planning. In the context of wildfire, increased population growth and development along the WUI has increased human exposure to wildfire in several Colorado communities. Local jurisdictions, with the support and active participation by state and federal partners, address wildfire vulnerability through emergency response and mitigation. Mechanisms for emergency response are well established but increasingly stretched and expensive as more homes are built in the WUI and need to be protected. Mitigation programs and resources are existing, but often are not appropriately resourced, yet remain a focus of discussion in many communities as they look for ways to diminish the danger and cost of wildfire.

Risk Summary

Table 4-68 Wildland Fires Hazard Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
San Luis Valley	Extensive	Highly Likely	Catastrophic	High
Alamosa County	Extensive	Highly Likely	Critical	Medium
Conejos County	Extensive	Highly Likely	Critical	Medium
Costilla County	Extensive	Likely	Catastrophic	High
Mineral County	Extensive	Highly Likely	Catastrophic	High
Rio Grande County	Extensive	Highly Likely	Catastrophic	High
Saguache County	Extensive	Highly Likely	Catastrophic	High

- The overall significance of this hazard to San Luis Valley is **high**
- Five Disaster Declarations due to Wildfire in San Luis Valley
- USDA dataset reported 860 wildfire events impacting San Luis Valley from 1997 to 2018 with 196,156 total acres burned
- Greatest number of wildfires in Saguache County and greatest total acres burned in Costilla County
- Increasing trend in the total number of fires and the total acres burned from fires annually in San Luis Valley
- Future growth into interface areas could increase wildfire risk
- Structure analysis found 57,930 people in San Luis Valley living in areas vulnerable to wildfire, with the greatest concentration of vulnerable people in Rio Grande County
- The at-risk structure analysis also found that $5,745,863,641 in structure value is at risk to wildfire in San Luis Valley
- Climate change could increase both the likelihood and severity of wildfires
- The FACE tool reported an estimated $959,000 in future annual losses in San Luis Valley from wildfires with highest growth rate and most severe climate considerations
- Related hazards: high wind, lightning, drought, flood, landslide

4.2.13 Cyber Attack

Hazard/Problem Description

The 2018 Colorado State Hazard Mitigation Plan defines cyber-attacks as “deliberate exploitation of computer systems, technology-dependent enterprises, and networks.” Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that, “cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated,” with implications for private- and public sector networks. Cyber threats can take many forms, including:

- **Phishing attacks:** Phishing attacks are fraudulent communications that appear to come from legitimate sources. Phishing attacks typically come through email but may come through text messages as well. Phishing may also be considered a type of social engineering meant to exploit employees into paying fake invoices, providing passwords, or sending sensitive information.
- **Malware attacks:** Malware is malicious code that may infect a computer system. Malware typically gains a foothold when a user visits an unsafe site, downloads untrusted software, or may be downloaded in conjunction with a phishing attack. Malware can remain undetected for years and spread across an entire network.

- **Ransomware:** Ransomware typically blocks access to a jurisdiction's/agency's/ business' data by encrypting it. Perpetrators will ask for a ransom to provide the security key and decrypt the data, although many ransomware victims never get their data back even after paying the ransom.
- **Distributed Denial of Service (DDoS) attack:** Perhaps the most common type of cyber-attack, a DDoS attack seeks to overwhelm a network and causes it to either be inaccessible or shut down. A DDoS typically uses other infected systems and internet connected devices to "request" information from a specific network or server that is not configured or powerful enough to handle the traffic.
- **Data breach:** Hackers gaining access to large amounts of personal, sensitive, or confidential information has become increasingly common in recent years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.
- **Critical Infrastructure/SCADA System attack:** There have been recent critical infrastructure Supervisory Control and Data Acquisition (SCADA) system attacks aimed at taking down lifelines such as power plants and wastewater facilities. These attacks typically combine a form of phishing, malware, or other social engineering mechanisms to gain access to the system.

The 2018 Colorado State Hazard Mitigation Plan concludes: "This is a newly developing threat, so as more resources are devoted to countering the hazard, the risk of a disruption would hopefully decrease. Mitigation opportunities for this hazard include continued diligence of the state's Office of Information Technology (OIT), as well as for other government and private sector entities to continue to monitor, block, and report cyber-attacks, and continually assess the vulnerability of systems."

Past Occurrences

According to the FBI's 2021 Internet Crime Report, the FBI received an average of 552,000 cyber-crime complaints per year over the last five years. The Crime Report also noted a trend of increasing cyber-crime complaints and losses each year. Nationwide losses in 2021 alone exceeded $6.9 billion, a 392% increase since 2017. Over the past five years, nationwide cyber-crime complaints totaled to 2.76 million, with $18.7 billion in losses. Colorado ranked 14th among states in losses, with $130,631,286 in total losses, and 17th in number of victims, with 10,537 victims of cyber-crime.

Ransomware is one of the most common types of cyber-attack. These attacks accounted for 3,729 complaints and over $49M in reported losses in 2021. Since many attacks go unreported, the actual numbers are likely higher. The cyber-security firm Symantec reported in 2016 that one in every 131 emails contained malware, and the company's software blocked an average of 229,000 web attacks every day. And according to a 2016 study by Kaspersky Lab, roughly one in five ransomware victims who pay their attackers never recover their data. The FBI Internet Crime Report predicts that ransomware will remain popular because of the increased use of remote school and work due to the COVID-19 pandemic.

In 2018, the Colorado Department of Transportation (CDOT) was impacted by a SamSam ransomware attack resulting in approximately a million dollars in loss. In 2020 both the town of Erie and the town of Lafayette Colorado fell victim to different types of cyber-attacks. The town of Erie lost more than a million dollars during a business email account (BEA) scam. Layfette lost approximately $45,000 resulting from a ransomware attack.

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.

The Privacy Rights Clearinghouse, a non-profit organization based in San Diego, maintains a timeline of 9,741 data breach events resulting from computer hacking incidents in the United States from 2005-2021. The database lists 172 data breaches against systems located in Colorado, totaling over 5,812,743 impacted records; it is difficult to know how many of those affected residents in the San Luis Valley. Attacks happening outside of the state can also impact local businesses, personal identifiable information, and credit card information. Table 4-69 shows several of the most significant cyber-attacks in Colorado in recent years. The data aims to provide a general understanding of the impacts from cyber-attacks by compiling an up-to-date list of incidents but is limited by availability of data: "this is an incomplete look at the true scope of the problem due in part to varying state laws."

Table 4-69 Major Cyber Attacks Impacting Colorado (100,000+ Records), 2005-2021

Date Reported	Target	Organization Type	Total Records	Description
7/9/2008	Division of Motor Vehicles Colorado	Government	3,400,000	The DMV failed to properly limit access to its database.
3/29/2012	Department of Child Support Services, IBM, Iron Mountain, Inc.	Government	800,000	Several computers being shipped were lost.
12/3/2010	Mesa County, Western Colorado Drug Task Force	Government	200,000	Sensitive information was accidentally posted in a place that was publicly accessible on the Internet.
4/22/2008	College Invest	Non-government Organization	200,000	Customers had personal information stored on a computer hard drive that disappeared during a move.
6/11/2006	Denver Election Commission	Government	150,000	Records containing personal information are missing at city election offices.
7/22/2010	Colorado Department of Health Care Policy and Financing	Government	105,470	A hard drive containing personal information was stolen.
7/9/2010	Governor's Office of Information Technology	Medical	105,470	Personal records were stolen.

Source: The Privacy Rights Clearinghouse

The Privacy Rights Clearinghouse reported one event that occurred in San Luis Valley. The report was documented on June 11, 2006. The event took place in the City of Alamosa when a laptop computer stolen from a locked closet at Adams State College contained personally identifiable data belonging to 184 high school students who participated in the college's Upward Bound program over the last four years. The HMPC noted that hospitals have been the targets of cyber-attacks, as well as reports of scammers targeting the elderly populations in the area. The HMPC also reported that Conejos County has experienced ransomware attacks and warnings are issued nearly daily on some sort of cyber incident.

Geographical Area Affected

Cyber-attacks can and have occurred in every location regardless of geography, demographics, and security posture. Anyone with information online is vulnerable to a cyber-attack. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the state can still impact people, businesses, and institutions within the Region. All servers in San Luis Valley are potentially vulnerable to cyber-attacks. Businesses, industry, and even individuals are also susceptible to cyber-attacks; therefore, geographical extent of cyber-attack is ranked as **significant**.

Magnitude/Severity

There is no universally accepted scale to explain the severity of cyber-attacks. The strength of a DDoS attack is often explained in terms of a data transmission rate. One of the largest DDoS disruptions ever, known as the Dyn Attack which occurred on October 21, 2016, peaked at 1.2 terabytes per second and impacted some of the internet's most popular sites to include Amazon, Netflix, PayPal, Twitter, and several news organizations.

Data breaches are often described in terms of the number of records or identities exposed. The largest data breach ever reported occurred in August 2013, when hackers gained access to all three billion Yahoo accounts. The hacking incidents associated with Colorado in the Privacy Rights Clearinghouse database are of a smaller scale, ranging from just 32 records to approximately 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 cyber-security firm Emsisoft estimates the average successful ransomware attack costs $81 million and can take 287 days to recover from. Due to the potential of significant financial and data loss, cyber-attack in San Luis Valley is ranked as **critical**.

Frequency/Likelihood of Occurrence

Small-scale cyber-attacks such as DDoS attacks occur daily, but most have negligible impacts at the local or regional level. Data breaches are also extremely common, but again most have only minor impacts on government services. Additionally, the FBI Internet Crime Report 2021 found that there is a trend of increasing cyber-attacks over the past 5 years. These trends are shown in Figure 4-28.

Figure 4-28 Trends of the Frequency of Cyber-attacks, 2016-2021

Source: The FBI Internet Crime Report 2021

Perhaps of greatest concern to San Luis Valley are ransomware attacks, which are becoming increasingly common. The possibility of a larger disruption affecting systems within the Region 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 Region cannot be ruled out. Due to the difficulty in predicting frequency of cyber-attack, but the general trend in increasing cases, cyber-attack frequency is ranked as likely.

Climate Change Considerations

While climate change has not been found to have a direct impact on cyber-attacks, modern solutions to combat climate change, such as the production of electric vehicles and solar panels, are vulnerable to cyber-attacks. The increase of technologies to address climate change paired with inadequate cyber-security could pose a major economic and social threat. An example of this occurred in 2020 when a large system management organization called SolarWinds was the target of the hacking group Nobelium, resulting in $90 million in losses.

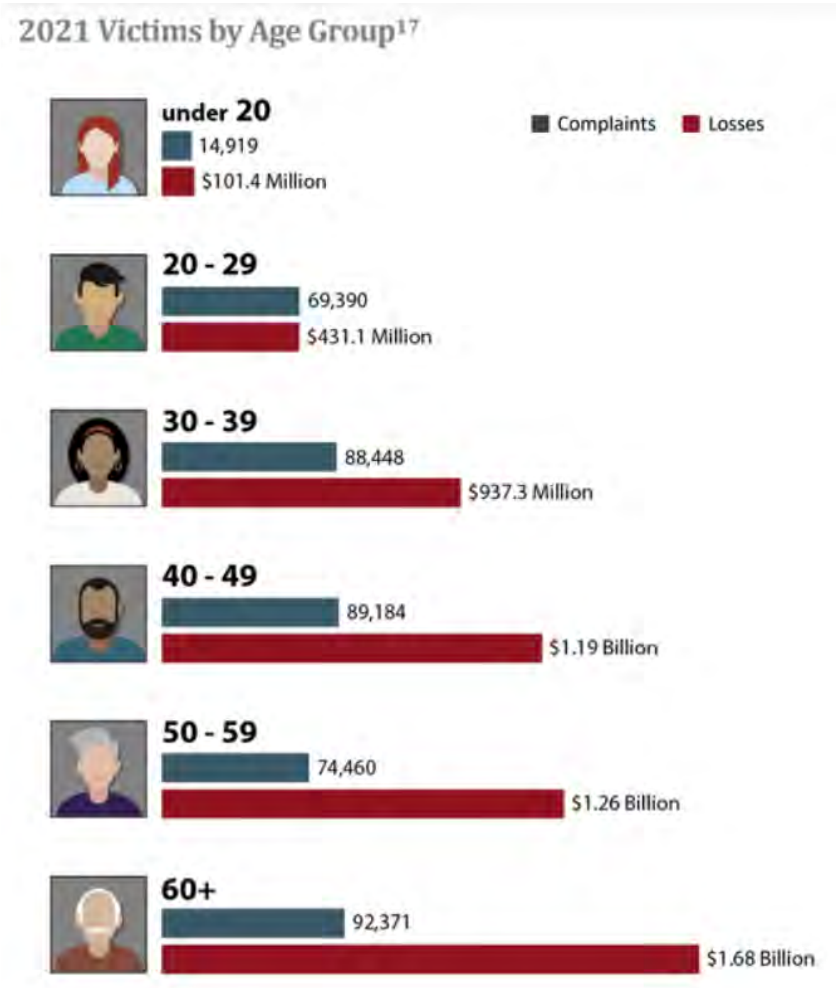
Vulnerability Assessment

People

Injuries or fatalities from cyber-attacks would generally only be possible from a major cyber terrorist attack against critical infrastructure. More likely impacts to the public are financial losses and an inability to access systems such as public websites and permitting sites. Indirect impacts could include interruptions to traffic control systems or other infrastructure.

The FBI Internet Crime Reports on the victims of cyber-attack by age group. While the number of cyber-attack complaints is comparable across age groups, the losses increase significantly as the age group increases, with individuals 60 years and older experiencing greatest losses. This is likely due to seniors being less aware of cyberthreats, lack the tools to identify cyberthreats, and "Grandparent Scams", which is a cyber-attack where criminals impersonate a loved one in need, such as a grandchild, and ask for money. Figure 4-29 displays the breakdown of victims by age group in 2021.

Figure 4-29 Cyber-attack Victims by Age Group in 2021



Source: The FBI Internet Crime Report 2021

Property

Most cyber-attacks affect only data and computer systems and have minimal impact on general property. However, sophisticated attacks have occurred against the SCADA systems of critical infrastructure, which could potentially result in system failures on a scale equal to 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.

Critical Facilities & Infrastructure

The delivery of services can be impacted since governments rely to a great extent upon electronic delivery of services. Most agencies rely on server backups, electronic backups, and remote options for Continuity of Operations/Continuity of Government. Access to documents on the network, OneDrive access, and other operations that require collaboration across the County will be significantly impacted.

Cyber-attacks can interfere with emergency response communications, access to mobile data terminals, and access to critical pre-plans and response documents. According to the Cyber & Infrastructure Security

Agency, cyber risks to 9-1-1 systems can have "severe impacts, including loss of life or property; job disruption for affected network users; and financial costs for the misuse of data and subsequent resolution." CISA also compiled a recent list of attacks on 9-1-1 systems including a DDoS in Arizona, unauthorized access with stolen credentials in Canada, a network outage in New York, and a ransomware attack in Baltimore.

Public confidence in the government will likely suffer if systems such as permitting, DMV, voting, or public websites are down for a prolonged amount of time. An attack could raise questions regarding the security of using electronic systems for government services.

Economy

Data breaches and subsequent identity thefts can have huge impacts on the public. The Internet Crime Complaint Center (IC3) estimates that identity theft alone resulted in $2.7 billion in losses to businesses and $149 million in losses to individuals. The FBI Internet Crime Report 2021 reported losses in Colorado due to cyber-attacks totaled $130,631,286 in 2021 alone.

Economic impacts from a cyber-attack can be debilitating. The cyber-attack in 2018 that took down the City of Atlanta cost at least $2.5 million in contractor costs and an estimated $9.5 million additional funds to bring everything back online. The attack in Atlanta took more than a third of the 424 software programs offline and recovery lasted more than 6 months. The 2018 cyber-attack on the CDOT cost an estimated $1.5 million. None of these statistics consider the economic losses to businesses and ongoing IT configuration to mitigate from a future cyber-attack.

Historical, Environmental, and Cultural Resources

Most cyber incidents have little to no impact on historic, cultural, or natural resources. A major cyber terrorism attack could potentially impact the environment by triggering a release of a HAZMAT, or by causing an accident involving HAZMAT by disrupting traffic control devices.

Development Trends

Changes in development have no impact on the threat, vulnerability, and consequences of a cyber-attack. Cyber-attacks can and have targeted small and large jurisdictions, multi-billion-dollar companies, small mom-and-pop shops, and individual citizens. The decentralized nature of the internet and data centers means that the cyber threat is shared by all, regardless of new construction and changes in development. As more systems become more reliant on technology and interconnected devices, this will likely increase the community's vulnerability.

Risk Summary

Table 4-70 Cyber-Attack Hazard Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
San Luis Valley	Significant	Likely	Critical	Medium
Alamosa County	Significant	Likely	Critical	Medium
Conejos County	Significant	Likely	Critical	Medium
Costilla County	Significant	Likely	Critical	Medium
Mineral County	Significant	Likely	Critical	Medium
Rio Grande County	Significant	Likely	Critical	Medium
Saguache County	Significant	Likely	Critical	Medium

- Overall, cyber-attacks are rated as a **medium** significance in the planning area

- Cyber-attacks can occur anywhere and on any computer network, therefore, this hazard is rated as "extensive" location
- There is an increasing trend in the number of cyber-attacks in the U.S. each year. While small scale cyber-attacks such as phishing attacks are likely to occur many times in the region yearly, significant attacks that result in monetary or data losses are far less likely
- Potential magnitude is ranked as critical due to the potential for significant monetary losses if the attacker demands ransom and the potential for confidential information and data to be hacked
- People ages 65+ are the most likely age group to experience greatest monetary losses, although anyone of any age can be victim to a cyber-attack
- Small business worth less than $10 million and local governments are increasingly becoming targets for cyber-attack, with criminals assuming these smaller organizations will lack the resources to prevent an attack
- One documented cyber-attack reported in the San Luis Valley occurred in the City of Alamosa when a laptop computer stolen from a locked closet at Adams State College and personal identification of students was compromised. The HMPC also noted hospitals as popular targets for cyber-attack in the region

4.2.14 Pandemic

Hazard/Problem Description

A pandemic can be defined as a public health emergency that attacks a large population across great geographic distances. Pandemics are larger than epidemics in terms of geographic area and number of people affected. Epidemics tend to occur seasonally and affect much smaller areas. Pandemics, on the other hand, are most often caused by new subtypes of viruses or bacteria to which humans have little or no natural resistance. Consequently, pandemics typically result in more deaths, social disruption, and economic loss than epidemics.

Three conditions must be met before a pandemic begins:

1) A new virus subtype must emerge that has not previously circulated in humans (and therefore there is no pre-existing immunity),
2) This new subtype must be able to cause disease in humans, and
3) The virus must be easily transmissible from human to human.

A pandemic is a global disease outbreak. Pandemic flu is a human flu that causes a global outbreak, or pandemic, of serious illness. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease could spread easily person-to-person, causing serious illness, and can sweep across the country and around the world in a very short time. The Centers for Disease Control and Prevention (CDC) has been working closely with other countries and the World Health Organization to strengthen systems to detect outbreaks of influenza that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Pandemics are generally thought to be the result of novel strains of viruses. Because of the process utilized to prepare vaccines, it is impossible to have vaccines pre-prepared to combat pandemics. Additionally, for novel viruses, identification of symptoms, mode of transmission, and testing/identification may require development, causing significant delays in response actions. A portion of the human and financial cost of a pandemic is related to the lag time to prepare a vaccine to prevent the future spread of the novel virus. In some cases, current vaccines may have limited activity against novel strains. Even when there is a strong healthcare system in place, disease outbreaks can strain and overwhelm community resources if there is a significant outbreak. The Central Region's vulnerable populations, young children, the elderly, under-resourced households, and those with underlying health conditions, will be the hardest hit during any disease outbreak.

Ongoing COVID-19 Pandemic

Since March 2020 and during the update of this plan, the San Luis Valley Region, the nation, and the world has been dealing with the COVID-19 pandemic, confirming that the pandemic is a key public health hazard in the State. The COVID-19 virus has a much higher rate of transmission than the seasonal flu, primarily by airborne transmission of droplets/bodily fluids. 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 hospitalization and a fatality rate of approximately 1%. Recent studies, however, have shown the average country/territory-specific COVID-19 case-fatality rate to be 2% - 3% worldwide and higher than previously reported estimates (Cao, Hiyoshi and Montgomery 2020). Case fatality rate, also called case fatality risk or case fatality ratio, in epidemiology, is the proportion of people who die from a specified disease among all individuals diagnosed with the disease over a certain period of time (Harrington 2022). The key challenge in containing the spread has been the fact that it can be transmitted by asymptomatic people.

2022 U.S. Monkeypox Outbreak

According to the CDC, monkeypox is a rare disease caused by infection with the monkeypox virus. Monkeypox virus is part of the same family of viruses as smallpox. Monkeypox symptoms are similar to smallpox symptoms but milder, and monkeypox is rarely fatal. Symptoms of monkeypox can include fever, headache, muscle aches and backache, swollen lymph nodes, chills and exhaustion; moreover, a rash that can look like pimples or blisters that appear on the face, inside the mouth, and on other parts of the body, like the hands, feet, chest, genitals, or anus. The rash goes through different stages before healing completely. The illness typically lasts 2-4 weeks. Sometimes, people get a rash first, followed by other symptoms. Others only experience a rash.

Monkeypox spreads in different ways. The virus can spread from person to person through:

- Direct contact with the infectious rash, scabs, or body fluids
- Respiratory secretions during prolonged, face-to-face contact, or intimate physical contact, such as kissing, cuddling, or sex
- Touching items (such as clothing or linens) that previously touched the infectious rash or body fluids
- Pregnant people can spread the virus to their fetus through the placenta

It is also possible for people to get monkeypox from infected animals, either by being scratched or bitten by the animal or by preparing or eating meat or using products from an infected animal.

Moreover, monkeypox can spread from the time symptoms start until the rash has fully healed and a fresh layer of skin has formed. The illness typically lasts 2-4 weeks. People who do not have monkeypox symptoms cannot spread the virus to others. At this time, it is not known if monkeypox can spread through semen or vaginal fluids.

Monkeypox was discovered in 1958 when two outbreaks of a pox-like disease occurred in colonies of monkeys kept for research. Despite being named "monkeypox," the source of the disease remains unknown. However, African rodents and non-human primates (like monkeys) might harbor the virus and infect people. The first human case of monkeypox was recorded in 1970. Before the 2022 outbreak, monkeypox had been reported in people in several central and western African countries. Previously, almost all monkeypox cases in people outside of Africa were linked to international travel to countries where the disease commonly occurs or through imported animals. These cases occurred on multiple continents.

The WHO declared Monkeypox Spread a Global Health Emergency on July 23, 2022. The Biden Administration also declared the monkeypox outbreak a public health emergency on August 4, 2022. According to the World Health Organization (WHO), as of August 3, 2022, 83 countries have reported 23,351 laboratory-confirmed cases. Together 10 countries account for 89% of the world's cases, with the United States having the highest number of cases, which is 5,175 cases. The State of Colorado has reported 79 monkeypox cases.

Past Occurrences

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% of the American workforce was bedridden.
- **1957-1958 Asian Flu:** The 1957 Asian Flu pandemic killed 1.1 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 one million people worldwide and approximately 100,000 people in the United States. 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:** The 2009 H1N1 virus was first detected in the United States in April 2009. It is now believed that the outbreak began in either Mexico or somewhere in Asia. The WHO officially declared a pandemic on June 11, 2009. Testing of the strain indicated that it did not contain markers associated with high death rates or increased risk of severe disease. About 70 percent of people who have been hospitalized with this 2009 H1N1 virus have had one or more medical conditions previously recognized as placing people at "high risk" of serious seasonal flu-related complications. This included pregnancy, diabetes, heart disease, asthma, and kidney disease. Young children were also at high risk of serious complications from 2009 H1N1, just as they are from seasonal flu. The elderly were not disproportionately affected by this strain, which is rare for most flu viruses. And while people 65 and older were the least likely to be infected with 2009 H1N1 flu, if they got sick, they were also at high risk of developing serious complications from their illness. The World Health Organization (WHO) declared the pandemic to be officially over in June 2010. The WHO estimated that over 18,000 people died of the H1N1 strain worldwide. This number could potentially be much higher. Deaths related to this particular strain of the virus could have gone unconfirmed or unreported. Nevertheless, this number is lower than the 250,000 to 500,000 people around the world who die of seasonal flu strains each year.
- **2020-Ongoing COVID-19:** The COVID-19 or novel coronavirus was detected in December 2019 and was declared a pandemic in March 2020. As of August 4, 2022, 582 million cases have been reported around the world with 6.41 million deaths, including approximately 91.8 million cases and 1.03 million deaths in the U.S. Worldwide there have been almost 12.4 billion vaccine doses administered. Within the State of Colorado, there have been 1,610,726 reported cases of COVID-19 and 13,230 deaths as of August 8, 2022. The response to the COVID-19 pandemic included numerous public health orders, including stay-home orders; massive testing and vaccination efforts; the establishment of alternate care sites to support the hospital system; and an unprecedented community-wide vaccination push.

Geographical Area Affected

The entire geographic area of the San Luis Valley is susceptible to a pandemic. Disease spread usually occurs in areas where vulnerable populations are also in areas where people live and work in close quarters. Depending on the specifics of the illness and its spread, these areas include shelters, senior homes, schools, and places of business.

The current COVID-19 pandemic has affected all the counties in the San Luis Valley. Table 4-71 below shows the total cases and deaths specific to the San Luis Valley Region. San Luis Valley comprises approximately 0.7% of the statewide total of cases and 1.3% of the statewide total of deaths. In general, it is likely that the more-populated areas and municipal areas may be affected sooner and may experience higher infection rates. Some indirect consequences may be the diversion of health and medical resources that may be otherwise available.

Table 4-71 COVID-19 Cases and Deaths by County in San Luis Valley (as of August 5, 2022)

County	Cases	Deaths
Alamosa	5,206	62
Conejos	2,072	57
Costilla	842	19
Mineral	282	3
Rio Grande	1,954	13
Saguache	1,362	12
Total	**11,718**	**166**

Source: The New York Times *Population total is based on U.S. Census Bureau ACS 5-Year Estimates 2016-2020.

Magnitude/Severity

The magnitude of a disease outbreak or public health emergency will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. Pandemic influenza is more easily transmitted from person to person but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time.

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 a virus could spread around the globe within hours, quickly creating a pandemic. Under such conditions, there may be very little warning time. 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 influenza pandemic unlike most other public health emergencies or community disasters. Pandemics typically last for several months to 1-2 years.

As seen with the ongoing COVID-19 pandemic, the rapid spread of the virus combined with the need for increased hospital and coroner resources, testing centers, first responders, and vaccination administration sites caused significant strain on the medical system and public health departments. Additionally, other public health-related triggers or commingled public health hazards (such as an outbreak of another pathogen) or even more contagious strains of COVID such as the recent Omicron and Delta B.1.617.2 variant can quickly lead to even more outbreaks.

The Pandemic Intervals Framework (PIF) is a six-phased approach to defining the progression of an influenza pandemic. This framework is used to guide influenza pandemic planning and provides recommendations for risk assessment, decision-making, and action. These intervals provide a common method to describe pandemic activities that 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.

Pre-Pandemic Interval

1) **Phase 1** is the natural state in which influenza viruses circulate continuously among animals (primarily birds) but do not affect humans.

2) **Phase 2** an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is thus considered a potential pandemic threat. Phase 2 involves cases of animal influenza that have circulated among domesticated or wild animals and have caused specific cases of infection among humans.

3) **Phase 3** an animal or human-animal influenza virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. Limited transmission under these circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic. 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.

4) **Phase 4** is characterized by the verified human-to-human transmission of the virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upward shift in the risk of a pandemic. 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)

5) **Phase 5** is characterized by verified human-to-human spread of the virus into at least two countries in one World Health Organization (WHO) region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short. Phase 5 represents human-to-human transmissions of the virus in at least two countries.

6) **Phase 6**, the pandemic phase, is characterized by community-level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. The designation of this phase will indicate that a global pandemic is underway. Phase 6 is the pandemic phase, characterized by community-level influenza outbreaks.

Frequency/Likelihood of Occurrence

Although it is impossible to predict the next disease outbreak, there is recent history that shows these outbreaks are not uncommon and are likely to reoccur. Based on the five pandemics that have affected the United States in roughly the last 100 years, a pandemic occurs on average roughly every 20 years. In other words, there is a 5% probability that a pandemic that affects the entire United States will occur in any given year.

For the current COVID-19 pandemic, due to the virus's ability to mutate and rapidly infect those who are not vaccinated, the pandemic may extend for several years, and booster vaccines may be necessary to prevent future outbreaks. In just the last couple of decades, the world has drastically increased points of transmissions through global travel and trade to levels unseen in human history – this may have a drastic impact on the frequency of pandemics and the speed with which they spread in coming years.

Climate Change Considerations

As the earth’s climate continues to warm, researchers predict wild animals will be forced to relocate their habitats — likely to regions with large human populations — dramatically increasing the risk of a viral jump to humans that could lead to the next pandemic. This link between climate change and viral transmission is described by an international research team led by scientists at Georgetown University and is published on April 28, 2022, in Nature. The scholars noted that the geographic range shifts due to climate change could cause species that carry viruses to encounter other mammals to share thousands of viruses. The viruses can then further be spread to humans. In addition, rising temperatures caused by climate change will impact bats, which account for the majority of novel viral sharing. Bats’ ability to fly will allow them to travel long distances and share the most viruses. Altogether, the study suggests that climate change will become the biggest upstream risk factor for disease emergence — exceeding higher-profile issues like deforestation, wildlife trade and industrial agriculture. The authors say the solution is to pair wildlife disease surveillance with real-time studies of environmental change. ("New Study Finds Climate Change Could Spark The Next Pandemic - Georgetown University Medical Center" 2022)

Vulnerability Assessment

People

Pandemics can affect large segments of the population for long periods. 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, people of low socio-economic status, 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. According to data collected from the ACS five-year estimates for 2016-2020, the elderly (those over 65 years of age) make up 18.8% of the regional population; the young (those under five years of age) make up 5.9% of the regional population, and 18.4% of the regional population had income in the past 12 months below poverty level. Impacts, mortality rates, speed and type of spread are disease-specific, though certain illnesses could cause high infectivity and mortality rates.

As seen with the current COVID-19 pandemic statewide, according to the Colorado Department of Public Health & Environment, the most positive cases occurred in the 20-29 & 30-39 age group. Hospitalizations and deaths, however, happened more within the 60+ age group.

Property

A pandemic would not have specific impacts on infrastructure or the built environment. Should infrastructure require human intervention to fulfill vital functions, these functions could be impaired by absenteeism, sick days and isolation, quarantine, and disease prophylaxis measures. As concerns about contamination increase, property may be quarantined or destroyed as a precaution against spreading illness. People living in congregate housing are at a higher risk of contracting a disease because physical distancing is difficult in large, crowded group facilities. During a pandemic, public shelters will require a "non-congregate" setting to prevent the spread of disease. This requires additional planning considerations or the use of facilities that allow for non-congregate shelter settings which may require an approval of request to FEMA for non-congregate sheltering and may have an increased cost (such as the use of individual hotel rooms) as opposed to traditional congregate sheltering facilities.

Critical Facilities & Infrastructure

Shortages in supplies and staff missing work could impact critical infrastructure and cause service disruptions. During the COVID-19 pandemic the US experienced a severe shortage of personal protective equipment (PPE) within the Health and Medical Sector. Community lifelines, such as healthcare facilities, like hospitals will be impacted and may be overwhelmed and will have difficulty maintaining operations due to bed availability, medical staffing shortages, and lack of PPE and other supplies. While automated systems and services that allow for the physical distancing of staff from other persons may fare better through a pandemic, due to the globalization of supply chains, services, and interdependency of most communities on robust staffing, all critical infrastructure sectors and lifelines would likely be affected in various ways.

Economy

A widespread pandemic outbreak could have devastating impacts on the Region's economy. The economic impacts fall under two categories – economic losses as a result of the pandemic, and economic losses to fight the pandemic. Economic impacts as a result of a disease include those costs associated with lost work and business interruption. Depending on the disease and the type and rate of spread, businesses could see a loss of consumer base as people self-isolate or avoid travel to the Region. This could last for a prolonged amount of time, compounding economic loss. Economic costs are also associated with incident response. Two of the biggest areas of cost are public information efforts and mass prophylaxis.

In a normal year, lost productivity due to illness costs U.S. employers an estimated $530 billion. During a pandemic, that figure would likely be considerably high and could trigger a recession or even a depression. According to an October 2020 report by The Journal of American Medical Association (JAMA) Network, the estimated cumulative financial costs of the COVID-19 pandemic related to the COVID-19 economic recession and compromised health (premature death, mental health, long-term health impairment) in the U.S. population was almost $16 trillion. According to the Colorado Department of Local Affairs, on May 28, 2020, Governor Polis signed Executive Order D2020 070, the CARES Act, to establish the Coronavirus Relief fund. On December 30, 2020, Governor Polis signed Executive Order D2020 295, amending the CARES Act, to extend the deadline for expenditure until December 31, 2021. Through the Department of Local Affairs, this fund reimbursed costs to Counties, Municipalities and Special Districts for necessary expenditures incurred due to the COVID-19 public health emergency. The total amount of funds available was $ 275 million.

Historical, Environmental, and Cultural Resources

Impacts on these resources are typically minimal. However, reduced tourism could lead to additional economic impacts.

Development Trends

Population growth and development contribute to pandemic exposure. Future development in and around San Luis Valley 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) and put more people at risk. During a disease outbreak, those in the immediate isolation area would have little to no warning, whereas the population further away in the dispersion path may have some time to prepare and mitigate against disease depending on the hazard, its transmission, and public notification.

Risk Summary

Table 4-72 P andemic Hazard Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
San Luis Valley	Extensive	Occasional	Critical	Medium
Alamosa County	Extensive	Occasional	Critical	Medium
Conejos County	Extensive	Occasional	Critical	Medium
Costilla County	Extensive	Occasional	Critical	Medium
Mineral County	Extensive	Occasional	Critical	Medium
Rio Grande County	Extensive	Occasional	Critical	Medium
Saguache County	Extensive	Occasional	Critical	Medium

- Pandemics affecting the U.S. occur roughly once every 20 years but cannot be reliably predicted.
- Effects on people will vary, while the elderly, people with underlying medical conditions, people of low socio-economic status, and young children are usually at higher risk.
- Effects on property are typically minimal, although quarantines could result in short-term closures.
- Community lifelines, such as healthcare facilities, like hospitals will be impacted and may be overwhelmed and have difficulty maintaining operations due to bed availability, medical staffing shortages, and lack of PPE and other supplies.
- 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.
- The hazard is considered medium significance across San Luis Valley.
- 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.

4.2.15 Hazardous Materials Incidents

Hazard/Problem Description

A hazardous material incident is defined as any actual or threatened uncontrolled release of a hazardous material, its hazardous reaction products or the energy released by its reactions that pose a significant risk to human life and health, property and/or the environment. HAZMAT incidents may also include chemical, biological, radiological, nuclear, and explosive (CBRNE) incidents. CBRNE incidents can cause a variety of impacts with in Colorado depending on the nature of the incident, material used, and environmental factors.

HAZMAT incidents can occur anywhere hazardous materials are stored or transported. This includes designated transportation routes throughout the city and fixed facilities in the city limits. There are 67 National Hazardous Material Routes Registered. Title 42, Article 20 of the Colorado Revised Statutes governs the routing of HAZMAT by motor vehicles on all public roads in Colorado. CDOT Policy Directive 1903.0 effective 5/20/2010, and CDOT Procedural Directive 1903.1 effective 2/3/2011, govern CDOT's role in the designation of hazmat routes.

The EPA also requires facilities containing certain extremely hazardous substances to generate Risk Management Plans (RMPs) and resubmit these plans every five years. As of 2022 there are six RMP facilities located within the San Luis Valley. As of 2022 there were 33 Tier II facilities recorded to be located throughout the study area.

As a rule, any hazmat release is anticipated to have an impact of no more than one mile around the spill area. The impact to life and property from any given release depends primarily on:

- The type and quantity of material released.
- The human act(s) or unintended event(s) necessary to cause the hazard to occur.
- The length of time the hazard is present in the area.
- The tendency of a hazard, or that of its effects, to either expand, contract, or remain confined in time, magnitude, and space.
- Characteristics of the location and its physical environment that can either magnify or reduce the effects of a hazard.

Past Occurrences

There are a variety of mechanisms to get an idea of the number and types of past HAZMAT incidents in the San Luis Valley. One such repository is the catalog of HAZMAT spill and accident reports at the National Response Center (NRC) as part of the Right to Know Network (RTK NET). According to this database, between 1990 and 2021 there were 138 incidents reported across the six counties within the study area. The table below shows the 31-year record for reported incidents in the San Luis Valley.

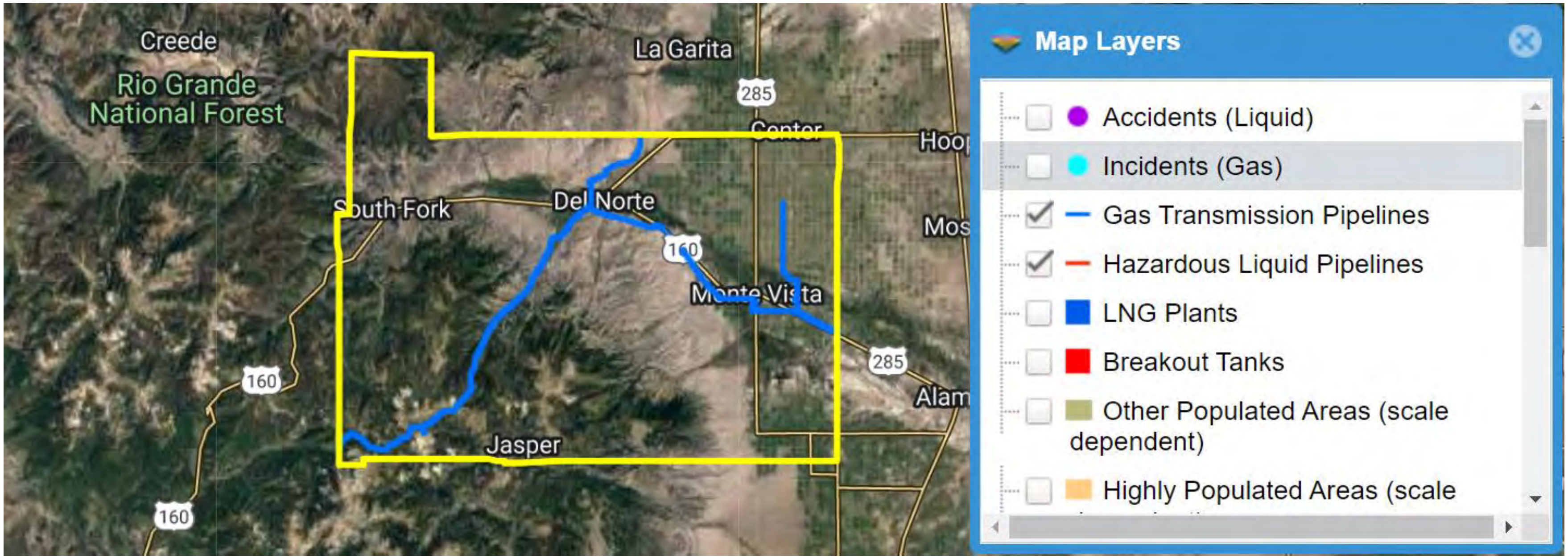
Table 4-73 NRC Reported Incidents San Luis Valley 1990-2021

County	# of Incidents
Alamosa	31
Conejos	15
Costilla	20
Mineral	26
Rio Grande	32
Saguache	13
Total	**137**

Source: NRC Incident Report Database

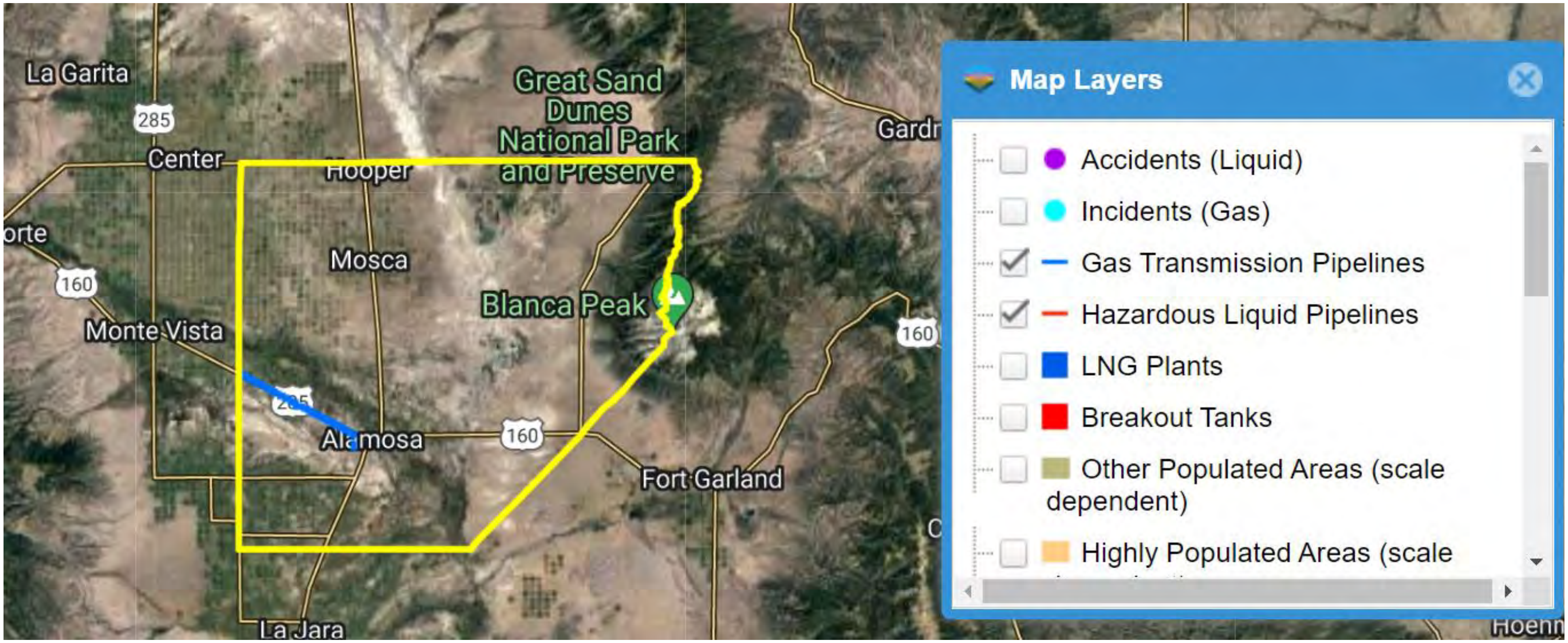
According to the data, during the time between 1990 and 2021 the study area saw an average of four NRC-reported incidents per year, which means that each county can reasonably expect multiple HAZMAT responses annually. Rio Grande, Alamosa, and Mineral Counties have had the highest amount of hazmat incidents and spills. The pipeline routes for Rio Grande, Alamosa, Mineral, and Saguache County are shown in the figures below. Pipeline ruptures can result in major spills, or even explosions. These pipelines also pass-through areas where denser populations of people and property are located.

Figure 4-30 Pipelines Located Within Rio Grande County



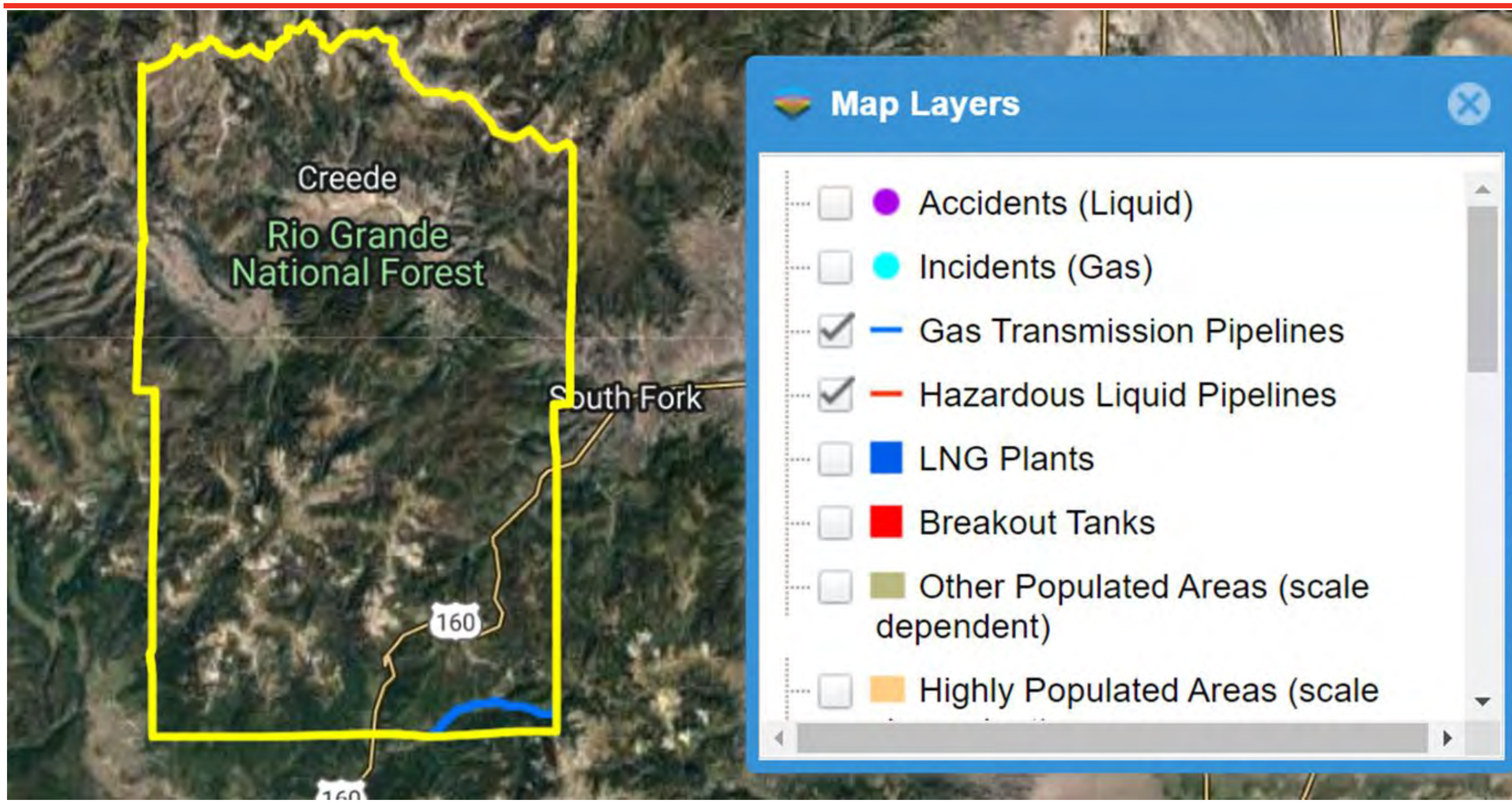
Source: National Pipeline Mapping System

Figure 4-31 Pipelines Located Within Alamosa County



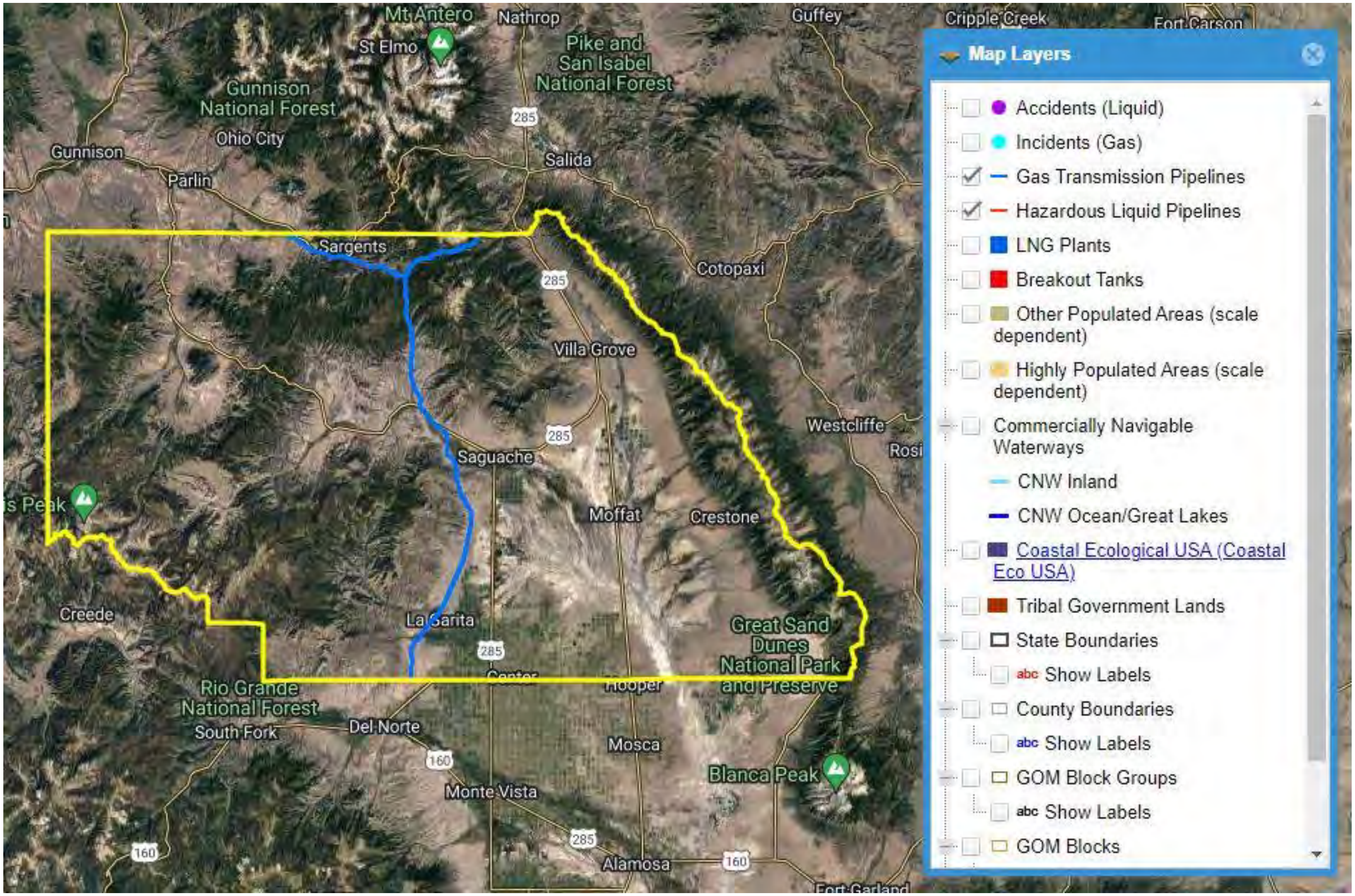
Source: National Pipeline Mapping System

Figure 4-32 Pipelines Located Within Mineral County



Source: National Pipeline Mapping System

Figure 4-33 Pipelines Located Within Saguache County



Source: National Pipeline Mapping System

Geographical Area Affected

HAZMAT incidents can occur at a fixed facility or during transportation. HAZMAT facilities are identified and mapped by the counties they reside in, along with the types of materials stored there; facilities generally reside in and around communities. Some facilities contain extremely hazardous substances; these facilities are required to generate Risk Management Plans (RMPs) and resubmit these plans every five years. In transportation, HAZMAT generally follows major shipping routes where possible (including road, rail, and pipelines), creating a hazard area immediately neighboring these routes. Information provided by the National Pipeline Mapping System (NPMS) indicates several pipelines conveying gas or hazardous liquids across the planning area.

Magnitude/Severity

Modifications in future conditions are unlikely to impact the rates of occurrence for human-caused hazards, such as hazardous material incidents. Nevertheless, it is possible that an increase or change in the occurrence of other hazards, such as severe storms and fire events, may increase the likelihood of an accidental HAZMAT release from transportation events.

Potential effects that could occur from hazardous waste spills or releases include:

- Injury
- Loss of life (human, livestock, fish, and wildlife)
- Evacuations
- Property damage
- Air pollution
- Surface, water, or ground pollution/contamination
- Interruption of commerce and transportation

Various considerations go into the impacts of a HAZMAT release, including method of release, the type of material, location of release, weather conditions, and time of day. This makes it complicated to pinpoint definite impacts. It can still be ascertained that items found in the study area will have at least one of the impacts listed above.

Frequency/Likelihood of Occurrence

The study area experiences multiple HAZMAT incidents each year, with different degrees of effect; based on the history of past occurrences, there is a 100% chance that the San Luis Valley will see a HAZMAT incident in any given year. Hazardous material spills and releases, both from fixed facilities and during transport, will continue to occur in each county in the study area annually.

Climate Change Considerations

Modifications in future conditions are unlikely to impact the rates of occurrence for human-caused hazards, such as hazardous material incidents. Nevertheless, it is possible that an increase or change in the occurrence of other hazards, such as severe storms and fire events, may increase the likelihood of an accidental HAZMAT release from transportation events.

Vulnerability Assessment

The San Luis Valley has assets such as energy pipelines and railroad tracks which carry many types of HAZMAT, and state highways running through its boundaries. A variety of HAZMAT originating in this area or elsewhere are transported along these routes and could be vulnerable to accidental spills. Consequences can vary depending on whether the spill affects a populated area vs. an unpopulated but environmentally sensitive area.

There are 67 National Hazardous Material Routes within Colorado; any routes used to carry HAZMAT introduce an element of risk of materials release to the area immediately adjacent to them. It is noted that within the study area many petroleum and other flammable products are transported by truck, and many have mixed payloads that do not list material amounts. Extractive industries were identified as the biggest source of HAZMAT within and moving through the entire valley.

People

HAZMAT incidents can cause injuries, hospitalizations, and even fatalities to people nearby. People living near hazardous facilities and along transportation routes may be at a higher risk of exposure, particularly those living or working downstream and downwind from such facilities. For example, a toxic spill or a release of an airborne chemical near a populated area can lead to significant evacuations and have a high potential for loss of life.

In addition to the immediate health impacts of releases, a handful of studies have found long term health impacts such as increased incidence of certain cancers and birth defects among people living near certain chemical facilities. However there has not been sufficient research done on the subject to allow detailed analysis.

Property

The impact of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e. liquid spill) may also be limited to the extent of the spill and remediated if needed. Potential impacts are hard to quantify, as different chemicals may present different impacts and issues. Property within a half mile in either direction of designated HAZMAT routes is at increased risk of impacts. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to property. However, some larger incidents involving pipelines, railroads, or explosive materials may cause significant and overwhelming damage to the surrounding communities.

Critical Facilities & Infrastructure

There are 33 Tier II facilities located throughout the study area. Tier II facilities are specified as an annual report that is mandatory for any business or company that stores hazardous materials. Of this 33 ten are in Alamosa County and seven in Rio Grande and Saguache respectively. These three counties make up 24 of the 33 Tier II facilities located in the San Luis Valley. Tier II facilities in the study area are highlighted in Table 4-74.

Table 4-74 San Luis Valley Tier II Facilities

County	Number of Tier II Facilities
Alamosa	10
Conejos	4
Costilla	3
Mineral	2
Rio Grande	7
Saguache	7
Total	**33**

Source: CDPHE, CEPC, HIFLD, NBI, WSP GIS Analysis

There are six facilities with "extremely hazardous" substances which require a Risk Management Plan (RMP) located within the San Luis Valley. Four of these are within Rio Grande County and two in Saguache County. RMP's within the study area are detailed in Table 4-75 below.

Table 4-75 San Luis Valley RMP Facilities

County	Jurisdiction	Name of Facility
Rio Grande	Monte Vista	WILBUR-ELLIS COMPANY (MONTE VISTA, CO)
Rio Grande	Rio Grande County	POOLE CHEMICAL - MONTE VISTA, CO
Rio Grande	Rio Grande County	THREE MILE LOCATION
Rio Grande	Rio Grande County	FARM SERVICE CENTER CO.
Saguache	Center	STONE'S FARM SUPPLY, INC.
Saguache	Center	CENTER ANHYDROUS AMMONIA PLANT

Source: CDPHE, CEPC, HIFLD, NBI, WSP GIS Analysis

Economy

Potential losses can vary greatly for hazardous material incidents. For even a small incident, there are cleanup and disposal costs. In a larger scale incident, cleanup can be extensive and prolonged. There can be deaths or injuries requiring doctor's visits and hospitalization, disabling chronic injuries, soil and water contamination can occur, necessitating costly remediation. Evacuations can disrupt home and business activities. Large-scale incidents can easily reach $1 million or more in direct damages.

Historical, Environmental, and Cultural Resources

Hazardous material incidents may affect a small area at a regulated facility or cover a large area outside such a facility. Widespread effects occur when hazards contaminate the groundwater and eventually the municipal water supply, or they migrate to a major waterway or aquifer. Impacts on wildlife and natural resources can also be significant. These types of widespread events may be more likely to occur during a transportation incident, such as a pipeline spill, and can have far reaching and devastating impacts on the natural environment and habitats.

Development Trends

Future development is expected to increase the number of people potentially exposed to the impacts of HAZMAT incidents. The number of HAZMAT that are stored, used, and transported across the region may continue to increase over the coming years if regional growth continues.

Risk Summary

Table 4-76 Hazardous Materials Risk Summary

Jurisdiction	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Alamosa County	Significant	Likely	Limited	Medium
Conejos County	Limited	Likely	Limited	Medium
Costilla County	Significant	Likely	Limited	Medium
Mineral County	Limited	Likely	Limited	Medium
Rio Grande County	Significant	Likely	Limited	Medium
Saguache County	Limited	Likely	Limited	Medium

- Overall, hazardous materials incidents are rated as a **medium** significance in the planning area.
- Hazardous materials incidents can occur anywhere hazardous materials are stored or transported, but incidents are most common during transportation.
- Hazardous materials incidents can cause injuries, hospitalizations, and even fatalities to people nearby. In addition to the immediate health impacts of releases, a handful of studies have found long term

health impacts such as increased incidence of certain cancers and birth defects among people living near certain chemical facilities.

- The impact of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e., liquid spill) may also be limited to the extent of the spill and remediated if needed.
- Potential losses can vary greatly for hazardous material incidents. For even a small incident, there are cleanup and disposal costs. In a larger scale incident, cleanup can be extensive and prolonged.
- Related Hazards: Cyber- Attack

5 Mitigation Strategy

Requirement §201.6(c)(3):
[The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

5.1 Mitigation Strategy Overview

This section describes the mitigation strategy process and mitigation action plan for the Region 6 Hazard Mitigation Plan. It describes how the counties in the Region met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- 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 each county's HMPC led to this mitigation strategy and action plan. Section 5.2 below identifies the goals of this plan and Section 5.4 describes the mitigation action plan.

5.2 Goals and Objectives

Requirement §201.6(c)(3)(i):
[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, each county's Planning Team has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals and mitigation actions were developed and updated based on these tasks. During the 2022 creation of this plan each county participated in a series of meetings designed to update and achieve a collaborative mitigation strategy as described further throughout this section.

During the first set of planning workshops held in 2022, the counties reviewed the results of the hazard identification, vulnerability assessment, capability assessment and goals from each of their previous plans. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the counties to update planning goals and to base the development of new or updated mitigation strategies for the counties in the Region.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for actions that will be used as means to achieve the goals.

The update of goals for each county in the region was initiated through a facilitated discussion at the second and third planning workshops held in 2022 (Risk Assessment and Goals workshop). The HMPC members were provided a PowerPoint presentation that explained goals, objectives and actions and listed examples of each. Existing plan goals and related plan goals were noted in the PowerPoint, including the State of Colorado Multi-Hazard Mitigation Plan (2018). This review was to ensure that the regional plan's mitigation goals were aligned and integrated with existing plans and policies.

Based on the risk assessment review and the goals update process, each county updated existing county-specific goals which provide the direction for reducing future hazard-related losses within the county and regional planning area. Prior to this planning process, Alamosa, Conejos, Mineral, Rio Grande, and Saguache Counties all had the same goals in their individual county HMPs; Costilla County had separate goals. Moving forward the Counties all elected to keep their previous goals and carry them forward into the new regional plan, with minor edits. The goal statements for each county in the Region are noted below:

5.2.1 Alamosa, Conejos, Mineral, Rio Grande, and Saguache County Goals:

- Goal 1: Reduce loss of life and personal injury caused by hazards.
- Goal 2: Reduce damage to critical facilities, personal property, natural and cultural assets, and other community assets caused by hazards.
- Goal 3: Minimize economic losses associated with hazards.

5.2.2 Costilla County Goals

- Goal 1: Enhance the safety of residents and businesses by protecting new and existing development from the effects of hazards.
- Goal 2: Protect new and existing public and private infrastructure and critical facilities from the effects of hazards.
- Goal 3: Ensure hazard awareness and risk reduction principles are institutionalized into the jurisdictions' daily activities, processes, and functions by incorporating it into policy documents and initiatives.
- Goal 4: Enhance community-wide understanding and awareness of community hazards.
- Goal 5: Publicize mitigation activities to reduce the area's vulnerability to hazards.
- Goal 6: Limit or discourage development in geologic hazard and wildfire prone areas.

5.3 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii):
[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

The next step in the mitigation strategy is to identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the effects of each hazard on new and existing buildings and infrastructure. During the 2021 planning process each county's CPT analyzed viable mitigation options by hazard that supported the identified goals. The CPT considered the following categories of mitigation actions, as defined in FEMA's 2013 *Local Mitigation Planning Handbook*:

- Plans and regulations: These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.

- Structure and infrastructure projects: These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
- Natural systems protection: These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.
- Education and awareness: These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady or Firewise Communities. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public is more likely to lead to direct actions.

The CPT was also provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- Prevention: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- Property protection: Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- Structural: Actions that involve the construction of structures to reduce the impact of a hazard.
- Natural resource protection: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- Emergency services: Actions that protect people and property during and immediately after a disaster or hazard event.
- Public information/education and awareness: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified and profiled in Chapter 4 was evaluated. At the mitigation strategy workshops the counties were also provided a matrix showing examples of potential mitigation action alternatives for each of the above categories, for each of the identified hazards. The counties were also provided a handout that explains the categories and provided further examples. Finally, two documents from FEMA were suggested as reference for ideas and best practices: The Hazard Mitigation Assistance Mitigation Action Portfolio (2020) and Mitigation Ideas (2013). These documents list the common alternatives for mitigation by hazard and/or best practices and examples of successful mitigation projects funded by FEMA. The counties were asked to consider both future and existing buildings in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Each proposed action was written on a large sticky note and posted on flip charts in the meeting rooms underneath the hazard it addressed. The result was a number of new project ideas with the intent of reducing the impacts of the identified hazards.

The mitigation strategy is based on existing local authorities, policies, programs, and resources, as well as the ability to expand on and improve these existing tools. As part of the Regional Plan update the County Planning Teams reviewed existing capabilities for reducing long-term vulnerability to hazards. Those capabilities are noted by jurisdiction in the county annexes and can be assessed to identify gaps to be addressed and strengths to enhance through new mitigation actions. For instance, gaps in design or enforcement of existing regulations can be addressed through additional personnel or a change in procedure or policy.

Based upon the key issues identified in the risk assessment, including the capability assessment, the counties came to consensus on proposed mitigation actions for each hazard for their jurisdictions. Certain hazards' impacts were best reduced through multi-hazard actions. A lead for each new action was identified to provide additional details on the project so they could be captured in the plan. Final action strategies are discussed in the respective annexes of each county.

5.4 Prioritization Process

Once the mitigation actions were identified, the County Planning Teams were provided FEMA's recommended prioritization criteria STAPLEE to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE is an acronym for the following:

- **Social:** Does the measure treat people fairly? (e.g., different groups, different generations)
- **Technical:** Is the action technically feasible? Does it solve the problem?
- **Administrative:** Are there adequate staffing, funding, and other capabilities to implement the project?
- **Political:** Who are the stakeholders? Will there be adequate political and public support for the project?
- **Legal:** Does the jurisdiction have the legal authority to implement the action? Is it legal?
- **Economic:** Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **Environmental:** Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

Other criteria used to assist in evaluating the priority of a mitigation action includes:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?

At the mitigation strategy workshops, the counties used STAPLEE to determine which of the new identified actions were most likely to be implemented and effective. Keeping the STAPLEE criteria in mind, each member 'voted' for the new mitigation actions by sticking a colored dot on the sticky note on which the action was written. The number of dots next to each action was totaled as an indication of relative priority and translated into 'high,' 'medium' and 'low.' The results of the STAPLEE evaluation process produced prioritized mitigation actions for implementation within the planning area.

The process of identification and analysis of mitigation alternatives allowed the County Planning Teams to come to consensus and to prioritize recommended mitigation actions for their jurisdictions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority as this is a requirement of the Disaster Mitigation Act regulations; however, this was a planning level analysis as opposed to a quantitative analysis. Quantitative cost-benefit analysis will be considered in additional detail when seeking FEMA mitigation grant funding for eligible projects identified in this plan.

Each mitigation action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details for each action led to the determination of a high, medium, or low priority for each.

5.5 Mitigation Action Plan

Requirement §201.6(c)(3)(iii):
[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special

Requirement §201.6(c)(3)(iii):
emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section outlines the development of the mitigation action plan. The action plan consists of the specific projects, or actions, designed to meet the plan's goals. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

5.5.1 Progress on Previous Mitigation Actions

This Regional Plan represents a plan update for all six counties. As part of the update process each county CPT reviewed the previously identified actions to assess progress on implementation. These reviews were completed using worksheets to capture information on each action including if the action was completed or deferred to the future. Actions that were not completed were discussed for continued relevance and were either continued in the Plan or in some cases recommended for deletion.

The counties and the majority of their participating jurisdictions have been very successful in implementing actions identified in their respective plans' Mitigation Strategy, thus, working steadily towards meeting each plan's goals. Progress on mitigation actions previously identified in these planning mechanisms are detailed in the mitigation action strategy in the county annexes. These action plans were also shared amongst the regional plan participants to showcase progress and stimulate ideas amongst the respective planning committees in each county. Reasons that some actions have not been completed include low priority, lack of funding, or lack of administrative resources. See the county annexes for more details on progress on implementation.

As of January 2023, 15 actions have been completed, 0 deleted and 142 are continuing in the 2023 San Luis Valley Regional Hazard Mitigation Plan. During the update process, 36 new actions were developed, bringing the total number of actions in the 2023 plan to 178. The table below summarizes progress implementing mitigation actions by county. Further details can be found in each county annex.

Table 5-1 Mitigation Action Progress Summary by County

County	Completed	Deleted	Continuing	New Actions in 2022	Total New/Continuing Actions
Alamosa	1	-	22	6	28
Conejos	6	-	25	12	37
Costilla	1	-	35	2	37
Mineral	2	-	9	1	10
Rio Grande	-	-	24	2	26
Saguache	4	-	24	11	35
Region-wide	1	-	3	2	5
Total	**15**	**-**	**142**	**36**	**178**

5.5.2 Continued Compliance with NFIP

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study (FIS). The FIS presents water surface elevations for floods of various magnitudes, including the 1% annual chance flood (also known as a 100-year flood) and the 0.2% annual chance flood (also known as a 500-year flood). Base flood elevations and the boundaries of the 1% and 0.2% floodplains are shown on Flood Insurance rate Maps (FIRMs), which are the principal tool for identifying the extent and location of the riverine flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under their floodplain management program.

Counties and jurisdictions that participate in the NFIP, which are noted in the respective annexes Capability Assessment, will continue to make every effort to remain in good standing with the program. All six Counties participate in the NFIP, and nine of the 17 municipalities do as well including the City of Alamosa (Alamosa County); Antonito and Manassa in Conejos County; City of Creede in Mineral County; Del Norte, Monte Vista, and South Fork in Rio Grande County; and the Town of Crestone and Town of Saguache in Saguache County (the remaining municipalities are not mapped or do not have Special Flood Hazard Area). This includes continuing to comply with the NFIP's standards for adopting floodplain maps and maintaining and periodically updating local floodplain regulations. Compliance beyond the minimum NFIP standards required for Colorado NFIP participating jurisdictions include compliance with Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1).

Actions related to continued NFIP compliance include:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the local floodplain management ordinances and rules;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital FIRMs in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

All communities are in compliance with Colorado Rules and Regulations for Regulatory Floodplains (2 CCR 408-1), by adopting language in their floodplain resolutions that include the higher standards summarized in Table 5-2 below.

Table 5-2 CWCB Higher Standards for the State of Colorado

Category	State of Colorado	Minimum NFIP
Floodway [Rule 8(A)]	0.5-foot maximum surcharge*	1.0-foot maximum surcharge
Freeboard for new structures [Rule 11(B)]	Lowest floor (including basements) 1-foot above BFE	Lowest floor (including basements) at or above BFE
Required LOMR [Rule 12(H)]	Any change to BFE +/- 0.3-foot	----
LOMR-F Areas [Rule 11(C)]	Lowest floor must have 1-foot freeboard above previous BFE	Area removed from SFHA
Critical Facilities [Rule 6(D)]	Lowest floor 2-feet freeboard above BFE	No specific standards

*0.5-foot for flooding sources with no effective floodway; new/updated studies.

Source: Rules and Regulations for Regulatory Floodplains in Colorado, Dept. of Natural Resources, CWCB

Also, to be considered are the flood mitigation actions contained in this Regional Plan that support the ongoing efforts by participating counties to minimize the risk and vulnerability of the community to the flood hazard, and to enhance their overall floodplain management program.

5.5.3 Mitigation Action Plan

The action plan presents the recommendations developed by the County Planning Teams, outlining how each county and the Region as a whole can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The mitigation actions developed by each county are detailed in Section 8 of each respective county's annex. These details include the action description, hazard (s) mitigated, lead and partner agencies responsible for initiating implementation, costs, funding sources, and timeline. Many of the action items included in this plan are a collaborative effort among local, state, and federal agencies and stakeholders in the planning area.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The counties are not obligated by this document to implement any or all of these projects. Rather, this mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards. The counties also realize that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to their overall goals, as listed in this plan.

Where feasible it is recommended that mitigation be integrated and implemented through existing planning mechanisms. Specific related mechanisms such as Community Wildfire Protection Plans, are noted in the county annexes.

Summary of Regional Mitigation Actions

The natural hazards profiled in this plan are common throughout the region. Natural hazards affect all of the participating counties without respect for political boundaries. As a result, these six counties routinely share resources during emergencies and maintain a strong tradition of cooperative planning. The 2016 update of the individual county plans further demonstrates the region's commitment to reducing risks from natural hazards. Regional cooperation allows counties to stretch resources, share best practices, and potentially implement more mitigation actions.

These participating San Luis Valley Counties cooperatively obtained a federal grant to develop this 2022/2023 regional hazard mitigation plan. In addition, the six Emergency Managers and other stakeholders met collectively to identify opportunities for collaborating on regional mitigation efforts in the San Luis Valley. Through regional collaboration, the San Luis Valley is taking advantage of shared resources, engaging regional expertise, and preventing duplication of efforts to ensure that communities in the Valley continue building resiliency to natural disasters.

During the 2016 update of individual county plans, priority risks identified in the THIRA, specifically wildfires and long-term power disruptions, were considered in the risk assessment process and in the development of new mitigation actions. As a result, the counties collectively identified four regional mitigation actions, detailed in Table 5-3 below. These regional mitigation actions presented in this chapter were also included as county mitigation actions in 2016 and were identified as high priority actions by the SLV Steering Committee. The purpose of highlighting these four actions is to draw attention to recommended actions, engage potential partners, and hopefully improve opportunities for financial assistance from government and the private sector. By emphasizing the importance of these mitigation actions to the entire region, the intent is to improve opportunities for implementation through strength in numbers. During the 2022-2023 update these actions were revisited and determined that two were completed and two were ongoing. The ongoing efforts are being implemented through related actions identified in the county annexes. Two new regional mitigation actions were identified in 2022 related to long term power and gas resilience in the Region. While the implementation of this action is largely in the purview of private utility providers, the action is captured here to indicate their level of importance to the local governments in the San Luis Valley.

Table 5-3 Regional Mitigation Actions

ID	Mitigation Action	Problem	Priority	Leads/Potential Partners/ Funding Sources	Timeframe/Status/Implementation Notes
Regional Mitigation Action #1	Improve Wildfire Awareness and Public Compliance with Burn Restrictions. (1) Develop county-level plans to support information-sharing during Red Flag warnings; (2) Adopt Colorado Certified Burner Program (CBP) endorsed by the Colorado Division of Fire Prevention and Control and increase awareness of existing wildfire Red Flag warnings for ditch burns.	The combination of an extended drought in the Valley and extensive pine- and spruce-beetle kill in the forests has resulted in unprecedented fuel accumulation, or fuel loads, that allows wildfires and grass fires to ignite more easily, spread quickly and burn more intensely.	High	Fire Protection Districts, Colorado Division of Fire Prevention and Control, Colorado State Forest Service, County Sheriff and Emergency Management, Colorado Division of Homeland Security and Emergency Management	Completed with annual implementation
Regional Mitigation Action #2	Improve Doppler Radar for Region. Obtain funding and support to place another Doppler radar tower in the SLV area to improve weather predictions and warnings.	Insufficient weather radar coverage in wide area including the San Luis Valley and Four Corners area (including the three bordering states), resulting in challenges for warning coordination meteorologists in providing timely warning and watch information related to severe weather events,	High	NWS, Colorado Division of Homeland Security and Emergency Management, local funds	Completed. Doppler Radar installed in Alamosa.

ID	Mitigation Action	Problem	Priority	Leads/Potential Partners/ Funding Sources	Timeframe/Status/Implementation Notes
		including flash flooding, hail and lightning.			
Regional Mitigation Action #3	Plan for power grid disruptions and failure. Continue to support the efforts of public health, emergency management and non-profit organizations to expand awareness of natural hazards, strengthen family and business emergency preparedness, identify and equip public shelters, and identify and support the needs of people with disabilities and other vulnerable population groups.	There is no "loop" in the grid to provide an alternate power source in the Valley -- in a prolonged power outage, electricity, communications, normal emergency services, fuel, sanitation, food, medications and public transportation may all be unavailable.	High	SLV Emergency Preparedness and Response (EPR), County Public Health, American Red Cross	2023-2028; Continue – In Process; Implement through the following actions in the county annexes: Alamosa- A.27 Conejos- CON.19, CON.20 Costilla – COS.36 Mineral – M.12 Rio Grande – RG.25 Saguache – S.2, S.10, S.17, S.21
Regional Mitigation Action #4	Flood mapping/seek updated DFIRMs. (1) Determine process for requesting updated flood maps and whether a schedule exists for modernizing local maps; (2) Identify state and/or agencies to direct requests for updated mapping and procedures for petitioning the agencies to expedite mapping; (3) Determine benefits if any to coming together to make a joint, multi-county request.	A common issue with many communities in the San Luis Valley is outdated flood maps that make it difficult to make informed decisions on the ground by local land use staff.	High	Colorado Water Conservation Board (CWCB), FEMA, Colorado Division of Homeland Security and Emergency Management Facilitation, monitoring and implementation of these regional mitigation actions will be the responsibility of the San Luis Valley Hazard Mitigation	Continue – In Process; various flood mapping studies are in process as of 2023, including flood studies for the Alamosa County, City of Alamosa, Mineral County, Costilla County, and the Town of Saguache Implement through the following actions in the county annexes: Alamosa- A.2, A.14 Costilla – COS.16 Mineral – M.1, M.11 Rio Grande – RG.25 Saguache – S.20

ID	Mitigation Action	Problem	Priority	Leads/Potential Partners/ Funding Sources	Timeframe/Status/Implementation Notes
				Steering Committee and other agencies and individuals that participate in collaborative planning within the San Luis Valley All-Hazards Region	
Regional Mitigation Action #5	Valley-wide electric power redundancy	This project would identify the feasibility of an additional pathway for electricity into the Valley, or use of generation (solar, biomass). There is only one source into the valley over Poncha Pass providing service to the entire valley. Hazards that could impact the lines include: High Winds and Tornadoes, Hailstorm, Lightning, Severe Winter Storm, Wildland Fires, Cyber Attack .	High	Xcel Energy Lead with support from administration from counties municipalities, Funding: Private utility funds, grants, investors, low interest loans	New in 2022; Timeframe 2023-2033
Regional Mitigation Action #6	Valley-wide natural gas redundancy	This project would identify the feasibility of an additional pathway for natural gas into the Valley. There	High	Xcel Energy Lead with support from administration from counties municipalities, Funding:	New in 2022; Timeframe 2023-2033

ID	Mitigation Action	Problem	Priority	Leads/Potential Partners/ Funding Sources	Timeframe/Status/Implementation Notes
		is only one source into the valley over the divide from the Four Corners region providing service to the entire valley. The gas line is prone to landslides (in Archuleta County) and severe cold.		Private utility funds, grants, investors, low interest loans	

6 Plan Adoption, Maintenance, and Evaluation

6.1 Formal Plan Adoption

Following approval by the San Luis Valley Regional Hazard Mitigation Planning Committee (RHMPC), the next step in the process of local adoption is the submission of the final draft document to the Colorado Division of Homeland Security and Emergency Management (DHSEM) for state-level review. FEMA then reviews the plan and issues final approval, either by a notice that the plan is Approved Pending Adoption (APA) by the governing body of each participating jurisdiction, or if the plan has been adopted already, a final approval packet. The plan must be formally adopted by each participating local government jurisdiction within one calendar year of receiving notice of APA status. Records of adoption and the approval packet from FEMA are documented in Appendix D. Each county will post the approved HMP, with all adoption resolutions and FEMA approval packet, to its web site within three months of FEMA approval.

6.2 Plan Maintenance and Evaluation

Regular maintenance of this plan will help maintain a focus on hazards that pose the greatest risks and on the recommended measures for reducing future potential hazard losses. The six county Emergency Managers in the San Luis Valley Region will serve as the primary points of contact and will coordinate all local efforts to monitor, evaluate, and update this plan. Participating jurisdictions and individual departments are responsible for implementing their specific mitigation actions and reporting on the status of these actions to the Emergency Managers.

Plan maintenance involves an ongoing effort to monitor and evaluate the implementation of identified action items in the plan, and to update the plan as progress, opportunities, obstacles, or changing circumstances are encountered.

The RHMPC will convene at least once each year to review and update the status of recommended mitigation actions. The Emergency Managers will schedule these meetings and invite members of the RHMPC to attend. At this review meeting, the RHMPC will review new hazards data or studies, discuss new capabilities or changes in capabilities, consider any input received from the public, evaluate the effectiveness of existing mitigation actions, and modify or add mitigation actions.

The results of the formal review meeting will be captured by the Emergency Managers and summarized in an annual progress status report. These progress status reports will guide and inform future five-year plan updates. Throughout the year, the Emergency Managers will monitor the progress of mitigation efforts through site visits, phone calls and/or emails with the agencies responsible for mitigation actions.

Updates to this plan will follow the most current FEMA and DHSEM planning guidance. The Emergency Managers will initiate a five-year plan update process within the time necessary to ensure that the current plan does not expire before the updated plan is approved. The schedule should allow time for contracting of technical or professional services, state and FEMA reviews, revisions based on FEMA review comments, and the formal adoption process.

6.3 Mitigation Plan Integration with Other Plans and Programs

Mitigation is most successful when it is incorporated within the day-to-day operations of land use planning, road and bridge/public works, public health, and other mainstream functions of local government. Multi-objective projects that mutually benefit partners and stakeholders are usually more cost-effective and more-broadly supported. Many other local plans present opportunities to address hazard mitigation in a way that can support multiple community objectives.

Ideally, identified mitigation actions should be implemented through existing plans and policies, which already have support from the community and policy makers. The incorporation of elements of this plan into existing planning mechanisms requires coordination between the Emergency Managers and the staff of each department responsible for implementing specific mitigation actions.

The Emergency Managers, with support and guidance provided by the RHMPC, will work with the responsible agencies to incorporate this Plan into the following existing planning mechanisms; additional specific mechanisms are noted in each county Annex in Section 9:

- Community Wildfire Protection Plans
- County and Municipal Comprehensive Plans
- County and Municipal Emergency Operations Plans
- Zoning, subdivision, and floodplain ordinances
- Capital improvement plans and county and municipal budgets
- Other plans and policies outlined in the capability assessment in each county annex
- Rio Grande, Conejos River, and Saguache Creek Stream Management Plans
- Rio Grande Water Conservation District Habitat Management Plan
- San Luis Valley Basin Implementation Plan
- Colorado Resiliency Office COVID-19 Regional Roadmap to Recovery initiatives

The Risk Assessment (Chapter 4) included in this plan provides data, analysis, and maps that can be integrated into other plans to inform policies and decision-making. Considering hazard information in land use plans, zoning and subdivision codes, and the development review process is a proven method for guiding future development away from identified hazard areas. This information can also be used to design and site future public facilities to minimize exposure to hazards.

6.4 Continued Public Involvement

To provide an ongoing opportunity to raise community awareness of natural hazards, this plan will be posted on each county web page and public comments can be addressed to the Emergency Manager at the contact information provided. The five-year update process provides an opportunity to build public support by publicizing success stories related to implementation of mitigation actions.

All stakeholders in the planning process will be invited to participate in the next five-year update of this plan and additional participation will be solicited from the public, partner agencies, new entities, and community groups in the future. The plan maintenance and update process will include continued opportunities for public and stakeholder involvement and input through attendance at open public meetings, web postings, and press releases to local media.

In addition, the Emergency Managers and other members of the RHMPC will identify opportunities to raise community awareness, including attendance and provision of materials at county, municipal, and school-sponsored events, activities of the fire protection district, and through the American Red Cross and public mailings.

All public comments received about the plan will be collected by the Emergency Managers, incorporated into mitigation progress status reports, and considered in future plan updates.

APPENDIX A: ACRONYMS AND DEFINITIONS

ACRONYMS

%g	Percentage of gravity
°C	Degrees Celsius
°F	Degrees Fahrenheit
ACS	American Community Survey
APA	Approved Pending Adoption
BCEGS	Building Code Effectiveness Grading Schedule
BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure and Communities
CAIC	Colorado Avalanche Information Center
CARES	Coronavirus Aid, Relief, and Economic Security
CBRNE	Chemical, Biological, Radiological, Nuclear, and Explosive
CDC	Centers for Disease Control and Prevention
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health & Environment
CEPC	Central Electric Power Cooperative
CFM	Certified Floodplain Administrator
CFR	Code of Federal Regulations
CGS	Colorado Geological Survey
CIS	Community Information System
CISA	Cyber & Infrastructure Security Agency
COOP	Continuity of Operations Plan
COVID-19	Coronavirus Disease 2019
CPT	County Planning Team
CRO	Colorado Resiliency Office
CRHRS	Colorado Rockfall Hazard Rating System
CRS	Community Rating System
CSFS	Colorado State Forest Service
CWCB	Colorado Water Conservation Board

CWPP	Community Wildfire Protection Plan
DFIRM	Digital Flood Insurance Rate Maps
DHSEM	Division of Homeland Security and Emergency Management
DMA	Disaster Mitigation Act
DMV	Department of Motor Vehicles
DNR	Colorado Department of Natural Resources
DOT	U.S. Department of Transportation
DR	(Major) Disaster Declaration
DWR	Colorado Department of Water Resources
EAP	Emergency Action Plan
EF	Enhanced Fujita
EM	Emergency Declarations
EOC	Emergency Operations Center
EMS	Emergency Medical Services
EPA	U.S. Environmental Protection Agency
EPR	Emergency Response and Preparedness
FACE	Future Avoided Cost Explorer
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flooding Mitigation Assistance
FM	Fire Management Declaration
FPD	Fire Protection District
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
HAZMAT	Hazardous Materials
HAZUS	Hazard, United States
Hazus-MH	Hazards, United States-Multi Hazard

HIFLD	Homeland Infrastructure Foundation-Level Data
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
HMP	Hazard Mitigation Plan
HOA	Homeowner's Association
HPS	Hantavirus Pulmonary Syndrome
HIRA	Hazard Identification and Risk Assessment
HSIP	Highway Safety Improvement Program
JAMA	Journal of American Medical Association
MAC	Multi-Agency Coordination
ML	Magnitude Scale
MMI	Modified Mercalli Scale
MPH	Miles per Hour
NASA	National Aeronautics and Space Administration
NBI	National Bridge Inventory
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NDIS	Natural Diversity Information Source
NEPA	National Environmental Policy Act
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
NEHRP	National Earthquake Hazard Reduction Program
NICB	National Insurance Crime Bureau
NOAA	National Oceanic and Atmospheric Administration
NPMS	National Pipeline Mapping System
NRC	U.S. Coast Guard's National Response Center
NRCS	National Resources Conservation Service
NPR	National Public Radio
NWS	National Weather Service
OIT	Office of Information Technology (State of Colorado)

PA	Public Assistance
PAWSD	Pagosa Area Water and Sanitation District
PDM	Pre-Disaster Mitigation
PGA	Peak Ground Acceleration
PIF	Pandemic Intervals Framework
PLPOA	Pagosa Lakes Property Owners Association
PPE	Personal Protective Equipment
PSSGID	Pagosa Springs Sanitation General Improvement District
REC	Rural Electric Cooperative
RETAC	Regional Emergency Medical and Trauma Advisory Council
RHMPC	Regional Hazard Mitigation Planning Committee
RMP	Risk Management Plan
SBA	Small Business Administration
SCADA	Supervisory Control and Data Acquisition
SFHA	Special Flood Hazard Area
SLV	San Luis Valley
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
THIRA	Threat and Hazard Identification and Risk Assessment
TRI	Toxic Release Inventory
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Services
USGS	U.S. Geological Survey
VFD	Volunteer Fire Department
WATF	Water Availability Task Force
WHO	World Health Organization
WRCC	Western Regional Climate Center
WSSI	Winter Storm Severity Index
WUI	Wildland Urban Interface

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.

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.

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.

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.

Dam: Any artificial barrier or controlling mechanism that can or does impound 10 acre-feet or more of 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.

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: An earthquake is defined as 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. Earthquakes can last from a few seconds to over 5 minutes and have been known to occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris as shocks shake, damage, or demolish buildings and other structures.

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.

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.

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.

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.

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. In 2007, the NWS began rating tornadoes using the **Enhanced Fujita Scale**. The EF-scale is a set of wind estimates (not measurements) based on damage ranked from EF0 to EF5. Standard measurements are taken by weather stations in open exposures.

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).

Liquefaction: Liquefaction is the complete failure of soils, occurring when soils lose shear strength and flow horizontally. It is most likely to occur in fine grain sands and silts, which behave like viscous fluids when liquefaction occurs. This situation is extremely hazardous to development on the soils that liquefy, and generally results in extreme property damage and threats to life and safety.

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.

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.

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.

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.

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.

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.

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%.

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.

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.

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.

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PLANNING PROCESS APPENDIX

Note: This appendix provides documentation of the plan update process during the 2022-2023 timeframe.

Kickoff Meeting: April 28, 2022

San Luis Valley Regional Hazard Mitigation Plan 2022 Update Kick Off Meeting Agenda

Date: Thursday April 28, 2022 **Time:** 1:30-3:00 MST

Webinar Link: https://us06web.zoom.us/j/2703146874

Call in Number: +1 346 248 7799
Meeting ID: 270 314 6874#

Project: San Luis Valley Regional Hazard Mitigation Plan

Subject/Purpose

This meeting will kickoff the 2022 the development of the San Luis Valley Regional Hazard Mitigation Plan. Each of the six counties in the San Luis Valley (Alamosa, Conejos, Costilla, Mineral, Rio Grande and Saguache) have existing plans that will form the basis for the Regional Hazard Mitigation Plan (HMP). The HMP identifies hazards, vulnerabilities, and ways to reduce hazard impacts through long-term sustainable mitigation projects. The requirements, process and schedule will be explained for participating jurisdictions and stakeholders. The meeting will provide an opportunity to review the hazards identified for profiling and vulnerability analysis.

Attendees: Hazard Mitigation Planning Committee and Stakeholders

1. Introductions
2. Hazard Mitigation Overview (CO DHSEM)
3. Mitigation Planning Process and Requirements
4. Role of the Hazard Mitigation Planning Committee and County Planning Teams
5. Overview of 2018 Hazard Mitigation Plans and Identified Hazards
6. Coordination with Other Agencies, Related Planning Efforts, & Recent Studies
7. Planning for Public Involvement
8. Project Schedule, Information Needs and Next Steps
9. Questions and Answers

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San Luis Valley
Regional Hazard Mitigation Plan 2022

Hybrid Kick-Off Meeting Summary
Thursday, April 28, 2022
1:30 – 3:00 pm MST
Hybrid (Zoom and In-Person) Meeting

Introductions and Opening Remarks

This document summarizes the kickoff meeting for the San Luis Valley Regional Hazard Mitigation Plan in 2022. The meeting was facilitated by Wood Environment & Infrastructure Solutions, Inc. (Wood) via Microsoft Teams, with some members of the Regional Hazard Mitigation Planning Committee (RHMPC) attending in person at the Alamosa County Emergency Operations Center. Wood serves as the consulting firm working under a contract with Alamosa County to facilitate the planning process to develop the San Luis Valley Regional Hazard Mitigation Plan, which will cover all six counties (Alamosa, Costilla, Conejos, Rio Grande, Mineral, Saguache), in the San Luis Valley.

Jeff Brislawn, Project Manager with Wood, began the meeting with a brief introduction of the plan update and emphasized the importance of maintaining a current Hazard Mitigation Plan (HMP), which is necessary for jurisdictions who seek FEMA mitigation grant funding before or after disasters. Jeff and the Wood team have worked on several HMPs near the region, including Chaffee County, Hinsdale County and Archuleta County. Jeff then introduced the Deputy Project Manager, Amy Carr, and the two Hazard Mitigation Planners, Chris Johnson and Natalie Schoen, who compose the Wood Team that will be assisting with the plan update. Jeff also mentioned that the Wood GIS Specialist, Mack Chambers, will be another member of the Wood Team working on the HMP.

Jeff emphasized the importance of jurisdiction participation throughout the planning process . A steering committee that consists of the emergency managers for each of the six counties will be lead points of contact for the collective Regional Hazard Mitigation Planning Committee (RHMPC) and Local Planning Committees (LPC) within each county. These points of contact are:

- Jeff Brislawn jeff.brislawn@woodplc.com – Project Manager, Wood
- Amy Carr amy.carr@woodplc.com – Deputy Project Manager, Wood
- Eric Treinen etreinen@alamosacounty.org – Emergency Manager, Alamosa County
- Rodney King rodney@co.conejos.co.us - Emergency Manager, Conejos County
- Art Wittner rgcoem@riograndecounty.org - Emergency Manager, Rio Grande County
- Terry Wetherill mincoemc@mincocolo.com - Emergency Manager, Mineral County
- Bobby Woelz rwoelz@saguachecounty-co.gov - Emergency Manager, Saguache County
- Christopher Rodriguez chris.rodriguez@costillacounty-co.gov - Emergency Manager, Costilla County

Jeff then asked those attending to introduce themselves by stating their name, title, and agency/jurisdiction. Sixty-nine (69) persons representing a mix of the consultant team, county departments, and cities were present for the meeting. Using an interactive tool called Slido Polls, Jeff asked attendees if they had participated in their county's previous Hazard Mitigation Plan (HMPs), to which 34% of people responded yes and 66% said no. The response to this question and all other Slido Poll questions asked throughout the meeting can be found under the attachments section at the end of this document.

Following introductions, Jeff discussed the agenda items. The key discussion is summarized below, and additional details are within the meeting PowerPoint presentation. The Slido Poll responses are included at the end of the document, in addition to a list of attendees and additional comments made during the presentation are noted in the meeting chat log at the bottom of this document.

Hazard Mitigation Overview (Colorado DHSEM)

Emily Palmer with the Colorado Department of Homeland and Emergency Management gave a presentation on the concept of hazard mitigation planning and its importance. Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from natural or human-caused hazards. Mitigation planning guides mitigation activities in a coordinated and economic manner to make communities more disaster resilient. An example of a hazard mitigation strategy is the practice of elevating homes located near a river, so the house stays above rising water during a flooding event and therefore minimizes damages to the home. The FEMA definition of mitigation does not include purchasing emergency vehicles or radios for communication, because those resources would be used to respond to a disaster, not prevent one.

Emily explained the U.S. Disaster Mitigation Act of 2000 requires state and local governments to adopt a hazard mitigation plan, updated every 5 years, to maintain eligibility for pre- and post-disaster FEMA mitigation assistance grants. Emily stated there are two main types of benefits a community gain from having a FEMA approved hazard mitigation plan (HMP); (1) the planning process is a great way to collaborate with other jurisdictions in the community; (2) having an HMP approved by FEMA makes a community eligible for FEMA grants (Pre-Disaster Mitigation, Flood Mitigation Assistance, Hazard Mitigation Grant Program-Post-Disaster). She noted that any funding requests from FEMA needs to be based on the hazards and mitigation strategy in the HMP. She added that information from the HMP, specifically the vulnerability assessment and mitigation strategy, can be used in other hazard related plans such as an Emergency Operations Plan.

There are trends resulting in increased costs for disaster response and recovery related to population growth and the increase in the types of events we experience as a community. Emily explained we need these plans for several reasons because the reduce future recovery costs, we can plan around predictive events, and they guide mitigation activities in a coordinated manner. Additionally, mitigation efforts are economically beneficial. It was found that, on average, for every $1 spent on mitigation, an average of $6 is saved during disaster response. Emily concluded by emphasizing that the HMP is not a regulatory document and there is no penalty for jurisdictions who are not able to meet all the hazard mitigation goals. Rather, this plan is used to outline the goals and actions that help communities better prepare for and respond to disaster events

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Hazard Mitigation Planning Process and Requirements

Amy Carr (Wood) presented a slide with the update requirements for the San Luis Valley 2022 Regional Hazard Mitigation Plan (HMP). She explained that this update will build on the previous six county HMPs, each created in 2018. A significant part of the update requirements includes revisiting the old plan and noting any changes in the risk assessment and capability assessment. Additionally, Amy explained that the Wood team will rely on the Regional Hazard Mitigation Planning Committee (RHMPC) and the public for any successful mitigation projects that change risk exposure. This information is important because it helps the team understand where improvements can be made and understand the strategies that worked well for the area. Other requirement for the plan update includes revisiting goals and identify completed, deleted, or deferred actions.

Amy continued to discuss the key elements for the plan update, such as updating the risk assessment to reflect changes in current hazards, risk and vulnerability, and climate change considerations since the 2018 HMPs. Additionally, Amy noted another key element of the HMP update is to analyze the progress on previous mitigation actions and create new actions.

Amy then presented a slide with the counties and their jurisdictions that are expected to participate in 2022 and will need to re-adopt the plan:

- **Alamosa County:** Alamosa County, City of Alamosa, Town of Hooper, Alamosa County Fire Protection District, Rio Grande Water Conservation District
- **Conejos County:** Conejos County, Town of Antonito, Town of La Jara, Town of Manassa, Town of Romeo, Town of Sanford
- **Costilla County:** Costilla County, Town of San Luis, Town of Blanca
- **Mineral County:** Mineral County, City of Creede
- **Rio Grande County:** Rio Grande County, City of Monte Vista, Town of Del Norte, Town of South Fork
- **Saguache County:** Saguache County, Town of Center, Town of Crestone, Town of Moffat, Town of Saguache

Amy continued the meeting with the specific planning requirements the Region and each County will have to meet to have a FEMA approved plan. Amy explained that the San Luis Valley Regional HMP (HMP) will be updated in accordance with the Disaster Mitigation Act (DMA) requirements. The original FEMA planning process involves a 4 Phase approach:

1. **Get Organized:** Amy described that the first phase in the approach is a commitment from jurisdictions to participate in planning and determine the planning team. The Regional Hazard Mitigation Planning Committee (RHMPC) includes county, municipalities, and special districts. The RHMPC is a tiered structure, starting with the advisory committee, which is composed of the six county emergency managers. Below each county emergency manager are the respective County Planning Teams, which consist of county, city and town departments, stakeholders, and any special district in the counties. Amy emphasized that local input and participation from RHMPC members is required for full FEMA approval. Stakeholders include other local, state, and federal agencies with a stake in hazard mitigation in the Region or may include academic institutions and local business and industry. Neighboring

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counties were also notified about the update and will be given an opportunity to provide input into the process. Amy identified the planning area for the HMP update as all incorporated and unincorporated areas of the six counties in San Luis Valley Region (Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache). Amy then asked the group if there are any other stakeholders that should be involved in this process. See results of the poll questions at the end of this summary.

2. Risk Assessment: Amy explained that the hazard identification and risk assessment (HIRA) is used to describe hazards, identify community assets, analyze risk based on gaps in assets, and summarize vulnerability. Conducting a risk assessment is a key aspect of a hazard mitigation plan and involves two components; hazard identification (what can happen here) and the vulnerability assessment (what will be affected). The HMP update will be based on existing documents and studies, with the previous six county HMPs providing the baseline for identified hazards and the groundwork for goals, policies, and actions for hazard mitigation. Data on hazards from the past 5 years will be used to conduct the risk assessment, using sources such as GIS-based maps, historic records, insurance data, etc. Members of the RHMPC and the public will ground truth this data to ensure the HMP is accurate and to maximize the utility of the document. Amy then asked the group if they have any specifics on hazard impacts in the past 5 years. See results of the poll questions at the end of this summary.

3. The vulnerability assessment will be used to determine what life and property are at risk of damages to the identified hazards for each county. The 7 community lifelines will be used to organize community assets and then a vulnerability assessment will be conducted to identify infrastructure and groups of people who will be more likely to experience losses. Amy asked the group what growth and development trends in the past 5 years may have increased or decreased vulnerability to hazards. Amy concluded the section by sharing a slide that highlighted various hazards information resources that could provide beneficial information for this plan update, including the previous county HMPs and the Colorado State Hazard Mitigation Plan. Amy then asked the group what other existing or recent plans, reports, or studies should be reviewed during this planning process. See results of the poll questions at the end of this summary.

4. **Update the Mitigation Strategy:** Amy continued to explain that the third step consists of reviewing goals and objectives from the previous six County HMPs, reviewing mitigation alternatives to expand or improve previous goals, and then drafting an action plan. Several types of mitigation projects are eligible for FEMA funding, including wildfire, flooding, winter storms, landslides, generator installation, climate resilience activities, etc.

5. **Adoption and Implementation:** Amy described how the public will provide input on the draft HMP before the official adoption of the plan by the governing board occurs. Once the plan is officially adopted, the designated project manager will integrate the plan into existing structures and track progress of the mitigation actions. The HMP will be revised as necessary to keep the plan current. Amy emphasized that to ensure that this HMP used, it is important to incorporate the document into existing plans and reference the document in the future.

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Role of the Regional Hazard Mitigation Planning Committee & County Planning Teams

Amy Carr (Wood) emphasized the importance of all jurisdictions stay involved in the planning process to get full FEMA approval of the HMP and ensure that the plan is suited to local needs. The role of the RHMPC is to provide accurate information and contribute ideas that will ensure the HMP is a useful document. The RHMPC will also play a crucial role in the gathering of public input. Wood will create the documents and public survey and the RHMPC will be responsible for sending this information out to their communities.

Participation includes the following for the **Regional Hazard Mitigation Planning Committee (RHMPC) members**:

- Attend meetings and participate in the planning process
- Provide requested information to update or develop jurisdictional information
- Provide status of previous mitigation projects
- Identify new mitigation projects
- Review drafts and provide comments
- Assist with and participate in the public input process
- Track your time for local match purposes

Participation for **jurisdictions**:

- Participate in the County RHMPC
- Coordinate with other departments/agencies from your jurisdiction
- Update jurisdictional information
- Identify new mitigation actions
- Complete and return Plan Update Guide
- Coordinate formal adoption

Participation for **stakeholders**:

- Attend RHMPC meetings or stay in loop via email list
- Provide data/information
- Partner on mitigation efforts
- Review and comment draft plan

Overview of 2018 Hazard Mitigation Plans and Identified Hazards:

Amy showed a slide that compared the hazards from the various 2018 HMPs and highlighted the difference between the previous county HMPs. While most of the hazards were included in all six of the previous county HMPs, several hazards were unique to a single county or were excluded from at least one county HMP. These hazards are avalanche, flash flood, land subsidence, lightning, water contamination, and windstorm. Amy then asked the group what other hazards should be considered in the plan update. See results of the poll questions at the end of this summary.

Hazard	Alamosa County	Conejos County	Costilla County	Mineral County	Rio Grande County	Saguache County
Avalanche	X	X		X	X	X
Dam Failure	X	X	X	X	X	X
Drought	X	X	X	X	X	X
Earthquake	X	X	X	X	X	X
Flood	X	X	X	X	X	X
Flash Flood	X					
Hail	X	X	X	X	X	X
Landslide	X	X	X	X	X	X
Land Subsidence			X			
Lightning	X	X		X	X	X
Severe Winter Storm	X	X	X	X	X	X
Tornado	X	X	X	X	X	X
Water Contamination			X			
Wildfire	X	X	X	X	X	X
Windstorm	X	X		X	X	X

Amy then gave an overview of the goals and mitigation actions from the previous county HMPs. Alamosa, Conejos, Mineral, Rio Grande, and Saguache Counties had the same three goals:

1. Reduce loss of life and personal injury caused by natural hazards.
2. Reduce damage to critical facilities, personal property, and other community assets caused by natural hazards.
3. Minimize economic losses associated with natural hazards.

The previous Costilla County HMP was written by the former and current County Emergency Managers, therefore the goals for Costilla County are different than the five other counties listed above. Costilla County listed nine goals:

1. Enhance the safety of residents and businesses by protecting new and existing development from the effects of hazards.
2. Protect new and existing public and private infrastructure and critical facilities from the effects of hazards.
3. Increase the communities' floodplain management activities and participation in the National Flood Insurance Program (NFIP).
4. Ensure hazard awareness and risk reduction principles are institutionalized into the jurisdictions' daily activities, processes, and functions by incorporating it into policy documents and initiatives.
5. Enhance community-wide understanding and awareness of community hazards.
6. Publicize mitigation activities to reduce the area's vulnerability to hazards.
7. Limit or discourage development in geologic hazard and wildfire prone areas.
8. Limit floodplain development to maintain public safety and protect the integrity of Riparian Corridors.
9. Provide for sustainability for the Water Supplies in Costilla County.

Amy concluded this section of the presentation by reviewing the mitigation actions from the 2018 HMPs. The total number of mitigation actions varied by county. Each county will be asked to report

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back to Wood the status for each action (Completed, In Progress, Not Started, Annual Implementation or Deleted). Amy emphasized again that there is no penalty for not starting the mitigation actions. This information will only be used to help Wood and the planning team judge whether the actions need to be changed to improve their effectiveness. Each participating jurisdiction (county, municipality, special district) will also need to add a at minimum 1 new mitigation action to the updated plan per FEMA requirements. The total number of mitigation actions per county in the previous HMPs are:

- Alamosa County: 21
- Conejos County: 31
- Costilla County: 31
- Mineral County: 11
- Rio Grande County: 14
- Saguache County: 28

Coordination with Other Agencies, Related Planning Efforts, & Recent Studies:

Amy Carr (Wood) facilitated a discussion on recent studies of hazards in other documents and reports that are related to the San Luis Valley HMP. Amy again emphasized the importance of integrating the updated HMP into other plans and vice versa to ensure the plan is being used effectively. Amy asked the group what opportunities exist to coordinate or integrate the HMP with other planning mechanisms. See results of the poll questions at the end of this summary.

Planning for Public Involvement

Amy noted that a survey will be developed to gather input from the public on hazard concerns and mitigation ideas. It is advantageous to involve the public in the planning process to strength local support for the plan and ensure that the mitigation actions outlined in the HMP will better suit local needs. The survey is an online form that takes less than 5 minutes to complete. The URL for the survey will be sent to the RHMPC to be advertised to community members through public information channels, official websites, social media, email blasts, etc. The RHMPC will also keep a record of public outreach for documentation purposes and report to Wood. Amy emphasized the importance of the public outreach to find the gaps between what the experts think and what the community perceives as risk. Amy asked the group if there are any upcoming opportunities for outreach at scheduled public meetings or events. See results of the poll questions at the end of this summary.

Project Schedule, Information Needs and Next Steps:

Jeff Brislawn (Wood) discussed a slide with initial information needs and next steps. Jeff encouraged the RHMPC to stay involved in these ways and provide any of the following information by email:

- Review existing hazard mitigation plans
- Recent hazard events (since 2018) – damages, incident logs, damage assessments, etc.
- Growth and development trends
- Recent updated plans and policies
- Stay informed by email of upcoming meetings

Jeff then explained that a Plan Update Guide (PUG) will be sent to all participating jurisdictions. Jurisdictions should review the hazard identification and ranking and fill out the status of actions from the previous HMP and return the PUG to Wood by a date to be determined. Jeff also encouraged all jurisdictions to send the public survey as broadly as possible.

Jeff concluded the meeting by discussing the next steps in the planning process. Jeff explained that the HMP will be updated over the next year, with at least two more meetings with the RHMPC and a predicted final approval date for the HMP by July 2023. Wood will be updating the Hazard Identification and Risk Assessment (HIRA) in the next few months, with input from the RHMPC. Four drafts of the HMP will be created: the first for internal review by RHMPC committee, a second for public review, a third for state review, and the final FEMA review. The first draft for RHMPC review is targeted for September-October of 2022, a public review draft in November-December of 2022, followed by a review by Colorado DHSEM in January-February of 2023, and then tentatively approved by FEMA in July 2023.

Project Milestones	Anticipated Timeline
Meeting #1 Kickoff Meeting	April 28th
Public Survey	May
Meeting #2 HIRA review	June-July
HIRA Draft for HMPC review	June-July
Meeting #3 Mitigation Strategy	July-August
HMPC Review Draft	September-October
Public Review Draft	November-December
DHSEM Review Draft	January – February 2023
Final Plan for FEMA Review (estimated)	March – April 2023
Final Approved HMP for local adoption	May-July 2023

The Wood Team will provide the meeting summary, handouts, presentation, and sign in sheet to the County Emergency Managers by email so that other RHMPC members that could not attend today's meeting can 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 RHMPC meeting will be following the update of the Hazard Identification and Risk Assessment section of the plan. The specific date will be shared when available.

Jeff Brislawn and Amy Carr ended the meeting by thanking everyone for their attendance and active participation throughout the meeting.

Adjourn

The meeting adjourned at 2:55 pm MST.

Attachments

Slido Poll Results:

1. If you didn't have to be in the meeting today, what would you rather be doing? Responses include:
    - Fishing
    - Sleeping
    - No place I would rather be
    - Camping
    - Reading
    - Mexico
    - Golfing
2. Did you participate in your county's previous HMP?
    - Yes: 34%
    - No: 66%
3. What other hazards should be considered?
    - Deer taking over the city
    - Festival preparation
    - Cyber attack
    - Pandemic human or animal
    - Railroad derailment
    - Loss of communications – radio towers, cell towers
    - Pandemic management
    - Biological e.g. pandemic epidemic
    - Outbreak
    - Hazardous Materials, cyber,
    - Outage and failure of communication
    - POL shortages
    - Septic waste failures
    - Dust Storm
    - Wind damage
    - Widespread electrical outage
    - Meteor strike.

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- Hazardous material spills
- Civil unrest
- Water contamination
- Power Failure

4. What growth and development trends in the past 5 years may have increased or decreased vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)?

    - Homeless population growing
    - Fires in the non- traditional WUI (grass and shrub)
    - Increase in homes in WUI areas
    - EMS workers being priced out of housing
    - Drought
    - Increased tree death in RGNF 2nd
    - Home developments in WUI
    - Dead trees
    - Development in floodplains
    - Increased demand for RV development
    - Beetle kill in San Juan Mountain
    - Range development in floodplain in Alamosa city
    - Aging community, senior needs
    - People who live off grid

5. Do you have specifics on any hazard impacts in the past 5 years (damage assessments, people and property impacts, repair costs, etc?)

    - Wind and fire impacts
    - Spring fire
    - Flooding along the Rio Grande
    - Electrical outage
    - Wind
    - Wildfire dead trees
    - Monte Vista fire
    - Flood
    - Fire, Multi-car accidents
    - Flashfloods taking out roads
    - Pandemic
    - Drought
    - Blizzard

6. What other existing or recent plans, reports, or studies should be reviewed for this planning process?

    - After Action Reports

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- COOP Plans
- Water infrastructure, road network for fire mitigation.
- Recent disasters
- LPHA POD Plans
- Drought statistics, flow rates on streams and rivers.
- CEPA (Colorado Emergency Preparedness Assessment)
- CWPPs
- Municipal Water Source Protection plans
- Evacuation plan
- CEPA

7. What opportunities exist to coordinate or integrate the Hazard Mitigation Plan with other planning mechanisms?

- Adoption of FEMA mapping in Conejos County
- Rebuilding EOC capabilities Defensive spaces New Dam storage
- Coordinate mitigation strategies with CWPP actions
- Fire & Evacuation Drills Tabletops at Health facilities
- Some of this can be combined with the Multi Agency Group meeting.
- Continued meetings and planning sessions scheduled by County Emergency Manager
- Conservancy District Assessment
- Current work on levees in City of Alamosa
- Utilizing Ski Hi Complex as a regional emergency shelter
- Levee recertification process
- CEPA
- Levee
- Airport plan

8. Are there any upcoming opportunities for outreach at scheduled public meetings or events?

- Early iron
- Ski Hi Stampede
- Town board meetings Conejos River Residents Summer meeting Pioneer days SLV CITIZEN Pod casts
- Schools, Monthly POA meetings
- Summerfest
- Bi-lingual
- Plan on three community meeting
- Summer rodeos
- Radio stations Newspaper Social Media Utility bills
- Alamosa roundup
- Childcare for attendees at an event
- Monthly Economic Dev meetings
- 7 Peaks

wood.

9. What other key stakeholders should be involved in this process?

- BLM, Forest Health Agency/Association
- Forest Personnel
- Airports
- Weather forecaster
- Faith based leaders
- Local industries
- CSP
- Public Health, EMS
- Town of Crestone
- CPW
- Conejos County Hospital Administration
- Schools ASU
- All utilities
- County commissioners
- National Park Service

Zoom Chat Log:

13:37:22 From Pam Rice, Great Sand Dunes NP&Pre : Pam Rice, Great Sand Dunes National Park and Preserve
13:37:31 From wmaez : Wendi Maez, Saguache County Administrator
13:37:53 From Rodney King : Rodney King, Conejos County OEM
13:38:24 From Amy Carr : slido.com Code #HMPKickoff
13:38:39 From WillH : Will Hickman, SLV Regional Airport Manager
13:39:02 From Ben Doon : Ben Doon, Costilla County Administrator
13:42:39 From joannakdok : Joanna Dokson Baca Grande Ambulance
13:43:47 From Mark Thompson (DHSEM) : Don't sell yourself short Chris. You did a bunch of great work on it!
13:44:19 From Tristram Post, Rio Grande NF, Saguache RD : Tristram Post, Rio Grande National Forest, Saguache Ranger District
13:44:19 From Rick Basagoitia - DNR : Rick Basagoitia
13:44:23 From Chris Rodriguez, Costilla OEM : Thanks Mark
13:44:24 From Bobby Woelz, Saguache OEM : Bobby Woelz, Saguache County Office of Emergency Management
13:44:24 From jcreel : Jared Creel Colorado State Patrol Hazmat
13:44:25 From Corey Gomez : Corey Gomez, Xcel Energy - Gas Operations Manager
13:44:27 From Adam Moore-CSFS : Adam Moore - Colorado State Forest Service
13:44:28 From Brett Williams :) : Brett Williams, State Patrol, Troop Commander overseeing all six counties in the SLV
13:44:34 From debra : Deb Yarbrough Monte Vista Cooperative
13:44:36 From Art : Art Wittner Rio Grande County EM
13:44:37 From christophersittler : Chris Sittler GM Stone's Farm Supply Saguache Cty

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13:44:39 From Ashley Valdez Xcel Energy : Ashley Valdez - Area Manager Community & Local Govt. Affairs for Xcel Energy in Southern Colorado
13:44:41 From Rick Basagoitia - DNR : Rick Basagoitia, Area Wildlife Manager, Colorado Parks and Wildlife
13:44:48 From Brett Williams :) : Hazard plans at state level
13:45:07 From Stephanie Ruybal : Stephanie Ruybal - City of Monte Vista - Ski Hi Complex Manager
13:45:16 From Linda D. : Linda DeHerrera - Conejos County Land Use Administrator
13:45:17 From Paul Wertz : Paul Wertz, Director Costilla County Public Health. no
13:45:45 From Janet Beiriger : Janet Beiriger Saguache County Public Health Deputy Director/EPR Manager
13:46:44 From Kaleigh : Kaleigh White, Operations Manager for Rio Grande County Public Health
13:49:22 From Devin Haynie - CDPS : Devin Haynie Deputy District Chief Colorado Division of Fire Prevention and Control. Participated in last go round.
13:52:01 From Diana Jones : Diana Jones, Alamosa School District Superintendent
13:52:33 From Kevin Daniel : Kevin Daniel, Executive Director of Infrastructure/Resources at Adams State University
13:53:56 From Jeff Brislawn, Wood : Jeff Brislawn, Project Manger, Wood Environment & Infrastructure Solutions
13:55:42 From Tara Hardy : Tara Hardy, Mineral County Public Health
13:57:52 From Mark Thompson (DHSEM) : SLVREC
13:58:36 From Ashley Valdez Xcel Energy : sorry. that was suppose to say Utilities.
14:15:56 From asmith : Annarae smith- Conejos county public health
14:23:10 From Gigi Dennis, Monte Vista : What does THIRA stand for?
14:23:37 From Eric Treinen Alamosa County OEM : Threat Hazard Risk Assessment
14:24:04 From Gigi Dennis, Monte Vista : Thanks Eric.
14:40:25 From Mark Thompson (DHSEM) : County fairs, 4th of July, etc.
14:43:57 From Greg : Greg Heavener - National Weather Service
14:52:39 From MedinaT : Tara Medina Costilla County Planning and Zoning.
14:53:40 From David R. Osborn: DHSEM : Good stuff Mark. Thank you for the professional guidance
14:54:45 From Gigi Dennis, Monte Vista : thank you!!
14:54:54 From wmaez : THANKS!
14:55:02 From Amy Carr : Thank you everyone!

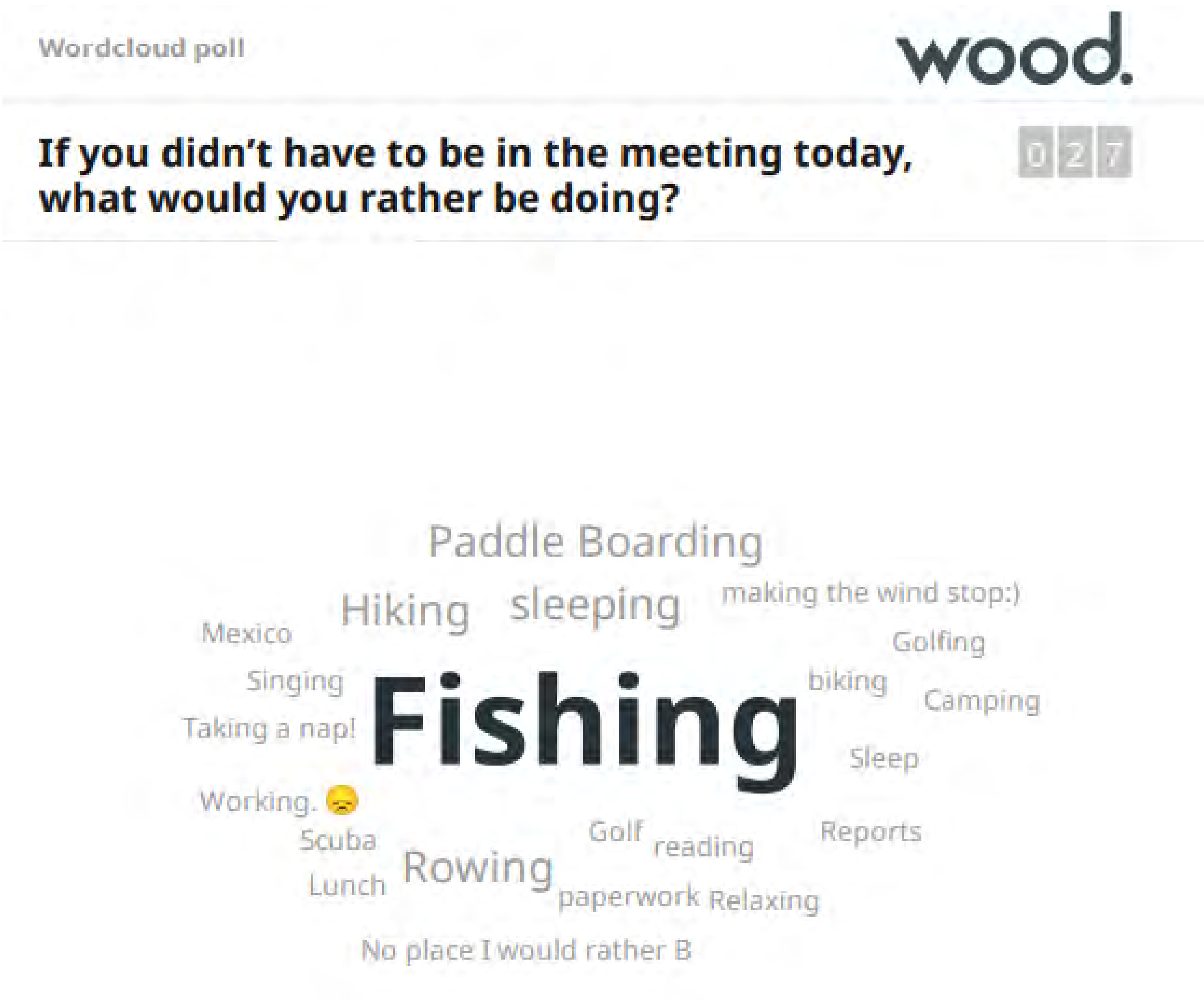
Slido Polls: Kickoff Meeting

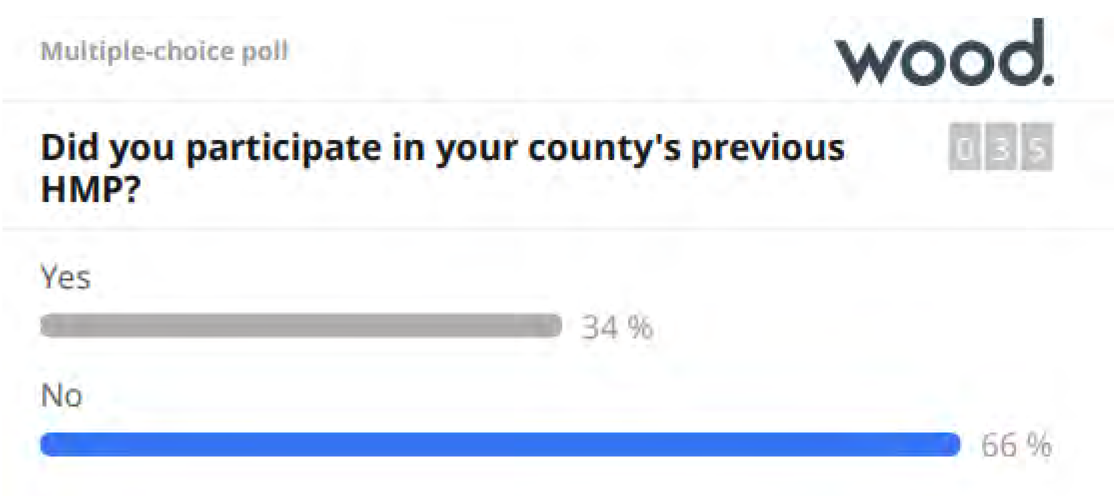
San Luis Kickoff

20 Apr - 05 May 2022

Poll results

Table of contents


Wordcloud poll
wood.
If you didn't have to be in the meeting today, what would you rather be doing?
0 2 7
Paddle Boarding
Hiking
sleeping
making the wind stop:)
Mexico
Golfing
Singing
Fishing
biking
Camping
Taking a nap!
Sleep
Working.
Scuba
Golf
reading
Reports
Lunch
Rowing
paperwork
Relaxing
No place I would rather B


Multiple-choice poll
wood.
Did you participate in your county's previous HMP?
0 3 5
Yes
34 %
No
66 %

Open text poll

wood.

What other hazards should be considered? 0 2 0

- deer taking over the city
- Festival preparation
- Cyber attack
- Pandemic human or animal
- railroad derailment
- Loss of communications - radio towers, cell towers
- Pandemic management
- biological e.g. pandemic epidemic
- Outbreak
- Hazardous Materials, cyber,
- Outage and failure of communication
- POL shortages
- Septic waste failures
- Dust Storm
- Wind damage
- Communication
- Widespread electrical outage
- Meteor strike.
- Hazardous material spills
- civil unrest
- water contamination
- Power Failure

Open text poll

wood.

What growth and development trends in the past 5 years may have increased or decreased vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)? 0 1 4
(1/2)

- Homeless population growing
- fires in the non- traditional wui (grass and shrub)
- Homelessness
- Beetle kill
- Increase in homes in WUI areas, EMS workers being priced out of housing. Aging community Drought
- Quod& floodplain developers
- Increased tree death in RGNF 2nd home developments in WUI
- more homes in the WUI Dead trees
- Some development in the WUI
- increase in homeless...
- Development in floodplains, people living off the grid, increased demand for Rv development
- Beetle kill in San Jaun Mountain range
- development in floodplain in Alamosa city

Open text poll

wood.

What growth and development trends in the past 5 years may have increased or decreased vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)?
(2/2)

0 1 4

- aging community, senior needs
- Let the front range have our water and we will look as developed as south park
- People who live off grid

Open text poll

wood.

Do you have specifics on any hazard impacts in past 5 years (damage assessments, people and property impacts, repair costs etc?)

0 1 4

- Wind and fire impacts
- Spring fire
- Flooding along the Rio Grande Electrical outage
- Wind, loss of power Flash floods
- Wildfire dead trees
- Monte Vista fire
- Flood
- Fire, Multi car accidents
- Wind
- flashfloods taking out roads
- Pandemic, fire, flash flooding, drought
- Wind and wildfire
- fire, blizzard
- Drought

Open text poll

wood.

What other existing or recent plans, reports, or studies should be reviewed for this planning process?

0 1 1

- After Action Reports
- COOP Plans
- Water infrastructure, road network for fire mitigation.
- Evap plans
- Recent disasters.
- Thanks Mark
- LPHA POD Plans
- Drought statistics, flow rates on streams and rivers.
- CEPA (Colorado Emergency Preparedness Assessment)
- CWPPs
- Municipal Water Source Protection plans
- Evacuation plan
- CEPA

Open text poll

wood.

What opportunities exist to coordinate or integrate the Hazard Mitigation Plan with other planning mechanisms?

0 1 3

- Adoption of fema mapping in Conejos County
- Rebuilding EOC capabilities Defensive spaces New Dam storage
- Coordinate mitigation strategies with CWPP actions
- Fire & Evacuation Drills Tabletops at Health facilities
- Some of this can be combined with the Multi Agency Group meeting.
- CWPP
- Continued meetings and planning sessions scheduled by County Emergency Manager
- Conservancy District Assessment
- current work on levees in city of alamosa
- Utilizing Ski Hi Complex as a regional emergency shelter
- Cwpp
- Levee recertification process
- CEPA
- Levee
- Airport plan

Open text poll

wood.

Are there any upcoming opportunities for outreach at scheduled public meetings or events?

0 1 1

- Early iron
- Ski Hi Stampede
- Town board meetings Conejos River Residents Summer meeting Pioneer days SLV CITIZEN Pod casts
- Schools, Monthly POA meetings
- Summerfest
- bi-lingual
- Plan on three community meeting
- Summer rodeos
- Radio stations Newspaper Social Media Utility bills
- Alamosa roundup
- child care for attendees at an event
- Monthly Economic Dev meetings
- 7 Peaks
- food

Open text poll

wood.

What other key stakeholders should be involved in this process?

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- BLM, Forest Health Agency/Association
- Forest Personnel
- Airports
- Weather forecaster
- Faith based leaders
- Local industries
- CSP
- Public Health, EMS
- It seems all everyone is present.
- Town of Crestone
- CPW
- Conejos County Hospital Administration
- Schools ASU
- All utiities
- Church leaders
- County commissioner
- Commissioners
- I think you forgot the National Park Service
- Conejos County Commissioners

Risk Assessment Meeting: August 15, 2022

SAN LUIS VALLEY

REGIONAL HAZARD MITIGATION PLAN

RISK ASSESSMENT MEETING

Monday August 15, 2022
2:00pm-4:00pm
Alamosa County Commissioner's Meeting Room/Zoom
8900 Independence Way
Alamosa, CO

1. **Introductions**
2. **Review Of Hazard Mitigation Planning Process and Requirements**
3. **Update On Public Involvement Activities**
4. **Review Of Hazards and Vulnerability Assessment Update**
5. **Review Of Mitigation Goals**
6. **Next Steps**
7. **Questions And Answers**

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San Luis Valley Regional Hazard Mitigation Plan
2022-2023 HMP Update

Risk Assessment Meeting Summary
August 15, 2022; 2:00-4:00 pm MT

Subject/Purpose

This document summarizes the risk assessment meeting held for the San Luis Valley Regional Hazard Mitigation Plan (HMP) 2022-2023 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 update to the 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. Jeff Brislawn, Project Manager at Wood, began the meeting with introductions. 43 individuals attended the meeting online and 25 in person, representing a mix of the consultant team, county department representatives, and various stakeholders.

Attendees

- Hazard Mitigation Planning Committee
- 68 people attended including:
    1. Aaron Horrocks – URGSD
    2. Alamosa School District
    3. Amber Maestas – Costilla County Public Health, CI/CT Supervisor
    4. Amy Wetherill
    5. Andrew Martinez – Crestone PW
    6. Annarae Smith – Public Health EPR Coordinator, Conejos County
    7. Art Wittner – Rio Grande County Emergency Manager
    8. Bobby Woelz – Saguache County Emergency Manager
    9. Camerod Decker – CSP Comm
    10. Carlos Garcia
    11. Carrie Zimmerman – superintendent center schools
    12. Chris Rodriguez – Costilla County Emergency Manager
    13. Cody Sullivan – DFPC
    14. Craig – Crestone VFD
    15. Craig Barraclough – Rio Grande County Administrator
    16. D. Archuleta – SLVFO/BLM
    17. Darrick Garcia – Alamosa EMS
    18. David R. Osborn – CODHSEM
    19. Diana Jones – Alamosa School District, Superintendent
    20. Denise Jiron – Conejos County PH
    21. Devin Haynie -CDPS
    22. Don Chapman – Alamosa Fire Chief
    23. Don Martinez
    24. Donna Wehe – SLV Health
    25. Emily Palmer – CODHSEM
    26. Eric Treinen – Alamosa County Emergency Manager

1

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27. Erin Minis
28. Eryn Wintz – Mineral County Clerk
29. Gigi Dennis – City Manager, City of Monte Vista
30. Gretchen Nelson – Crestone PW
31. Harry Reynolds – Public Works Director, City of Alamosa
32. Ida White – Response Coordinator, Rio Grande Public Health
33. Irene Merrifield – DHSEM Mitigation Planning
34. Janet Beiriger – Saguache County Public Health
35. Jean Borrego – SLV Regional Homeland Security Coordinator
36. Joe Romero – CDOT
37. Joni Adelman – Mineral County Public Health
38. Joseph Baroz
39. Kaleigh White – Accountant/Ops Manager for Rio Grande Public Health
40. Kathy Woods – City of Alamosa
41. Ken Anderson -city of Alamosa Chief of Police
42. Linda Smith – SLV EPR
43. Lionel Valdez – Capulin Fire Chief
44. Logan Montoya – SLV EPR
45. Lucas Casias – GIS Coordinator, Costilla County
46. Luis Murillo – Assistant Superintendent, Alamosa School District
47. M. Shawn Woods – Alamosa County Sheriff
48. Mark Thompson – CODHSEM
49. Mitchell Jarvies – Conejos County Commissioner
50. Mona Kaye Lovato – Saguache County Public Health
51. Naomi
52. Pete Magee – San Luis Valley GIS/GPS Authority
53. Rich Atkins – Chaffee County Emergency Manager
54. Rodney King – CC OEM
55. Sam Scavo – Forester, Colorado State Forest Service, Alamosa Field Office
56. Sandra Hostetter – Alamosa County Assessor
57. Scott Honeycutt – Alamosa School District
58. Scott Johnson – City of Creede, Public Works Director
59. Scott Wiedeman – Monta Vista School District
60. Sean Killoy
61. Terry Wetherill – Mineral County Emergency Manager
62. Toby Melster
63. Tristram Post – Saguache RD District Ranger
64. Vern Heersink – Alamosa County Commissioner
65. Wendy Maez, Saguache County Administrator
66. Zach Weiderspon – SLV Health
67. Jeff Brislawn – Wood E&IS
68. Christopher Johnson – Wood E&IS

2

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Introductory Remarks/Review of the planning process

Following introductions, Jeff reviewed the planning process being followed and discussed the project status and progress made thus far. Highlights include:

- Kickoff meeting April 28, 2022
- Risk and capability assessments in process
- Plan update guides provided
- Online public survey closed August 8th
  - 255 total responses were received

Jeff also gave a brief overview of the public survey results. The survey results revealed that the general population views drought, wildfire, and high winds and tornadoes as the most significant hazards threatening the region. The full public survey results will be shared by email following the meeting.

Review of identified hazards and vulnerability assessment update highlights

The general risk assessment requirements were outlined before turning to a detailed discussion of each hazard. Highlights were presented on each hazard included in the updated risk assessment chapter of the plan. Refer to the PowerPoint presentation for specific details on each hazard. Highlights of the discussion are noted by hazard in the table below.

Hazard or Topic	Meeting Discussion and Problem Statements
Avalanche	• Discussion about increasing the risk rating of avalanche for Mineral County to High.
Dam Failure/Incident	• Discussion from David Osborn about the significance of dam being low in Mineral County, assumed it should be medium. • Joni Adelman seconded this thought. • A recent tabletop exercise for the Platoro Dam in Conejos County was mentioned.
Flooding	• Jeff presented results of an updated analysis of structures in floodplains in the 6 counties and municipalities. • Only Rio Grande County has FEMA National Food Hazard Layer (NFHL) mapped floodplains. The best available digital flood hazard data for the other counties was based on Hazus modeling done for the 2018 Colorado Hazard Mitigation Plan update. • Comments about Rio Grande County exposure to flood seeming low, specifically in South Fork. Christopher Johnson noted that it's possible that, since the FEMA NFHL is from 2011, maybe many of these structures have been built after the 2011 flood map and that the floodplains may have changed. Jeff noted that also the building footprint layer, based on a nationwide assessment from Microsoft, may be incomplete. • There was a question about if RV were parks considered in the analysis? Jeff replied no. • Question: Did we compare the differences between this plan and the previous 2016 plans in terms of numbers and values of structures exposed? Christopher commented that he was unsure if the planner who drafted the flood section had done that yet, but that we could try and highlight changes in vulnerability over time across the counties. Jeff also noted that the previous plans didn't go

3

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Hazard or Topic	Meeting Discussion and Problem Statements
	to this length of detail, so much of this vulnerability analysis is new. (Post meeting follow up – previous flood analysis in the 2018 was based on Hazus flood risk assessment completed in 2009; specific to Rio Grande County the current flood risk assessment uses more accurate floodplain (FEMA NFHL) and inventory data.) • Question: Can floodplain information from Wood's study on the Alamosa levee be incorporated into the risk assessment? Jeff said he would check with Wood water resources group to see if that could be possible, and on the status of preliminary mapping for Mineral County.
Wildland Fire	• Discussions about past recent fire events. Also, the increasing dangers for wildland fires becoming large urban conflagrations. • Urban fires in Alamosa were noted in 2018 and 2002.
Landslide/Rockfall/Debris Flow	• Comments from the group about the frequency of landslides and rockfall along the region's highways, notably highway 149, 114, and 285. Joni Adelman noted that the areas of the highway that often get blocked can cut off Mineral County's access to health and medical facilities (Hwy 114) • Comments about the incidents of this hazard increasing post fire notably with debris flow • Other trouble spots include SH 17 in Conejos Canyon, FR 250, and 152 to the Sand Dunes National Park. • Hwy 149 routinely impacted and CDOT addresses cleanup • Group agreed that maybe Conejos County should be increased from low to medium
Earthquake	• No Comments
Drought	• Comment from the group about the water community being active in sustainability initiatives, including conducting groundwater recharge projects to help sustain/replenish groundwater resources in the Valley
Hail	• No Comments
Lightning	• Comment from Alamosa County that there are significant lightning strikes in the valley and they've been lucky thus far that a major wildfire hasn't been sparked by them. • A comment that the probability of occurrences seems to be going up with more cloud to ground strikes and more beetle kill and drought stressed fuels to increase wildfire risk. • While the risk of fire starts is more likely, this is tempered by more active monitoring.
High Winds and Tornadoes	• Group noted that they often get damages inflicted by high winds, and that the usual high wind "season" seems to be expanding. • Dust and windstorms have been problematic, leading to vehicle collisions on Hwy 17 this summer. • Wind and wildfire conditions have been problematic, leading to almost blackout conditions from wind driven smoke on Hwy 160. • Wind also causes problems for flight for life hospital transport.

4

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Hazard or Topic	Meeting Discussion and Problem Statements
Severe Winter Storms	• Joni Adelman noted that severe winter storms often result in power outages, which further results in dangerous conditions for residents who are oxygen dependent • An attendee noted livestock losses as another common loss. • La Manga and Poncha Passes were noted as trouble spots for transportation during winter storms.
Cyber Attack	• Change the probability rating to "likely" • Hospitals have been targets, as well as scammers targeting elderly (vulnerable population) • Conejos County noted ransomware attacks have occurred, and warnings are issued nearly daily on some sort of cyber incident.
Hazardous Materials Incidents	• The probability of HAZMAT incidents should be increased across the board to "likely"
Pandemic	• No Comments

Review of Mitigation Goals
Jeff led a brief discussion on the mitigation strategy update, which will primarily be the focus of the next meeting. The key differences between goals, objectives, and actions were outlined. Each of the county goals from the previous plans were presented, summarized below:

Alamosa, Conejos, Mineral, Rio Grande, and Saguache County Goals:
1. Reduce loss of life and personal injury caused by natural hazards.
2. Reduce damage to critical facilities, personal property, and other community assets caused by natural hazards.
3. Minimize economic losses associated with natural hazards.

Costilla County Goals:
1. Enhance the safety of residents and businesses by protecting new and existing development from the effects of hazards.
2. Protect new and existing public and private infrastructure and critical facilities from the effects of hazards.
3. Increase the communities' floodplain management activities and participation in the National Flood Insurance Program (NFIP).
4. Ensure hazard awareness and risk reduction principles are institutionalized into the jurisdictions' daily activities, processes, and functions by incorporating it into policy documents and initiatives.
5. Enhance community-wide understanding and awareness of community hazards.
6. Publicize mitigation activities to reduce the area's vulnerability to hazards.
7. Limit or discourage development in geologic hazard and wildfire prone areas.
8. Limit floodplain development to maintain public safety and protect the integrity of Riparian Corridors.
9. Provide for sustainability for the Water Supplies in Costilla County.

The Plan Update Guides include a space for suggestions on any changes or updates to these goals. They can be adopted as is if the group still feels they are relevant. The group felt that they would like to revisit goals prior to the next meeting.

5

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An overview of the 2018 mitigation actions were also provided; Alamosa County had 21 actions, Conejos County had 31 actions, Costilla County had 31 actions, Mineral County had 11 actions, Rio Grande County had 14 actions, and Saguache County had 28 actions. Updated statuses on each of these actions will be needed, identifying if each action has either been completed, continuing and in progress, continuing but not yet started, an action with annual implementation, or deleted since the 2018 plans. A status-tracker will be shared to collect input on the status of 2018 mitigation actions to facilitate the reporting. In addition, each jurisdiction is required to come up with at least one new action for the plan update. This will be the focus of the next meeting.

Next Steps/Adjourn
The project schedule was reviewed:

Project Milestone	Anticipated Timeline
• Updated HIRA	August
• HMPC Meeting #3	September
• HMPC Review Draft	October
• Public Review Draft	November-December
• CO DHSEM Review	January-February 2023
• Final Plan for FEMA Review (estimated)	March-April 2023
• Final Approved HMP for local adoption	May-July 2023

Next steps were discussed, including the following:

- Complete and return the Plan Update Guide, where outstanding
- A status-tracker will be shared to collect input on status of 2018 mitigation actions
- Start thinking of ideas for new mitigation actions
- Stay informed by email of upcoming meetings
- Review results of public survey
- Draft HIRA for HMPC review coming soon

Adjourn

The meeting adjourned at 4:00 pm

6

San Luis Valley Regional Hazard Mitigation Plan Update
Risk Assessment Meeting Chat Log

14:10:15 From Mona Kaye Lovato : Joni, I have sound

14:10:40 From David R. Osborn: DHSEM : @ Rich: Recording is now on

14:11:33 From Rich Atkins - CC OEM : Just didn't see recording on. Wanted to make sure it was recorded.

14:12:16 From J Borrego : Jean Borrego, SLV Regional Homeland Security Coordinator.

14:17:38 From Amber Maestas : Amber Maestas-Costilla County Public Health Agency- CI/CT Supervisor

14:23:58 From Gigi Dennis, Monte Vista : Gigi Dennis, City Manager, Monte V.

14:31:03 From Joni Adelman : I would second increasing risk of Avalanche in Mineral County

14:35:34 From Mark Thompson (CO DHSEM) : Mark Thompson, CO DHSEM.

14:39:15 From Joni Adelman : I would agree

14:44:05 From Sam Scavo - CSFS : The South Fork numbers seem low. Considering all the homes along the river.

14:44:33 From Craig, Rio Grande County : Agreed on South Fork...

14:45:17 From Mona Kaye Lovato : is the structure count only full time residents?

14:55:15 From Gigi Dennis, Monte Vista : can't hear the audience if they are speaking.

14:56:00 From Alamosa County : ok we will provide mic, thanks

14:56:31 From Gigi Dennis, Monte Vista : 👍

15:01:24 From wmaez : It's hard to hear comments from the room

15:12:22 From Joni Adelman : Hwy 149

15:13:30 From Mona Kaye Lovato : hwy 114 Cochetope

15:17:54 From Joni Adelman : very interesting, I haven't seen this data before

15:31:23 From Tristram Post, Saguache RD : Thanks Dario for speaking to this topic for the group

15:46:36 From Christopher Johnson : Got that!

15:57:19 From Mitchell : Mitchell Jarvies Conejos County Commissioner

7

Hazard Survey Results, Risk Assessment Meeting

Hazard	Alamosa	Conejos	Costilla	Mineral	Rio Grande	Saguache
Avalanche	L	L	L	M	L	L
Dam Incidents	L	M	L	L	L	L
Drought	H	H	H	H	H	H
Earthquake	L	L	L	L	L	L
Flooding (Flash Flood & Levee Failure)	L	L	M	M	M	M
Hailstorm	M	H	M	M	M	M
High Winds and Tornadoes	H	H	H	M	H	H
Landslide/Rockfall / Debris Flow	L	L	L	M	H	L
Lightning	M	H	H	H	M	M
Severe Winter Storm	M	M	H	H/M	H	M
Wildland Fires	H	M	H	H	H	H
Cyber Attack	M	M	L	M	M	M
Pandemic	M	M	M	M	M	M
Hazardous Materials Incident	M	M	L	L	M	L

Mitigation Strategy Meeting: September 19, 2022

San Luis Valley Regional Hazard Mitigation Plan Mitigation Strategy Meeting Agenda

Date: Monday, September 19, 2022
2:00 pm-4:30 pm MST

Meeting at: Alamosa County Commissioner's Meeting Room
8900 Independence Way
Alamosa, CO 81101

Project: San Luis Valley Regional Hazard Mitigation Plan

Subject/Purpose

The purpose of this meeting is to review the planning process so far, then modify, add, and/or delete mitigation actions and projects applicable to the San Luis Valley based on HMPC input and pertinent plan goals. Prioritization of mitigation projects will be conducted as well, and next steps to plan finalization, including future plan implementation and maintenance, will be discussed.

Attendees: San Luis Valley Regional Hazard Mitigation Planning Committee and Stakeholders

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1. Introductions
2. Review of the Planning Process
3. Review of possible mitigation activities and alternatives
4. Discuss criteria for mitigation action selection and prioritization
5. Review of progress on existing actions in the plan
6. Brainstorming Session: Development of new mitigation actions (group process)
7. Prioritize mitigation actions (group process)
8. Discuss plan implementation and maintenance
9. Discuss next steps
10. Questions and Answers/Adjourn

wood.

San Luis Valley Regional Hazard Mitigation Plan

Mitigation Strategy Meeting Summary

September 19, 2022, 2:00 – 4:30 pm

Introductions

Amy Carr, Deputy Project Manager, WSP (Formally Wood Environment and Infrastructure Solutions (Wood)), kicked off the hybrid virtual/in-person meeting and thanked everyone for their participation. Amy led a roll call of attendees present in the room to introduce themselves and requested that those joining online entered their name and affiliation in the chat log. In total 39 individuals participated in the meeting, 16 in person and 23 online, representing each of the 6 counties that make up the San Luis Valley and are participating in the planning process, as well as stakeholders and partner organizations.

Participants:

1. Amy Carr, WSP
2. Christopher Johnson, WSP
3. Jeff Brislawn, WSP
4. Chris Rodriguez, Costilla County OEM
5. Art Wittner, Rio Grande County OEM
6. Bobby Woelz, Saguache County OEM
7. Logan Montoya, SLV EPR
8. Terry Wetherill, Mineral County OEM
9. Jason Kreps, CDOT
10. Joe Pomero, CDOT
11. Lori Laske, Alamosa County OEM
12. Linda Smith, SLV EPR
13. Parrich Gura, Alamosa LMS
14. Vern Heersink, Alamosa County
15. Erin Minks, Senator Bennet's Office
16. DJ Enderle, City of Monte Vista
17. Rodney King, Conejos County OEM
18. Eric Treinen, Alamosa County OEM
19. Emily Palmer, Hazard Mitigation Planning Specialist, CO DHSEM
20. Robert Espinoza, Costilla County Commissioner
21. Cameron Decker, Alamosa Regional Communication Center, SLV E911
22. Beverly Strnad, Alamosa County Public Health Department
23. Gigi Dennis, City of Monte Vista, City Manager
24. Janet Beiriger, Saguache County Public Health
25. Jean Borrego, SLV Homeland Security Coordinator
26. Kolawole Bankole, Director of Rio Grande County Public Health Department
27. Joanna Dokson, Ambulance Administrator, Baca Grande Emergency Services
28. Dixie Diltz, Rio Grande County Land Use Administrator
29. Carlson T
30. David Osborn, CO DHSEM

31. Diana Jones
32. Ida White
33. Irene Merrifield, CO DHSEM
34. Mark Thompson, State Hazard Mitigation Officer, CO DHESM
35. Lyndsie Ferrell
36. Tristram Post
37. A. Williams, Costilla County / Red Cross
38. Rich Atkins, Chaffee County OEM
39. Tyler Carlson, CDOT

Review of the Planning Process

The FEMA planning process steps were recapped; WSP is currently wrapping up the Risk Assessment process and beginning the mitigation strategy portion. This meeting addressed mitigation strategizing and goal review/development aspects.

The progress on the plan update process to date was reviewed. Highlights include:

- Kickoff webinar held April 28, 2022
- Risk Assessment meeting held August 15, 2022
- Online Public Survey closed August 8th with 255 responses
- HIRA Draft out for HMPC review in the coming weeks

The goals and objectives from each county's previous Hazard Mitigation Plan were revisited and 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. During this time there was some discussion amongst the group and comments on the goals from the previous plan. Beverly Strnad, with Alamosa County Public Health, questioned if the wording "natural hazards" in the goals was too specific, and if they should be broadened to include manmade hazards. The group agreed and it was decided to remove "natural" from all of the goals. Dr. Kolawole Bankole, with Rio Grande County Public Health, stated that incorporating equity in the mitigation goals should be a focus. Mark Thompson, with Colorado DHSEM, commented that goals should be broad in nature because mitigation will never be "done" so to speak, it is always going to be an ongoing effort and activity with no defined finish line. Actions on the other hand we do want to be specific and "SMART" (Specific, Measurable, Achievable, Realistic, and Time-related). A comment was raised on why Costilla County's goals were different from the rest; the answer was in part their plan was done in a different timeline. Costilla County suggested removing goals related to NFIP and water sustainability as too specific.

The goals were confirmed during this third meeting as follows, based on the conversation:

- **Alamosa, Conejos, Mineral, Rio Grande, and Saguache County Goals:**
  - Goal 1: Reduce loss of life and personal injury caused by ~~natural~~ hazards.
  - Goal 2: Reduce damage to critical facilities, personal property, natural and cultural assets and other community assets caused by ~~natural~~ hazards.
  - Goal 3: Minimize economic losses associated with ~~natural~~ hazards.
- **Costilla County Goals**

- Goal 1: Enhance the safety of residents and businesses by protecting new and existing development from the effects of hazards.
- Goal 2: Protect new and existing public and private infrastructure and critical facilities from the effects of hazards.
- (Removed) ~~Goal 3: Increase the communities' floodplain management activities and participation in the National Flood Insurance Program (NFIP).~~
- Goal 3: Ensure hazard awareness and risk reduction principles are institutionalized into the jurisdictions' daily activities, processes, and functions by incorporating it into policy documents and initiatives.
- Goal 4: Enhance community-wide understanding and awareness of community hazards.
- Goal 5: Publicize mitigation activities to reduce the area's vulnerability to hazards.
- Goal 6: Limit or discourage development in geologic hazard and wildfire prone areas.
- (Removed) ~~Goal 8: Provide for sustainability for the Water Supplies in Costilla County.~~

Review of Possible Mitigation Activities

Amy gave an overview of what kinds of activities and alternatives can be considered for hazard mitigation. Through hazard mitigation we're trying to reduce the future demand for, and rising costs of, disaster response and recovery. 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 list of best practices and alternatives for mitigating various hazards, and a short discussion on climate change and adaptation considerations. Example hazard-specific mitigation projects were discussed including FEMA funding-eligible projects for wildfire, flooding, winter storm, and other hazards.

Prioritizing Mitigation Actions

Amy explained the prioritization of actions in more detail. FEMA suggests using the STAPLEE method for prioritization.

- Social – What are the potential social impacts of an action?
- Technical – What is the technical feasibility to implement the action?
- Administrative – What are the administrative capabilities to implement the action?
- Political – Is there the political will to implement the project?
- Legal – Do you have the legal authority?
- Economic – Is the project economically feasible?
- Environmental – What are the environmental impacts of benefits from the project?

Other things to consider when thinking of new mitigation actions include:

- Life safety and vulnerable populations
- Addressing high risk hazards
- Protect critical facilities and assets
- Actions that help meet multiple goals and objectives

Review of Progress on Existing Mitigation Actions

Prior to the meeting, a Mitigation Action Tracker was sent to the HMPC listing each jurisdiction's mitigation actions from their respective previous plans. Each HMPC representative was asked to provide comments on the status of each action. Those in person were asked to group themselves together based on the County they are within and talk through the Tracker together to fill in some of the missing statuses and provide more information on the progress that has been made to date. Each group determined they needed to reach back to their jurisdictions to receive more input. The Tracker is attached to this meeting summary and each jurisdiction is asked to **send back a completed tracker to WSP by October 7th**.

The mitigation action statuses are categorized as one of the following: Completed, Annual Implementation (ongoing), Continue-In Progress, Continue-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 or federal land). Annual Implementation are actions that a jurisdiction is conducting on an ongoing basis, but the jurisdiction wants to continue forward into the updated plan to maintain visibility on the action.

Developing New Mitigation Actions

Each participating jurisdiction is required to develop at least one new action for the 2022 plan update. Ideally, jurisdictions should develop actions that address all the hazards addressed in the plan, or at a minimum each High significance hazard. 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

- FEMA's Mitigation Action Portfolio: https://www.fema.gov/sites/default/files/2020-08/fema_mitigation-action-portfolio-support-document_08-01-2020_0.pdf
- Colorado Planning for Hazards Guide: https://planningforhazards.com/home

For those in person at the meeting, Amy 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. Post-it notes were passed out and attendees were asked to spend ten minutes to write at least one mitigation action. After each individual completed this, they were then asked place their post-it at the front of the room. Once all the actions were posted at the front of the room, each individual was given 4 dot stickers and asked to read through the actions and keep in mind the STAPLEE criteria (Social, Technical, Administrative, Political, Legal, Economic, and Environmental). Using their 4 dot stickers and they were asked to place the stickers on the actions and "vote" for the actions they think should be the highest priority based.

A total of 31 potential new mitigation actions were written on the post it notes and transcribed following the meeting into a spreadsheet and shared as attachments to this meeting summary. Each HMPC member that suggested a new action is asked to fill out a New Mitigation Action Form with more details on the action and how it will be implemented over time. Each participating jurisdiction will need at least one new mitigation action form complete. Please return new mitigation actions to Jeff Brislawn or Christopher Johnson by October 14th.

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. This is the final formal meeting of the HMPC.

Project Milestone	Anticipated Timeline
• Return Mitigation Action Status Trackers	October 7th
• Return New Mitigation Actions	October 14th
• Updated HIRA for Review	October
• HMPC Review Draft	Late October
• Public Review Draft	November
• CO DHSEM Review	November
• FEMA Review (estimated)	November-December
• Final Approved HMP for local adoption	January-February 2023

Questions and Answers/Adjourn

The meeting adjourned around 12:00 pm. Points of Contact for this HMP update effort:

Jeff Brislawn
Project Manager
WSP
jeff.brislawn@wsp.com
303-704-5506

Eric Treinen
Emergency Manager
Alamosa County
etreinen@alamosacounty.org
(719) 589-1131

Rodney King
Emergency Manager
Conejos County
rodney@co.conejos.co.us
(719) 580-4133

Art Wittner
Emergency Manager
Rio Grande County
rgcoem@riograndecounty.org

Terry Wetherill
Emergency Manager
Mineral County
mincoemc@mincocolo.com
(719) 850-0514

Christopher Rodriguez
Emergency Manager
Costilla County
Chris.rodriguez@costillacounty-co.gov
(719) 672-3371

Bobby Woelz
Emergency Manager
Saguache County
rwoelz@saguachecounty-co.gov
(719) 588-0197

wsp

Meeting Chat Log

13:58:20 From AyeshaW to Everyone:
A Williams Costilla County / Red Cross
13:58:39 From Jeff Brislawn, Wood to Everyone:
Jeff Brislawn, Project Manager, Wood
14:00:11 From Emily Palmer (DHSEM) to Everyone:
Emily Palmer - hazard mitigation planning specialist - DHSEM
14:00:28 From cdecker to Everyone:
Cameron Decker - Alamosa Regional Communication Center - SLV E911
14:00:37 From Christopher Johnson to Everyone:
Christopher Johnson - Hazard Mitigation Planner, Wood E&IS
14:01:32 From Beverly Strnad to Everyone:
Beverly Strnad, Alamosa County Public Health Dept
14:02:37 From Emily Palmer (DHSEM) to Everyone:
yes
14:06:24 From Gigi Dennis, Monte Vista to Everyone:
Gigi Dennis, City of MV, City Mgr
14:06:30 From Janet Beiriger to Everyone:
Janet Beiriger Saguache County Public Health
14:06:53 From J Borrego to Everyone:
Jean Borrego, SLV Homeland Security Coordinator
14:06:54 From Dr. Bankole to Everyone:
Kolawole Bankole, Director, Rio Grande County Public Health Dept
14:08:05 From joannakdok to Everyone:
Baca Grande Emergency Services/Ambulance Joanna Dokson, Ambulance Administrator
14:15:15 From RGC Landuse to Everyone:
Dixie Diltz Rio Grande County Land Use Administrator
14:37:21 From Gigi Dennis, Monte Vista to Everyone:
all sounds good
14:43:37 From Beverly Strnad to Everyone:
Could you give an example of multi-hazard, since there were so many?
14:44:52 From Beverly Strnad to Everyone:
Ok, thanks
14:47:21 From Dr. Bankole to Everyone:
Can you post a link in the chat for this?
14:48:12 From Christopher Johnson to Everyone:
Trying to upload the spreadsheet right now, just one moment!
14:48:33 From Dr. Bankole to Everyone:
Thanks
14:49:06 From Christopher Johnson to Everyone:
Did that work?
14:50:07 From Dr. Bankole to Everyone:

It does. Thanks
14:50:22 From Christopher Johnson to Everyone:
Perfect! Thanks
14:51:17 From Jeff Brislawn, Wood to Everyone:
For those online let us know if there are any questions.
14:55:31 From Dr. Bankole to Everyone:
Changing priority from 2016 from Medium to High for 2022 on All Hazards: Re- Public Health Emergency, for RGC. Its also ongoing for 2022
14:58:57 From Christopher Johnson to Everyone:
Thanks for that update!
15:05:59 From Christopher Johnson to Everyone:
https://www.fema.gov/sites/default/files/documents/feam_fy21-bric-mitigation-action-portfolio.pdf
15:06:10 From Christopher Johnson to Everyone:
https://planningforhazards.com/home
15:06:56 From Christopher Johnson to Everyone:
Here are some of those resources for how to prioritize actions, and some ideas for new mitigation actions
15:07:15 From Dr. Bankole to Everyone:
Thanks @Christopher
15:13:20 From Dr. Bankole to Everyone:
There a text message of notification. "We have a report of gun at Alamosa High School. Police are on school grounds and investigating the incident. Schools are on lockdown"
15:15:16 From Chris Rodriguez to Everyone:
Report we're receiving is this is a "swatting" situation, Law sweeping the building now.
15:17:13 From Chris Rodriguez to Everyone:
Alamosa High School is clear no injuries
15:34:42 From Jeff Brislawn, Wood to Everyone:
Tying in actions or projects from other plans is recommended, examples include recently updated Basin Implementation Plan drought resiliency efforts, Stream Management Plans recently developed etc..
15:38:00 From Dr. Bankole to Everyone:
I'm thinking about enhancing our SLV Regional Environmental Health and Safety; and maintaining various prevention programs related to ensuring/maintaining a safe living, learning and working environment. Programs include but are not limited to: Educational programs - Fire Safety, Laboratory and Research Safety, Occupational Safety, and Environmental Compliance
15:51:38 From Dr. Bankole to Everyone:
Vaccination, testing plans
15:54:02 From David R. Osborn: DHSEM to Everyone:
Thank you. Jumping to another call.

Selection and Prioritization Criteria and Example Mitigation Action Items

Mitigation Action Selection and Prioritization Criteria

- Does the proposed action protect lives or vulnerable populations?
- Does the proposed action address hazards or areas with the highest risk?
- Does the proposed action protect critical facilities, infrastructure, or community assets?
- Does the proposed action meet multiple objectives (multi-objective management)?
- Is there a strong advocate for the action or project that will support the action's implementation?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

Social - Does the measure treat people fairly (different groups, different generations)? Does it consider social equity, disadvantaged communities, or vulnerable populations?

Technical - Will it work? (Does it solve the problem? Is it feasible?)

Administrative - Is there capacity to implement and manage project?

Political - Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal - Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic - Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental - Does it comply with environmental regulations or have adverse environmental impacts?

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			■		■	■		■

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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				■	■			

3

Slido Polls: Mitigation Strategy Meeting

SLV Meeting #3 Mitigation Strategy

17 - 23 Sep 2022

Poll results

Open text poll

wood.

Which Jurisdiction Department or Agency do you represent?

005

- Beverly Strnad, Alamosa County Public Health Department
- Forest Service- Saguache Ranger District
- SLV Homeland Security Coordinator for the San Luis Valley All Hazards Region.
- 911 PSAP and dispatch. Colorado State Patrol
- DHSEM

Public Survey

Public Survey Outreach

Alamosa County

From:	Eric Treinen
To:	Carr, Amy
Subject:	Fwd: Regional Hazard Mitigation Plan Survey
Date:	Wednesday, June 22, 2022 3:39:03 PM

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

This was sent to all of our county employees

---------- Forwarded message ---------
From: **Belina Ramirez** <bramirez@alamosacounty.org>
Date: Wed, Jun 22, 2022 at 3:37 PM
Subject: Regional Hazard Mitigation Plan Survey
To: All Users <all@alamosacounty.org>, State Address <stateaddresses@alamosacounty.org>

Take Our Survey On Hazards!

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral and Saguache. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey is to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur. The survey has 10 questions and only takes about 5 minutes.

The survey is open till August 8, 2022.

https://forms.office.com/r/Sz8md8Z2vX

Conejos County

Emergency Management Office

San Luis Valley Hazard Mitigation Plan Public Input Survey

The San Luis Valley (Alamosa County, **Conejos County**, Costilla County, Mineral County, Rio Grande County, and Saguache County) is updating its Multi-Jurisdictional Hazard Mitigation Plan in 2022-2023 per the five year update cycle required of FEMA and the Federal Disaster Mitigation Act of 2000.

The Regional Hazard Mitigation Plan analyzes each county's vulnerabilities to natural and human-caused hazards and identifies mitigation actions that can be taken to minimize property damage and reduce the loss of life by lessening the impacts of disasters.

The purpose of this survey is to collect information from the public and stakeholders to better understand the vulnerabilities within each of the six participating counties, as well as solicit input on needs to best mitigate, or reduce, the impacts of hazards before they occur.

The survey should take around 5 minutes to complete. Please complete this survey by **August 8, 2022**. Thank you for your participation!

The survey is open till August 8, 2022. PLEASE Click ON THIS LINK:

https://forms.office.com/r/Sz8md8Z2vX

Rodney King, Conejos County Emergency Manager

Emergency Management

CONTACT US   ANNOUNCEMENTS

Conejos County is revising the **Hazard Mitigation Plan** for the next 5 years. Public input will be open in November.

Contact Rodney King

Costilla County

Emergency Management

Chris Rodriguez
Emergency Management Coordinator
(719) 298-1797
chris.rodriguez@costillacounty-co.gov

Final Multi-Hazard Mitigation Plan

##

SLV Regional Hazard Mitigation Plan Survey

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral and Saguache. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey is to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur. The survey has 10 questions and only takes about 5 minutes.

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https://forms.office.com/r/Sz8md8Z2vX

Mineral County

Office of Emergency Management

Mineral County Emergency Management endeavors to relay critical information in a timely and accurate manner. This page will be updated regularly as information becomes available. Please refer to this page often for the latest information.

If you desire additional information not found on this page please contact the Mineral County Emergency Manager, Terry Wetherill at mincoemc@mincocolo.com

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral and Saguache. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey was to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur.

The survey results can be found here: https://docs.google.com/spreadsheets/d/1Vcx99CB_MHsjod-eYv-CYzp9lZcjZmK...

Creede happenings

Mineral County CO Emergency Management
June 24 at 12:45 PM ·

Take Our Survey On Hazards!

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral and Saguache. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey is to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur. The survey has 10 questions and only takes about 5 minutes.

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https://forms.office.com/r/Sz8md8Z2vX

Amy Wetherill and Luke Crenshaw Jr. 1 Comment

Like Comment Send

Mineral County CO Emergency Management
June 24 at 12:45 PM ·

Take Our Survey On Hazards!

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral and Saguache. The plan also identifies mitigation actions that can be taken to minimize ... See more

4

2 Comments 1 Share

Saguache County

From:	Robert Woelz
To:	Carr, Amy
Cc:	Art Wittner; Chris Rodriguez; Osborn - CDPS, David; Phil Graham; Rodney King; Terry Wetherill; Eric Treinen; Brislawn, Jeff P
Subject:	Re: San Luis Valley Regional Hazard Mitigation Plan: Public Input Survey
Date:	Wednesday, June 29, 2022 12:24:15 PM
Attachments:	image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi Amy,

I have posted the Hazard Mitigation Plan **Public Survey** on:

Saguache OEM Facebook: https://www.facebook.com/SaguacheOEM
Saguache OEM Twitter: https://twitter.com/SaguacheOEM

Saguache County Website Home Page: https://saguachecounty.colorado.gov/
Saguache County OEM Webpage: https://saguachecounty.colorado.gov/OEM/HMP

SLV Emergency Facebook: https://www.facebook.com/slvemergency
SLV Emergency Twitter: https://twitter.com/SLVEmergency
SLV Emergency Website: https://www.slvemergency.org/

- Bobby

Bobby Woelz, CO-CEM®
Director
Saguache County
Office of Emergency Management

719-588-0197

RWoelz@SaguacheCounty-CO.gov

SaguacheCounty.Colorado.gov

Saguache County Office of Emergency Management
June 29 at 12:16 PM ·

Take Our Survey On Hazards!
We want your opinion to help us write our new Hazard Mitigation Plan.
The survey has 10 questions and only takes about 5 minutes.
The survey is open till August 8, 2022.
https://forms.office.com/r/Sz8md8Z2vX

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Hazard Mitigation Plan Update

Take Our Survey On Hazards!

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The purpose of this survey is to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur.

The survey has **10 questions** and only takes about **5 minutes.**
The survey is open till August 8, 2022.

Take the Survey on Hazards!

Pinned Tweet

Saguache County Office of Emergency M... @Saguach... · Jun 29

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1 1

Saguache County Government

Search

Home › Departments ›

Home » Hazard Mitigation Plan

Hazard Mitigation Plan

The Hazard Mitigation Plan provides local officials with a tool to guide policies and actions that can be implemented to reduce risk and future losses from natural hazards. Information in this plan is intended for use by local officials to help guide mitigation activities and inform decisions on local land use policy in the future.

2018 Hazard Mitigation Plan

2023 Hazard Mitigation Plan UPDATE

Take Our Survey On Hazards

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human-caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral, and Saguache. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey is to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur.

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The survey is open till August 8, 2022.

Take the Survey

Saguache County Resources

Commissioner Agendas

Job Opportunities

Emergency Food Programs

Covid-19 Updates

Spring 2022 Sales Tax Grant Recipient's

Take Our Survey On Hazards

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human-caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral, and Saguache. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey is to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur. The survey has 10 questions and only takes about 5 minutes.

The survey is open till **August 8, 2022.**

Take the Survey on Hazards

San Luis Valley

Welcome to the SLV Emergency Website

This website is maintained by the SLV Regional Emergency Coordination Committee to support emergency preparedness and response in the six counties of the San Luis Valley. When we are supporting an emergency or disaster situation, we will post updates on this page.

Announcements

Take Our Survey On Hazards

The San Luis Valley is in the process of developing a Regional Hazard Mitigation Plan in 2022, building upon county mitigation plans. The Regional Hazard Mitigation Plan analyzes vulnerabilities to natural and human-caused hazards and involves all municipalities and certain special districts within six counties: Alamosa, Conejos, Costilla, Rio Grande, Mineral, and Saguache. The plan also identifies mitigation actions that can be taken to minimize property damage and public safety risks. The purpose of this survey is to solicit public input on hazards of concern and suggestions for reducing the impacts of hazards before they occur.

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Pinned Tweet

SLVEmergency @SLVEmergency · Jun 29

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forms.office.com/r/Sz8md8Z2vX

1 3

Public Survey Results

San Luis Valley Hazard Mitigation Plan Public Input Survey

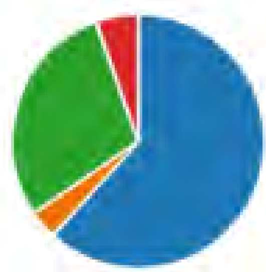
255	14:58	Closed
Responses	Average time to complete	Status

1. Where do you live? (If "other" please indicate where)

Alamosa County	55
Conejos County	21
Costilla County	35
Mineral County	25
Rio Grande County	37
Saguache County	82

2. Which community in Alamosa County do you live, work or represent? (If "other" please indicate where)

City of Alamosa	34
Town of Hooper	2
Unincorporated Alamosa County	16
Other	3

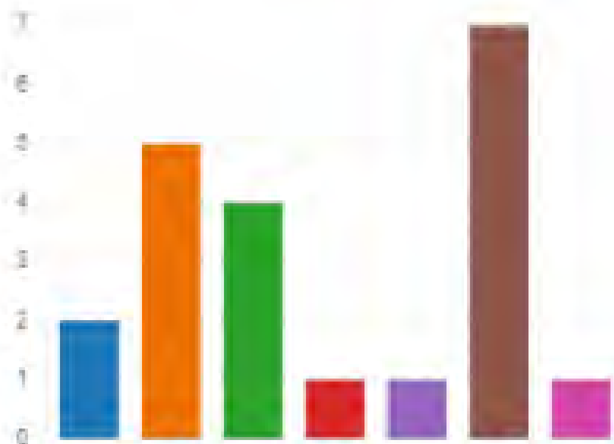


3. How long have you lived in this community?

Less than 1 year	2
1-5 years	7
5-10 years	11
over 10 years	35

4. Which community in Conejos County do you live, work or represent? (If "other" please indicate where)

Town of Antonito	2
Town of La Jara	5
Town of Manassa	4
Town of Romeo	1
Town of Sanford	1
Unincorporated Conejos County	7
Other	1



5. How long have you lived in this community?

Less than 1 year	0
1-5 years	2
5-10 years	2
over 10 years	17

6. Which community in Costilla County do you live, work or represent? (If "other" please indicate where)

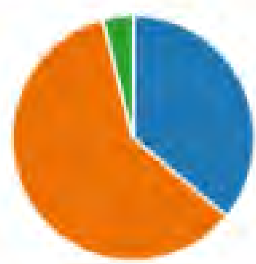
Town of San Luis	11
Town of Blanca	2
Unincorporated Costilla County	13
Other	9

7. How long have you lived in this community?

Less than 1 year	3
1-5 years	6
5-10 years	10
over 10 years	16

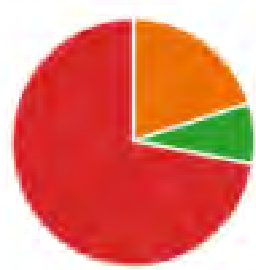
8. Which community in Mineral County do you live, work or represent? (If "other" please indicate where)

City of Creede	9
Unincorporated Mineral County	15
Other	1



9. How long have you lived in this community?

Less than 1 year	0
1-5 years	5
5-10 years	2
over 10 years	18



10. Which community in Rio Grande County do you live, work or represent? (If "other" please indicate where)

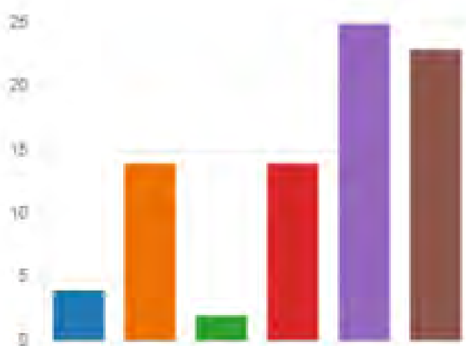
City of Monte Vista	13
Town of Del Norte	9
Town of South Fork	4
Unincorporated Rio Grande Cou...	11
Other	0

11. How long have you lived in this community?

Less than 1 year	1
1-5 years	6
5-10 years	7
over 10 years	23

12. Which community in Saguache County do you live, work or represent? (If "other" please indicate where)

Town of Center	4
Town of Crestone	14
Town of Moffat	2
Town of Saguache	14
Unincorporated Saguache County	25
Other	23



13. How long have you lived in this community?

Less than 1 year	10
1-5 years	20
5-10 years	11
over 10 years	41

Public Meeting HMP Workshop: January 4th, 2023

NOTICE OF PUBLIC WORKSHOP REGARDING THE DRAFT OF THE SAN LUIS VALLEY HAZARD MITIGATION PLAN UPDATE

January 4th, 2023 9:00-10:00 am

Virtual meeting link: https://zoom.us/j/2703146874 or call in 253-215-8782 or669-900-6833 and use Meeting ID 270 314 6874

The San Luis Valley Region and its six participating counties (Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache) are in the final stages of a planning effort to assess risks from natural, human-health, and human-caused hazards and to identify ways to reduce those risks. A planning process that began in February 2022 has resulted in a draft update to each county's existing Hazard Mitigation Plan (HMP) in one cohesive, regional plan. A HMP is required under the Federal Disaster Mitigation Act of 2000 to be eligible to receive certain federal disaster assistance and grants for hazard mitigation projects. A virtual public workshop will be held to introduce the draft plan, its hazards and highlights of the mitigation strategy and will include a presentation followed by a question-and-answer period. The plan will also be made available for public review and comment in January. Following the public workshop and comment period the Plan will be submitted for final approvals and ultimately adoption by all involved jurisdictions.

SLV Emergency Website

Announcements

VIDEO: Public Workshop on the Hazard Mitigation Plan Update 01/04/2023

This virtual public workshop was held to introduce our draft of the Hazard Mitigation Plan, its hazards, and highlights of the mitigation strategy. It included a presentation followed by a question-and-answer period.

Watch the **Public Workshop** here: https://youtu.be/F09_30SBy14

The updated Hazard Mitigation Plan will be available for public review and comment soon....

By slveadmin on 01/04/2023 09:01 PM

NOTICE OF PUBLIC WORKSHOP

REGARDING THE DRAFT OF THE SAN LUIS VALLEY HAZARD MITIGATION PLAN UPDATE
January 4th, 2023
9:00 – 10:00 am

Virtual meeting link: https://zoom.us/j/2703146874 or call 253-215- 8782 or 669-900-6833 and use
Meeting ID 270 314 6874

The San Luis Valley Region and its six participating counties (Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache) are in the final stages of a planning effort to assess risks from natural, human health, and human-caused hazards and to identify ways to reduce those risks. The planning process that began in February 2022 has resulted in a draft update to each county's existing Hazard Mitigation Plan (HMP) in one cohesive, regional plan.

An up-to-date Hazard Mitigation Plan is required under the Federal Disaster Mitigation Act of 2000 to be eligible to receive certain federal disaster assistance and grants for hazard mitigation projects.

A virtual public workshop will be held to introduce the draft plan, its hazards, and highlights of the mitigation strategy and will include a presentation followed by a question-and-answer period. The plan will also be made available for public review and comment in January. Following the public workshop and comment period, the Plan will be submitted for final approvals and ultimately adoption by all involved jurisdictions.

Chat Log

08:58:54 From Tyler Off To Everyone:
Tyler Off
08:59:05 From DARGARCIA To Everyone:
Darrick Garcia Alamosa EMS
08:59:06 From Bobby Woelz, Saguache OEM To Everyone:
Bobby Woelz, Saguache OEM
08:59:06 From Janelle Kukuk To Everyone:
Janelle Kukuk, Mineral County Administrator
08:59:09 From Linda Smith, SLV EPR To Everyone:
Linda Smith, SLV Emergency Preparedness & Response (Public Health)
08:59:13 From Ken Anderson To Everyone:
Ken Anderson Alamosa Police Department
08:59:24 From Dale Culver To Everyone:
Dale Culver Great Sand Dunes NP&P
08:59:24 From Tyler Off To Everyone:
Tyler Off South Fork Fire Rescue
08:59:27 From christophersittler To Everyone:
Chris Sittler Stone's Farm Supply
08:59:51 From Tom McCracken Saguache County Commissioner To Everyone:
Tom McCracken Saguache County Commissioner
09:00:05 From Brandi Hazard To Everyone:
Brandi Hazard Rio Grande County Public Health Dept.
09:00:20 From Rodney King To Everyone:
Rodney King, Conejos County OEM
09:00:27 From Jim McCloskey To Everyone:
Jim McCloskey (San Luis Valley Amature radio association (SARA)
09:00:44 From David Osborn CDHSEM To Everyone:
David R. Osborn; DHSEM
09:00:52 From Rick Syring To Everyone:
Rick Syring, San Luis Valley Amateur Radio Association
09:01:15 From Gigi Dennis, Monte Vista To Everyone:
Happy New Year from the City of Monte Vista
09:01:19 From Roni Wisdom To Everyone:
Roni Wisdom, Alamosa County Administrator
09:01:21 From Paul Wertz To Everyone:
Paul Wertz, Costilla County Public Health
09:01:50 From Chris Rodriguez To Everyone:
Chris Rodriguez, Costilla County Deputy Administrator, and acting Emergency Manager
09:01:53 From Christopher Johnson To Everyone:
Christopher Johnson, WSP
09:02:04 From sean killoy To Everyone:
Sean Killoy, American Red Cross
09:02:08 From Rob Vance Monte Vista To Everyone:
Rob Vance Monte Vista Public Works
09:02:12 From Amber Maestas To Everyone:
Amber Maestas, Costilla County Public Health Agency
09:04:08 From Don Dustin To Everyone:
Don Dustin
09:04:22 From Wendi Maez To Everyone:
Wendi Maez
09:04:23 From SLV Local Foods Coalition To Everyone:
Liza Marron Saguache County Commissioner Elect I will give my email when I get a county email next week

09:04:24 From Owen Woods To Everyone:
Owen Woods - AlamosaCitizen.com
09:04:27 From Chella Moores To Everyone:
Mona Lovato and Chella Moores with Saguache County Public Health
09:04:28 From Adam Moore To Everyone:
Adam Moore - Colorado State Forest Service
09:04:30 From Lori Laske, Alamosa County Commissioner To Everyone:
Lori Laske, Alamosa County Commissioner
09:04:31 From Lisa Clay To Everyone:
Lisa Clay, Deputy Emergency Manager, Gunnison County
09:04:37 From Tim Mann - CDPS To Everyone:
Tim Mann - CO DHSEM Whole Community Inclusion Planning Specialist
09:04:37 From Miguel Chairez To Everyone:
Miguel Chairez; Town of Crestone
09:04:41 From Averill Doering To Everyone:
Averill Doering, Town of Crestone
09:05:01 From Denise Jiron To Everyone:
Denise Jiron, Conejos County Public Health
09:05:29 From J Borrego To Everyone:
Jean Borrego, San Luis Valley Regional Homeland Security Coordinator
09:05:33 From Erin Minks To Everyone:
Erin Minks, Senator Bennet
09:06:04 From Christina Lakish To Everyone:
Christina Lakish, Deputy Chief Baca Grande Fire Department
09:09:09 From Emily Palmer To Everyone:
Emily Palmer, DHSEM Hazard Mitigation Planning Specialist
09:09:36 From smorrill To Everyone:
Scott Morrill, Gunnison County Emergency Management
09:17:47 From Irene Merrifield - DHSEM Mitigation To Everyone:
Irene Merrifield, State of Colorado DHSEM Mitigation Section
09:32:50 From Gigi Dennis, Monte Vista To Everyone:
Jeff, can you please show the dollar amount slide that drought has caused to the region? Thanks
09:36:44 From Chella Moores To Everyone:
We have another meeting. Sorry we have to go!
09:45:35 From Roni Wisdom To Everyone:
Jeff, Is there a list in the plan of what is considered critical facilities? Thanks
09:46:42 From Diana Jones To Everyone:
Diana Jones, Superintendent, Alamosa School District
09:46:44 From Gigi Dennis, Monte Vista To Everyone:
That one
09:46:45 From Joni Adelman To Everyone:
Joni Adelman - Mineral County Public Health (STPHD)
09:46:46 From bstone To Everyone:
Bill Stone-Alamosa Fire Department
09:46:52 From Don Dustin To Everyone:
Don Dustin, Mineral County Ambulance
09:46:58 From Town of Moffat To Everyone:
Nina Magee, Town Clerk, Town of Moffat
09:46:59 From Rachelle Wilson To Everyone:
Rachelle Wilson- Baca Grande Fire Department
09:47:09 From David Frees To Everyone:
David Frees, Deputy Emergency Manager, Saguache County
09:47:20 From Scott Johnson To Everyone:
Scott Johnson City of Creede Public Works
09:47:45 From Jim V To Everyone:
Jim Vanderpool, Baca Grande ES fire Chief.

09:48:02 From Janet's iPhone To Everyone:
Janet Beiriger Saguache County Public Health
09:48:24 From Christopher Johnson To Everyone:
https://cwcb.colorado.gov/FACE
09:48:36 From Christopher Johnson To Everyone:
Here is a link to the FACE tool if anyone would like to explore!
09:48:36 From iPhone To Everyone:
Annarae smith- conejo county public health
09:52:44 From christophersittler To Everyone:
Just to put a different twist on drought related revenue losses, in my individual instance, one company, one location, our revenue losses, individually are greater than the $5.4MM per year
09:52:54 From Roni Wisdom To Everyone:
great, thanks
09:55:35 From Erin Minks, Sen Bennet To Everyone:
https://www.rgwcd.org/projectsmain/habitat-conservation-plan
09:57:09 From Averill Doering To Everyone:
Are there any regulatory consequences for not implementing the plan actions?
09:59:14 From bstone To Everyone:
Thank you for sharing this information!
09:59:36 From Liza Marron To Everyone:
Thank-you for a great presentation
09:59:42 From Roni Wisdom To Everyone:
Thank you

Public Comment Period

Public Comment Period Outreach

NOTICE OF PUBLIC WORKSHOP REGARDING THE DRAFT OF THE SAN LUIS VALLEY HAZARD MITIGATION PLAN UPDATE

January 30th, 2023

For Immediate Release

The San Luis Valley Region and its six participating counties (Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache) are in the final stages of a planning effort to assess risks from natural, human-health, and human-caused hazards and to identify ways to reduce those risks. A planning process that began in February 2022 has resulted in a draft update to each county's existing Hazard Mitigation Plan (HMP) in one cohesive, regional plan. A HMP is required under the Federal Disaster Mitigation Act of 2000 to be eligible to receive certain federal disaster assistance and grants for hazard mitigation projects. The plan will is being made available for public review and comment between January 30th to February 14th. Following the public comment period the Plan will be submitted for final approvals and ultimately adoption by all involved jurisdictions.

The draft plan can be viewed online here:

INSERT LINK

Link to a comment form to provide feedback:

https://forms.office.com/r/Ecz2id0Pyj

Public Comment Period Results

State Agency Coordination

Colorado Dam Safety

---------- Forwarded message ---------
From: **Perry - DNR, Mark** <mark.perry@state.co.us>
Date: Fri, Aug 19, 2022 at 2:23 PM
Subject: San Luis Valley Regional Hazard Mitigation Plan: Dam Risk / Sanchez Dam
To: Osborn - CDPS, David <david.osborn@state.co.us>, Chris Rodriguez <chris.rodriguez@costillacounty-co.gov>
Cc: Hunyadi, John <john.hunyadi@state.co.us>, keith <keithcaldon_6@hotmail.com>, Darin Schepp - DNR <darin.schepp@state.co.us>

Hi David and Chris,

I'm sorry I wasn't able to make the SLV Hazard Mitigation Plan update phone call this past Monday, but I would like to follow-up with you on dam safety: Will the plan include Dam Risk and specifically Sanchez Dam?

As you know, Sanchez Dam is under a storage restriction order by the State Engineer due to safety concerns. Repairs may be needed to address the concerns; work on dams can be costly. And as you probably know, FEMA created the High Hazard Potential Dam (HHPD) grant program to help private owners repair unsafe dams. https://www.fema.gov/emergency-managers/risk-management/dam-safety/rehabilitation-high-hazard-potential-dams

One of the FEMA HHPD grant eligibility requirements is:

- **Located in a jurisdiction with a FEMA-approved hazard mitigation plan that includes dam risk.**

Please don't hesitate to contact me to discuss. Thank you guys for all the work you do.

Sincerely,
Mark

Mark A. Perry, P.E.
Dam Safety Engineer
Colorado Dam Safety

P 719-542-3368 x2118 | C 719-250-5606
314 E. Abriendo Ave., Suite B, Pueblo CO 81004
mark.perry@state.co.us | https://dwr.colorado.gov/

--
David R. Osborn
Field Manager
San Luis Valley Service Area

Colorado Geological Survey

Matt Morgan
Assistant Director/Senior Research Geologist
Colorado Geological Survey
College of Earth Resource Sciences & Engineering
Colorado School of Mines
1801 Moly Road
Golden, CO 80401
email: mmorgan@mines.edu
phone: o-303-384-2647 c-720-346-8606
website: http://coloradogeologicalsurvey.org/staff/matt-morgan/

From: Chambers, Mack <mack.chambers@woodplc.com>
Sent: Wednesday, May 11, 2022 9:34 AM
To: Matthew Morgan <mmorgan@mines.edu>
Subject: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.

Hi Matt,
Wood is under contract with several Colorado local government entities supporting the update of local hazard mitigation plans. Currently we are working these plans and we are reaching out to ensure we have the latest geologic hazards data that may be available from the CGS:

- City of Manitou Springs
- Archuleta County
- Pitkin County
- San Luis Valley Region (Alamosa, Conejos, Costilla, Mineral, Rio Grande and Saguache)

Data we are looking for include landslide, rockfall, debris flow, unstable soils, expansive soils, and earthquakes (faults, liquefaction). I may have most of this data but it would be good to know if I have the latest and or if something shouldn't be used. I recently went to the CGS website to obtain layers that were in Manitou Springs' last plan but the GIS data is only viewable through your service and not for download. I am connected to the CGS GIS Server through ArcMap but these layers are only for viewing as well.

Here are 2 layers I was trying to obtain for Manitou Springs.

https://coloradogeologicalsurvey.org/publications/debris-flow-susceptibility-map-colorado/
https://coloradogeologicalsurvey.org/publications/landslide-inventory-el-paso-colorado/

We are looking to have the data by the end of May.

Thank you,

Mack Chambers
GIS Analyst
Mobile: (720) 839-1516
www.woodplc.com

wood.

From: Scot Fitzgerald <ffitzger@mines.edu>
Sent: Thursday, May 12, 2022 10:12 AM
To: Chambers, Mack <mack.chambers@woodplc.com>
Subject: Re: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Mr Chambers,

Hello, my name is Scot Fitzgerald and I work for the Colorado Geological Survey.

So we can chat on the phone but I wanted to first send you this webmap beta we have been working on the past couple of years. It will show you the latest things we have mapped. Some of the things will not appear unless you are zoomed in further so make sure and look around at different extents.

You can also add this to a map through ArcCatalog. Let me know if you need those instructions. That way you always have the latest data and dont need to ask for it again.

https://cologeosurvey.maps.arcgis.com/apps/webappviewer/index.html?id=d6c1453c76bf419f936c4ef2baa0ab8d

thanks!

F Scot Fitzgerald, GISP
Colorado Geological Survey
Colorado School of Mines
GIS Analyst II
ffitzger@mines.edu

From: Chambers, Mack <mack.chambers@woodplc.com>
Sent: Thursday, May 12, 2022 11:42 AM
To: Scot Fitzgerald <ffitzger@mines.edu>
Cc: Brislawn, Jeff P <jeff.brislawn@woodplc.com>; Field, Scott <scott.field@woodplc.com>; Carr, Amy <amy.carr@woodplc.com>
Subject: RE: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.

Hi Scot,
Thank you for the response and the link. From what I can tell I can only view these layers and can't export them for analysis or mapping outside of your server. Is it possible to obtain the shapefiles? If I'm missing something please let me know.

Are there any recent (past 4-5 years) or ongoing studies on geologic hazards that we should know about or describe in the Hazard Mitigation Plans we currently have projects in? There are new requirements from CO DHSEM that we formally consult with the Colorado Geological Survey as part of our planning process.

- City of Manitou Springs
- Archuleta County
- Pitkin County
- San Luis Valley Region (Alamosa, Conejos, Costilla, Mineral, Rio Grande and Saguache)

Thank you,

Mack Chambers
GIS Analyst
Mobile: (720) 839-1516
www.woodplc.com

From: Scot Fitzgerald
To: Chambers, Mack
Cc: Brislawn, Jeff P; Field, Scott; Carr, Amy; Karen Berry; Jonathan Lovekin
Subject: Re: [External] Geologic Hazards GIS data to support various hazard mitigation planning efforts.
Date: Thursday, May 12, 2022 11:57:12 AM
Attachments: image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Mr Chambers

You can in fact add them for visualization in ArcCatalog and pull them into your ArcMap or ArcPro projects with steps 1-3 below. You can do limited analysis with just the feature service which meets most peoples needs.

If you need to further analysis in custom workflows and want the feature classes then you can do the workflow below and export your region of interest. We don't typically advertise this workflow, especially for this web map because it is a beta product, but Im guessing you can export what you need faster than I can package it up for you. If you do not feel like doing this you can send me your regions of Interest and I will export what you need.

1. Open ArcCatalog, choose "Add ArcGIS Server"
2. Choose "use GIS service" and then in the Server URL box put your full server location, ie CGS's REST directory: https://cgsarcimage.mines.edu/arcgis/rest/services
3. Open a project in ArcMap or Pro and then drag over your feature class from the REST service directory you just added in Catalog
4. Then search for the tool "Feature Class to Feature Class" in ArcMap or "WFS to Feature Class" in Pro
5. Export the Feature class to your working GDB for that project and then add to your map.

As for the question about recent or ongoing geologic studies I have CC'd Karen Berry and Jonathan Lovekin to reply to this. Feel free to reach out to them and they might be able to provide more information on those that what I am aware of.

Please let me know if you need further help!

thanks,

F Scot Fitzgerald, GISP
Colorado Geological Survey
Colorado School of Mines
GIS Analyst II
ffitzger@mines.edu

Colorado Climate Center

From: "Brislawn, Jeff P" <jeff.brislawn@wsp.com>
Date: Wednesday, October 19, 2022 at 11:08 AM
To: "Schumacher,Russ" <Russ.Schumacher@colostate.edu>
Cc: "Field, Scott" <scott.field@wsp.com>, "Johnson, Christopher A" <christopher.johnson@wsp.com>
Subject: Coordination with CO Climate Center on various Local Hazard Mitigation Plan updates

**** Caution: EXTERNAL Sender ****

Hi Russ,
Hope you are doing well. I wanted to let you know that Wood has sold its Environment & Infrastructure business, which includes our Hazard Mitigation and Emergency Management program, to WSP recently. Our emails now have WSP.com on them, but other than that its business as usual and we are excited to be part of a global firm with a core focus on resiliency and sustainability.

Also, I wanted to make you aware that we are under contract with several CO local governments to update their local hazard mitigation plans. I am reaching out on behalf of our clients to see if there are any initiatives or studies related to these entities that the Colorado Climate Center may be engaged in that we should be aware of. We have been incorporating climate change into the hazard risk assessment as to how it may influence severity and frequency of relevant hazards, based on Colorado studies (Colorado Climate Change Vulnerability Study, CO State HMP, CO Drought Plan etc.) and the 4th National Climate Assessment.
Many of the planning efforts are in final stages and we will be making the drafts available for review and comment also when we get to that point. Below is the list of current clients and planning efforts.

City of Manitou Springs
City of Westminster (initial stages)
San Luis Valley Region: Alamosa County, Conejos County, Costilla County, Mineral County, Rio Grande County and Saguache County
Archuleta County
Pitkin County
Delta County (initial stages)

Regards,
Jeff

From:	Schumacher,Russ
To:	Brislawn, Jeff P
Subject:	Re: Coordination with CO Climate Center on various Local Hazard Mitigation Plan updates
Date:	Wednesday, October 19, 2022 8:11:53 PM
Attachments:	image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi Jeff,

Thanks for getting in touch about this.

Probably the one thing worth being aware of is that we're in the process of updating the "Climate Change in Colorado" report that was last published in 2014 (http://wwa.colorado.edu/sites/default/files/2021-07/Climate_Change_CO_Report_2014_FINAL.pdf). We've finished some of the preliminary work (mainly updating some of the figures from the 2014 report to include observations from more recent years), and will soon be starting some updates to the future projections, etc. The plan is to finish and publish it by next spring/summer.

Other than that though, we haven't really been involved in new work that's at the level of what would be worth incorporating into these plans. There has been a lot of recent research related to drought and wildfire given what's happened in the west in the last couple decades – it's generally not specific to Colorado, but still relevant. For example, the NOAA report on the 2020 drought: https://www.drought.gov/documents/noaa-drought-task-force-report-2020-2021-southwestern-us-drought and various wildfire studies like https://www.pnas.org/doi/full/10.1073/pnas.1607171113 and https://www.pnas.org/doi/pdf/10.1073/pnas.2111875118

I've also been contacted by a couple of county officials about their plan updates (though not any of the counties you mentioned).

Anyway, hope that helps a bit – let me know if there's additional info I can help with!

Russ

—
Russ S. Schumacher
Director, Colorado Climate Center
Colorado State Climatologist
Professor, Department of Atmospheric Science
Colorado State University
e-mail: russ.schumacher@colostate.edu
phone: 970.491.8084
web: https://www.atmos.colostate.edu/people/faculty/schumacher/

Colorado Resiliency Office

On Wed, Oct 19, 2022 at 10:55 AM Brislawn, Jeff P <jeff.brislawn@wsp.com> wrote:

Hi Anne

Hope you are doing well. I wanted to let you know that Wood has sold its Environment & Infrastructure business, which includes our Hazard Mitigation and Emergency Management program, to WSP recently. Our emails now have WSP.com on them, but other than that its business as usually and we are excited to be part of a global firm with a core focus on resiliency and sustainability.

Also, I wanted to make you aware that we are under contract with the following local governments to update their local hazard mitigation plans. I am reaching out on behalf of our clients to see if there are any initiatives related to these entities that the Colorado Resiliency Office may be engaged in that we should be aware of. Many of the planning efforts are in final stages and we will be making the drafts available for review and comment also when we get to that point.

City of Manitou Springs

City of Westminster (initial stages)

San Luis Valley Region: Alamosa County, Conejos County, Costilla County, Mineral County, Rio Grande County and Saguache County

Archuleta County

Pitkin County

Delta County (initial stages)

Regards,

Jeff

Jeff Brislawn, CFM

Sr Associate, Hazard Mitigation and Emergency Management

From:	Miller - DOLA, Anne
To:	Brislawn, Jeff P
Cc:	Field, Scott; Johnson, Christopher A
Subject:	Re: Coordination with CRO on various Local Hazard Mitigation Plan updates
Date:	Wednesday, October 19, 2022 1:07:14 PM
Attachments:	image001.png

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi Jeff,
Thanks for the update.

CRO is working with 16 rural regions on resiliency and recovery roadmaps, with a focus on economic resiliency. You can learn more here. We're over a year into the 2-year initiative with roadmaps under development now.

Best regards,
Anne

From:	Robert Woelz
To:	jeff.brislawn@wsp.com
Subject:	HMP Public Comment. Fwd: follow up from Mo VanWalleghan
Date:	Thursday, February 9, 2023 3:48:16 PM
Attachments:	#1 .png Screen Shot 2023-02-09 at 12.04.56 PM.png Screen Shot 2023-02-09 at 12.06.05 PM.png Screen Shot 2023-02-09 at 12.06.40 PM.png

Hi Jeff,

I received a "public comment" on the HMP directly (*see email below*).

In summary:

Page 410, F-1 : please add: KV HOA (approximately 200+ residents) and the Baca Grande POA (approximately 1500+ residents) under the "unincorporated communities".

If possible, note KV HOA & Baca Grande POA on all maps.

Thanks, Jeff,
Bobby

Bobby Woelz, CO-CEM®
Director
Saguache County
Office of Emergency Management

719-588-0197

RWoelz@SaguacheCounty-CO.gov

SaguacheCounty.Colorado.gov

---------- Forwarded message ---------
From: **Mo Eich VanWalleghan** <mindful.land.use@gmail.com>
Date: Thu, Feb 9, 2023 at 1:10 PM
Subject: follow up from Mo VanWalleghan
To: <rwoelz@saguachecounty-co.gov>

Bobby,

Thank you for speaking with me on Monday. This is the email account I am using for work projects, but my professional email is mo.vanwalleghan@gmail.com.

I reviewed *The San Luis Valley Hazard Mitigation Plan Update* particularly section Annex F: Saguache County. I have attached a few screen grabs for your reference.

Page 410
F-1 / Attachment #1
In reading the description, the areas of both KV HOA (approximately 200+ residents) and the

Baca Grande (approximately 1500+ residents) are not noted. I would like to request that these two population centers be officially added to the listed areas in unincorporated Saguache County. These two combined population centers make up almost half of the total number of residents in unincorporated Saguache. I would very much like to check in about how to better include these population centers in future processes for these kinds of things.

If possible also on the maps it would seem that noting both the KV HOA and the Baca Grande POA would help highlight the major population centers in relationship to what the map is identifying. See three attachments. Right now in some ways 1700 people are invisible as "urban" areas because they are not noted or listed in the beginning or specifically noted on the maps.

So hopefully this is the "comments" that you are looking for to add/update the document, which will support the future grants (possibly from FEMA) that we discussed. I was thinking to forward this info onto Mae Folsom (Board President) at the KV HOA and Jay W. the Manager of the Baca Grande POA. Your thoughts?

Also if there are other places you think I should comment for Annex F: Saguache County starting on page 411 or beyond, please let me know.

I do hope we can work together to bring much needed big grants to Saguache County and the San Luis Valley.

Mo

Maureen Eich VanWalleghan
Equity Strategist
Grants Facilitator
Collaboration Manager
—serving the San Luis Valley
928.499.2273

From: Robert Woelz
To: jeff.brislawn@wsp.com
Subject: HMP Saguache Fwd: Re: follow up from Mo VanWalleghan
Date: Thursday, February 9, 2023 7:15:56 PM

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi Jeff,
Baca POA & KV HOA would like a couple mitigation actions to the plan as well
See their email below.
If you have any questions please let me know or you can follow up with Mo directly at: mindful.land.use@gmail.com

Thanks,
Bobby

---------- Forwarded message ---------
From: **Mo Eich VanWalleghan** <mindful.land.use@gmail.com>
Date: Thu, Feb 9, 2023, 5:18 PM
Subject: Re: Thanks, Mo Re: follow up from Mo VanWalleghan
To: Robert Woelz <rwoelz@saguachecounty-co.gov>

Bobby,
Hopefully I am getting this right...
Mo

purple is for adding

KV HOA
S.31 Complete stormwater drainage study for known problem areas (KV HOA)
Flood: Saguache County
KV Estates HOA & Saguache County; Road & Bridge
1-5 Years $50,000 Low New in 2022
Seek updated FEMA digital floodplain maps (DFIRMs).

KV HOA to develop/install water tank for water storage for water access in emergencies

Baca Grande POA
S.3? Complete stormwater drainage study for known problem areas
(Baca Grande POA)
Flood: Saguache County

Baca Grande POA & Saguache County Road & Bridge
1-5 Years $500,000 (New in 2022)
approximately 103 miles total in the BG POA
88 maintained by POA and 15 maintained by Saguache

Develop backup power sources for emergency services, including all fire stations, and identify shelter/mass care facilities and pre-wire to accept portable generators.

Install wells and holding tanks exclusive for the fire department, either redrilling one or two wells in the Baca Grande POA and/or drilling three new ones. The Baca Grande fire department due to the size of the Baca Grande POA needs faster access to water in an emergency.

> Thu, Feb 9, 2023 at 1:10 PM Mo Eich VanWalleghan <mindful.land.use@gmail.com> wrote:
>
> > Bobby,
> >
> > Thank you for speaking with me on Monday. This is the email account I am using for work projects, but my professional email is mo.vanwalleghan@gmail.com.
> >
> > I reviewed *The San Luis Valley Hazard Mitigation Plan Update* particularly section Annex F: Saguache County. I have attached a few screen grabs for your reference.
> >
> > Page 410
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> > In reading the description, the areas of both KV HOA (approximately 200+ residents) and the Baca Grande (approximately 1500+ residents) are not noted. I would like to request that these two population centers be officially added to the listed areas in unincorporated Saguache County. These two combined population centers make up almost half of the total number of residents in unincorporated Saguache. I would very much like to check in about how to better include these population centers in future processes for these kinds of things.
> >
> > If possible also on the maps it would seem that noting both the KV HOA and the Baca Grande POA would help highlight the major population centers in relationship to what the map is identifying. See three attachments. Right now in some ways 1700 people are invisible as "urban" areas because they are not noted or listed in the beginning or specifically noted on the maps.
> >
> > So hopefully this is the "comments" that you are looking for to add/update the document, which will support the future grants (possibly from FEMA) that we discussed. I was thinking to forward this info onto Mae Folsom (Board President) at the KV HOA and Jay W. the Manager of the Baca Grande POA. Your thoughts?
> >
> > Also if there are other places you think I should comment for Annex F: Saguache County starting on page 411 or beyond, please let me know.
> >
> > I do hope we can work together to bring much needed big grants to Saguache County and the San Luis Valley.
> >
> > Mo

Maureen Eich VanWalleghan
Equity Strategist
Grants Facilitator
Collaboration Manager
—serving the San Luis Valley
928.499.2273

ID	Start time	Completion time	Email	Name	Please provide comments on the draft 2023 San Luis Valle	Select affiliation (select	Which county do you li	Please provide your con
1	1/31/23 19:58:52	1/31/23 19:59:51	anonymous		Adam moore	Government-State	Alamosa	Adam.moore@colostate.edu
2	2/6/23 11:23:07	2/6/23 11:41:11	anonymous		Page 4-139 and Figure 4-31 - the text and map should be revised to include the Excel pipeline that runs through Saguache County. Also, in all of the Annex's sections 6.2 under Historical and Cultural Assets - the National Historic Preservation Act should be cited? and not NEPA? Insure the correct reference. In Annex F - Saguache County page F-1 suggest rewording National Protected Areas - ie Saguache County includes multiple federal land agency jurisdictions such as the Great Sand Dunes Park and Preserve, Bureau of Land Management, Gunnison and Rio Grande National Forests. Portions of the La Garita Wilderness Area and Sangre de Cristo Wilderness Areas are also within Saguache County.	Government-Federal	Saguache	Tristram Post, Rio Grande National Forest, Saguache District Ranger. email - tristram.post@usda.gov Thank you for all your hard work getting this document together!
3	2/7/23 19:54:14	2/7/23 20:57:48	anonymous		I focused mainly on the wildfire sections. I also left some comments on the google document. Table 4-1 any chance to color code the hazard ranking for quicker reference? Dams - it would be nice to have a brief discussion of how dams could be affected in a post fire environment Wildfire Overall the integration of the HMP and the CWPP could have been done better. https://mil.wa.gov/asset/602d79e58b6e7 Consider listing all the CWPP identified communities and potentially mapping them according to hazard ratings. Annexes - great spot to list WUI communities and ratings. Maybe even map them. Alamosa Annex - table A-6 Mosca should be listed; A-8 missing 2018 brush fire south of alamosa. Conejos Annex - don't forget about Ortiz and Mogote Costilla Annex - don't forget about Fort Garland Saguache Annex - I would rate Crestone as at least medium, if not high for wildland fire	Government-State	alamosa	adam.moore@colostate.edu

From:	Perry - DNR, Mark
To:	Brislawn, Jeff P; Chris Rodriguez; Dave Osborn; Johnson, Christopher A
Cc:	Hunyadi, John; Mark Thompson - CDPS; keith; Craig Cotten; Darin Schepp - DNR
Subject:	Re: SLV HMP question, Sanchez Dam seepage repairs
Date:	Thursday, February 2, 2023 9:53:49 AM
Attachments:	image001.png New Mitigation Action Worksheet_SANCHEZ DAM.docx

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Gentleman, thanks for the quick response about a Sanchez Dam Safety mitigation project.

I talked to the dam owner (Sanchez Ditch and Reservoir Co. president) and to our State Dam Safety Chief -- both fully support a Sanchez Dam seepage mitigation project for the SLV Hazard Mitigation Plan. The proposed funding source would be FEMA's High Hazard Dam Potential (HHDP) grant: https://www.fema.gov/emergency-managers/risk-management/dam-safety/rehabilitation-high-hazard-potential-dams

Please see the attached completed new mitigation action worksheet for Sanchez Dam seepage repairs. Don't hesitate to contact me if you have questions or need additional information.

Many thanks.

Sincerely,
Mark

Mark A. Perry, P.E.
Dam Safety Engineer
Colorado Dam Safety

P 719-542-3368 x2118 | C 719-250-5606
314 E. Abriendo Ave., Suite B, Pueblo CO 81004
mark.perry@state.co.us | https://dwr.colorado.gov/

On Wed, Feb 1, 2023 at 7:50 PM Brislawn, Jeff P <jeff.brislawn@wsp.com> wrote:

> Chris,
>
> Yes there is. Can he provide the details in the attachment? Then we can incorporate into the final plan. Would love to see a project for the Sanchez Dam, I remember that one being problematic waaaay back when I started my career at State OEM.
>
> Jeff

Jeff Brislawn, CFM

Assistant Vice President, Hazard Mitigation and Emergency Management

M+ 1 303-704-5506

WSP USA

2000 S. Colorado Blvd., Ste. 2-1000

Denver, CO 80222

wsp.com

From: Chris Rodriguez <chris.rodriguez@costillacounty-co.gov>
Sent: Wednesday, February 1, 2023 3:49 PM
To: Brislawn, Jeff P <jeff.brislawn@woodplc.com>
Cc: Dave Osborn <david.osborn@state.co.us>; Mark Perry <Mark.Perry@state.co.us>
Subject: Fwd: SLV HMP question, Sanchez Dam seepage repairs

Good afternoon Jeff,

Please see comments below for Costilla County, specifically Sanchez Dam and Reservoir. Is there a way we can incorporate this into the plan?

Chris

---------- Forwarded message ---------
From: **Osborn - CDPS, David** <david.osborn@state.co.us>
Date: Wed, Feb 1, 2023 at 1:29 PM
Subject: Re: SLV HMP question, Sanchez Dam seepage repairs

To: Perry - DNR, Mark <mark.perry@state.co.us>
Cc: Thompson - CDPS, Mark <markw.thompson@state.co.us>, Christopher Rodriguez <chris.rodriguez@costillacounty-co.gov>

You bet. We have a short turn-around time so I will reach out to Chris Rodriguez who was just promoted to the Deputy Administrator position. Chris continues to manage emergency management until they have a new hire onboard. I've taken the liberty to copy Chris to this email. Oz..

On Wed, Feb 1, 2023 at 9:45 AM Perry - DNR, Mark <mark.perry@state.co.us> wrote:

> Yes sir. That answers my question.
>
> David, could I work with you and the Costilla County EM to add a specific Mitigation Action for Sanchez Dam seepage repairs? If you have any guidance on how to proceed, I'll be happy to oblige. I can draft a goal or whatever you need.
>
> Many thanks,
>
> Mark
>
> Mark A. Perry, P.E.
> Dam Safety Engineer
> Colorado Dam Safety
>
> P 719-542-3368 x2118 | C 719-250-5606
> 314 E. Abriendo Ave., Suite B, Pueblo CO 81004
> mark.perry@state.co.us | https://dwr.colorado.gov/
>
> On Wed, Feb 1, 2023 at 9:38 AM Thompson - CDPS, Mark <markw.thompson@state.co.us> wrote:
>
>> Mark,

That level of specificity is the goal because it creates a clear linkage between the HMP and a grant application. In other cases we would want to see something like "collaborate with dam owner to restore X Dam to full capacity and Satisfactory condition."

Does that help?

Mark

Mark W. Thompson

State Hazard Mitigation Officer

OFFICE OF EMERGENCY MANAGEMENT

DHSEM 2022 BRIC/FMA Announcement & HMA Webinar

DHSEM Announces Increased Federal Cost Shares to 90% for HMGP

New Hazard Mitigation Grant Opportunities for 2022

Mitigation Notice of Interest (NOI) Form

P 720.852.6600 | F 720.852.6750 | C 720.630.0770

9195 E. Mineral Ave, Centennial, CO 80112

markw.thompson@state.co.us | https://dhsem.colorado.gov/

www.COEmergency.com | www.mars.colorado.gov
| www.COBEOC.Colorado.gov

Twitter: @COEmergency | Facebook: COEmergency

SERVICE * TEAMWORK * RESPECT * INTEGRITY * VISION * EXCELLENCE

Our Mission is to lead and support Colorado's effort to prevent, protect,

mitigate, respond to and recover from all-hazard events.

On Wed, Feb 1, 2023 at 9:35 AM Perry - DNR, Mark <mark.perry@state.co.us> wrote:

Hi Mark & David,

I'm sorry to bother you guys with a dumb question, so thanks for your patience.

So I reviewed the draft SLV HMP, currently out for public review. I see that dams are addressed in a number of places in the report, which is great. Question: If we have a specific dam repair project in mind for FEMA HHPD grant funding, does that exact project need to be listed as an Action in the County's Mitigation Action Plan? For example, I'm referring specifically to foundation seepage repair measures for Sanchez Dam, Costilla County.

Many thanks for any guidance you can provide.
Mark

Mark A. Perry, P.E.
Dam Safety Engineer
Colorado Dam Safety

P 719-542-3368 x2118 | C 719-250-5606
314 E. Abriendo Ave., Suite B, Pueblo CO 81004
mark.perry@state.co.us | https://dwr.colorado.gov/

--

David R. Osborn

Field Manager

San Luis Valley Service Area

719.480.9024 Cell | 24/7 Dispatch 719.589.5807 | Mineral County 719.658.2600

24 Hour Emergency Line: 303.279.8855

1301 West Avenue - Alamosa, Colorado 81101

david.osborn@state.co.us | www.DHSEM.state.co.us

www.COEmergency.com | www.Colorado.gov/MARS | COBEC.colorado.gov

Twitter: @COEmergency | Facebook: COEmergency

SERVICE * TEAMWORK * RESPECT * INTEGRITY * VISION * EXCELLENCE

Our Mission is to lead and support Colorado's effort to prevent, protect, mitigate, respond to and recover from all-hazard events.

--

Chris Rodriguez

Costilla County

Deputy County Administrator

Emergency Management Coordinator

Cell: 719.298.1797

Office: 719.672.3372

-LAEmHhHzdJzBlTWfa4Hgs7pbKl

APPENDIX D: PLAN ADOPTION AND APPROVAL

Note: This appendix provides documentation of the required record of adoption which will be incorporated when available. When the plan is adopted in 2023 a scanned version of the adoption resolutions will be inserted for each participating jurisdiction within Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache counties. A sample adoption resolution is provided here. The final FEMA approval packed will be included for future reference regarding the five-year expiration date and suggestions for improvement in the next update.

Mitigation Plan Adoption Sample Resolution

Resolution # _____

Adopting the 2023 San Luis Valley Hazard Mitigation Plan

Whereas, *(name of county or community) recognizes the threat that natural hazards pose to people and property within our community; and*

Whereas, *undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and*

Whereas, *an adopted Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and*

Whereas, *(name of county or community) resides within the Planning Area, and fully participated in the mitigation planning process to prepare this Hazard Mitigation Plan; and*

Whereas, *the Colorado Division of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials have reviewed the 2023 San Luis Valley Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body; and*

Now, therefore, be it resolved, *that the (name of board or council), hereby adopts the San Luis Valley Hazard Mitigation Plan, as an official plan; and*

Be it further resolved, *the County of ________ will submit this Adoption Resolution to the Colorado Division of Homeland Security and Emergency Management and Federal Emergency Management Agency, Region VIII officials to enable the Plan's final approval.*

Passed: ___(date)______________

____

Certifying Official

Alamosa County Adoption Records

Alamosa County

City of Alamosa

Town of Hooper

Alamosa County Fire Protection District

Rio Grande Water Conservation District

Conejos County Adoption Records

Conejos County

Town of Antonito

Town of La Jara

Town of Manassa

Town of Romeo

Town of Sanford

Costilla County Adoption Records

Costilla County

Town of San Luis

Town of Blanca

Mineral County Adoption Records

Mineral County

City of Creede

Rio Grande County Adoption Records

Rio Grande County

City of Monte Vista

Town of Del Norte

Town of South Fork

Saguache County Adoption Records

Saguache County

Town of Center

Town of Crestone

Town of Moffat

Town of Saguache

2000 S. Colorado Boulevard, Suite 2-1000
Denver, CO 80222